CYPRIOT GREEK DOWN SYNDROME

THEIR GRAMMAR AND ITS INTERFACES

by

Christa Christodoulou

B.A., Aristotle University, Thessaloniki, 1999
M.A., University of Essex, 2000

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Abstract

This dissertation investigates the linguistic performance of 16 Cypriot Greek individuals diagnosed with Down Syndrome (henceforth, CG_{DS}), aged 19;0 to 45;11, and compares their performance to 17 Cypriot Greek Typically Developing Children (hereafter, CG_{TDC}), aged 7;0 to 8;11. Three hypotheses were tested to determine whether the differences between the two groups, as well as the Grammar of Cypriot Greek adults with typical development (henceforth, CG_{TD}) were: (i) syntactically, (ii) morphologically, or (iii) phonetically and phonologically conditioned.

When consulting previous research, a number of shortcomings were observed. Therefore, an innovative methodology was employed to address these issues. Contrary to previous research, which argues for an overall inflectional impairment (either syntactically or morphologically conditioned), this dissertation establishes that the vast majority of differences between the two groups are phonetically conditioned. These differences are due to the distinct physiology of the articulation apparatus in CG_{DS}. Furthermore, a small number of phonologically conditioned differences were either due to (i) the phonological environment (syllable structure and word-position) or (ii) phonological feature underspecification. However, there is also a very small residue of differences that are morphologically conditioned. When a produced feature value does not match the target, CG_{DS} and CG_{TDC} exhibit the same three strategies: (i) use of an alternative feature value (as the default) to the targeted one, (ii) affix drop and (iii) full-word omission.

I propose a unified analysis, according to which the morphological differences between CG_{DS}, CG_{TDC} and CG_{TD} are due to a failure of *Blocking*. The competition between a phonetic exponent that includes (i) all feature values resulting from the syntactic derivation, and (ii) a subset of the features, but no contrasting features, fails to be resolved in favour of the most specified form. I further propose that this may

be extended to phonological features. Finally, I propose that full-word and phoneme omissions suggest a problem with vocabulary or sound insertion, which may be rooted in phonological and verbal short-term memory limitations.

In sum, I argue that the adult CG_{DS} Grammar is not an impaired version of the adult CG_{TD} Grammar.

Preface

Chapters 5, 6 and *7* are based on data collected from human participants: 16 Cypriot Greek individuals diagnosed with Down Syndrome (ages 19;0 to 45;11), and 17 Cypriot Greek typically developing children (ages 7;0 to 8;11).

My application (*File: H07-03130*) to conduct experimental research on humans (*Minimal Risk*) was reviewed, by the Behavioural Research Ethics Board at the University of British Columbia on January 28, 2008. Final approval was granted on March 5, 2008, after all requirements were fulfilled and all certificates pertaining to my research were provided.

As stated in the confidentiality agreement included in the consent form, for privacy purposes, the names of the participants are not used throughout the Dissertation. Instead, a *Participant ID* is used to refer to the production of a particular individual. Information on the participants' Intelligence Quotient (IQ) is given in *Appendix B*, but once again a *Participant ID* was used to conceal the identity of participants.

Table of Contents

List of Tables

List of Figures

List of Graphs

List of Features, Abbreviations and Conventions

I.	GLOSSING – INFLECTIONAL FEATURES AND FUNCTION WORDS	
ACC	=	Accusative
GEN	=	Genitive
NOM	=	Nominative
VOC	=	Vocative
PRES	=	Present
PAST	=	Past
DEP	=	Dependent
FUT	=	Future
PL	=	Plural
SG	=	Singular
SG/PL	=	Singular or Plural
1/1st	=	1st Person
2/2nd	=	2nd Person
3/3rd	=	3rd Person
IMPF	=	Imperfective
PRF	=	Perfective
FEM	=	Feminine
MASC	=	Masculine
NEU	=	Neuter
SUBJ	=	Subjunctive
IMP	=	Imperative
OPT	=	Optative

OPT	=	Optative
NEG	=	Negation
PREP	=	Preposition
CONJ	=	Conjunction

II. PHONOLOGICAL FEATURES

Cons	=	Consonantal
Contin	=	Continuant
Sonor	=	Sonorant
Spread gl	=	Spread glottis

III. ABBREVIATIONS FOUND IN TEXT

AGR	=	agreement
AgrP	=	agreement Phrase
Agr_SP	=	agreement Subject Phrase
ATOM	=	agreement/Tense Omission Model
CHAT	=	CHILDES format for transcription and coding
CHILDES	=	Child Language Data Exchange System
CG_{DS}	=	Cypriot Greek individuals diagnosed with Down Syndrome
CG_{TDC}	=	Cypriot Greek Typically Developing Children
CG_{TD}	=	Cypriot Greek adults with Typical Development
CG	=	Cypriot Greek
CP	=	Complementizer Phrase
CV	=	Consonant-Vowel
CVC	=	Consonant-Vowel-Consonant
(C)CVC	=	(Consonant-)Consonant-Vowel-Consonant
D	=	Determiner
DET	=	Determiner
DP	=	Determiner Phrase
DS	=	Down Syndrome
Eng_{DS}	=	English individuals diagnosed with Down Syndrome

Eng_{SLI}	=	English individuals diagnosed Specific Language Impairment
Eng_{TD}	=	English adults with Typical Development
Eng_{TDC}	=	English Typically Developing Children
EOI	=	Extended Optional Infinitive Hypothesis
FS	=	False start or stuttering
Ger_{DS}	=	German individuals diagnosed with Down Syndrome
Ger_{TDC}	=	German Typically Developing Children
$Greek_{DS}$	=	Greek individuals diagnosed with Down Syndrome
$Greek_{SLI}$	=	Greek individuals diagnosed Specific Language Impairment
$Greek_{TD}$	=	Greek adults with Typical Development
$Greek_{TDC}$	=	Greek Typically Developing Children
$Greek_{WS}$	=	Greek individuals diagnosed with Williams Syndrome
IIH	=	Inflectional Impairment Hypothesis
INF	=	Infinitive
INFL	=	Infinitival
IP	=	Inflectional Phrase
IQ	=	Intelligence Quotient
It_{DS}	=	Italian individuals diagnosed with Down Syndrome
It_{SLI}	=	Italian individuals diagnosed with Specific Language Impairment
It_{TDC}	=	Italian Typically Developing Children
$N_{C(X)}$	=	Category of noun, adjective, determiner, pronoun, etc. The Subscript $_C$ followed by a Latin numeral indicates the nominal class a noun or adjective belongs to. $_X$ marks the relevant given Inflectional class.
NP	=	Noun Phrase
OI	=	Optional Infinitive
P-EX	=	Phonetic exponent (phonological representation of morpho-syntactic features)
PhI	=	Productions with phonetic (or phonological) issues affecting inflectional features
PP	=	Prepositional Phrase
P-SEG	=	Phonological Segment
RDBMS	=	DataBase Management System

SLI	=	Specific Language Impairment
SG	=	Standard Greek
SG_{TD}	=	Standard Greek Typical Developing Adults
Subj	=	Subjunctive
S/V agreement	=	Subject/Verb agreement
TP	=	Tense Phrase
TD	=	Typically Developing
UG	=	Universal Grammar
V	=	Vowel
VC	=	Vowel-Consonant
VP	=	Verb Phrase

IV. ABBREVIATIONS AND CONVENTIONS FOUND IN TABLES AND FIGURES (OTHER THAN THE ONES MENTIONED ABOVE)

%	=	Percentage
∅	=	Omission of a word or phoneme/sound
φ use	=	Feature use (only for a specific feature value)
Alt	=	Alternative Use (Use of a form other than the one targeted or expected based on the experimental stimulus or experimental target)
Alternative	=	Use of a form other than the one targeted or expected based on the experimental stimulus or experimental target
Alternative INC %	=	Percentage of incorrect Productions based only on the use of a feature values as an alternative to other feature values
Aug	=	Augment (Past Prefix)
CG_{DS} Gl %	=	Global Use (includes every utterance produced by CG_{DS})
CG_{TDC} Gl %	=	Global Use (includes every utterance produced by CG_{TDC})
CG_{DS} Prod %	=	CG_{DS} productions (excluding omissions, incomplete utterances and fillers)
CG_{TDC} Prod %	=	CG_{TDC} productions (excluding omissions, incomplete utterances and fillers)
C_I (or other)	=	Inflectional paradigms a nominal belongs to, based on Ralli (1998)
COR %	=	Percentage of correct Productions

Gl %	=	Calculated based on percentage of global use (the production of every single utterance targeted– whether a full word, incomplete utterance or fillers)
Global	=	Overall use of a specific feature or feature value regardless of whether it was produced as targeted or as an alternative to another feature value, based on the experimental task
Global INC %	=	Percentage of incorrect Productions based on the participants' overall production of a specific feature of feature value
INC %	=	Percentage of incorrect Productions
LF	=	Logical Form
Match	=	Use of a form as targeted or expected based on the experimental stimulus or experimental target)
N	=	Number of Tokens
NM	=	Non-Match (produced utterances which did not match the target)
NM %	=	Percentage of Non-Match (percentage of produced utterances which did not match the target)
Obg	=	Obligatory
Opt	=	Optional
Overall Performance	=	the production of every single utterance targeted– whether a full word, incomplete utterance of a filler
PF	=	Phonetic Form
Prod%	=	Production Percentage (overall productions excluding omissions and incomplete utterances or fillers

V. TRANSCRIPTION CONVENTIONS

/ /	=	Underlying phonological form of a phoneme
[ ]	=	Actual production of a phoneme
∅	=	Omission
( )	=	Optional

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At the age of 14, I was first faced with the dilemma of what career I wanted to pursue. I responded with an approximate description of the qualifications needed to be a (neuro)linguist, but I was told that the goals I was setting for the future were unrealistic and I should try to think of a more conventional profession like a doctor, a teacher or a lawyer. This dissertation is an answer to those who questioned that anything is possible. Thank you for the motivation you gave me to prove otherwise.

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listen to all my data analysis problems and cared enough to pay attention when I talked about my work. These people were my second family in Vancouver and without them I have no idea how different things would be. I would like to thank Vanora Miller, Alexandra Moreno, Andres Varhola, Ruth Moreno, and Thomas Beckman, for always being my fun group, trying to drag me out of my cave and into a more relaxing, laid back lifestyle. Sorry for disappointing you most of the time, but thank you for never giving up. Especially, thanks to Ale and Vanora, who always had an interesting way of putting things into perspective and for the most sane-insane conversations I have ever had. Thanks to Jaclyn and Scott Widenmaier, Katie Calloway, David Bergeron, Laura Estrata and Andrew Hill for some of the most valuable and meaningful friendships I have ever had. I would like to also thank my "Greek family" in Vancouver: Georgios Giannelis, Diomidis Michalopoulos, Lena Patsa and Andreas Sotirakopoulos. Thanks for the words of encouragement, love, and support, for always caring and being willing to help, for the most amazing road-trips and best homemade pizza I have ever had in my life. Last, but not least, there is someone who has always been there for me and there are hardly any words to express my love and gratitude. Thanks to Dan Bewley for offering me every possible help and positive emotion a human being is capable of, without thinking twice. Without him, I doubt I would have been able to complete this work. In the moment of crisis, he was always level-headed to keep me sane and calm. In the moment of happiness he was there to celebrate with me. In difficult moments he was there to support me and keep me safe. I feel blessed to have him in my life, especially through the most difficult journey, I had to complete so far, *την Ιθάκη μου*.

To my family
(for all their support)

and

To my mentor
(for believing in me)

Chapter 1

Introduction

1.1 THESIS

The goal of this dissertation is to examine the linguistic performance of Cypriot Greek individuals diagnosed with Down Syndrome (henceforth, CG_{DS}). Previous research has reported that English individuals diagnosed with Down Syndrome (henceforth, Eng_{DS}) use Tense[1] and Subject/Verb (hereinafter, *S/V*) agreement differently than English Typically Developing (hereinafter, Eng_{TD}) adults and children (Laws and Bishop 2003, Eadie et al. 2002, Chapman and Hesketh 2000, Chapman et al. 1998, *inter alia*).[2] This difference in use is generally taken to indicate impairment of the inflectional system, and I will refer to it as the Inflectional Impairment Hypothesis (henceforth, *IIH*). In this dissertation, I investigate whether the same is also true for CG_{DS} adults; namely, whether CG_{DS} adults also display inflectional impairment and if so what the conditioning factors are. I will test three hypotheses to determine what conditions the differences between CG_{DS} adults and 7- to 8-year old Cypriot Greek Typically Developing Children (henceforth, CG_{TDC}):

I. The differences in the production of the inflectional system are morphologically conditioned

II. The differences in the production of the inflectional system are syntactically conditioned

[1] When referring to inflectional features, words are capitalised.

[2] No extensive/substantial study of Case marking in Down Syndrome (henceforth, *DS*) is available to date.

[3] From this point forward I will refer to these grammatical differences as the CG_{DS} grammar, the term not actually

III. The differences in the production of the inflectional system are phonetically and phonologically conditioned.

Naturally, the possibility remains that differences between the two groups are a result of a combination of factors.

Note that the source of the hypothesised impairment (morphology, syntax, or phonology) cannot be determined on the basis of previous work. This is due to several factors. First, previous analyses lack extensive morphological, syntactic, phonetic and phonological analyses of the experimental results. Second, the majority of the existing studies are conducted on Eng_{DS} where poor morphology limits the testing ground. Finally, factors, external to morpho-syntax, are not controlled for. In this dissertation, I will show that the differences found between the CG_{DS} and Cypriot Greek adults with Typical Development (henceforth, CG_{TD}) result from: (i) mainly articulatory and phonological restrictions associated with Down Syndrome (hereafter, *DS*), (ii) use of default forms, and (iii) restrictions with vocabulary insertion. This leads me to conclude that the so-called inflectional impairment is not due to a defective Grammar, but instead points towards a different realisation of some grammatical aspects of the CG_{TD} Grammar.[3]

In the remainder of this chapter I give an overview of this Thesis. In *Section 1.2*, I explain the motivations for this research and list the contributions of the current study to the fields of Linguistics, Neurolinguistics, and Speech-Language Pathology, as well as research on *DS* in general. In *Section 1.3*, I discuss the background on which the three hypotheses are evaluated. Finally, I give a brief summary of each chapter (*Section 1.4*). I conclude with a final note on what makes this research different from previous work and discuss avenues for future research.

[3] From this point forward I will refer to these grammatical differences as the CG_{DS} Grammar; the term not actually meaning a different Grammar per se, but rather differences with certain grammatical functions analysed and discussed throughout this dissertation.

1.2 THE SIGNIFICANCE OF INFLECTIONAL IMPAIRMENT IN DOWN SYNDROME

The main characteristic of the hypothesised impairment (*IIH*) is affix drop, i.e. the optional realisation of inflectional marking. The core question I address in this dissertation is, whether the adult CG_{DS} productions can indeed be characterised by and inflectional impairment, and if they can, what conditions this hypothesised inflectional impairment in *DS*?

A question to ask is whether the alleged impairment is specific to Tense and *S/V* agreement or whether it affects all types of inflection? A review of the existing literature is not conclusive. For instance, Ring and Clahsen (2005) show problems with inflectional morphology (including optional inflection of Tense-marking, Comparative and Plural marking). In contrast, Eadie et al. (2002) report problems with verbal inflection (Tense and *S/V* agreement), especially regular Past inflection *–ed*, but no problems with plurals and the gerund. A study by Laws and Bishop (2003) reports accurate use of Tense (regular and irregular), but problems with 3rd Person Singular. Moreover, while Chapman and Hesketh (2000) argue for an overall inflectional impairment, Eadie et al. (2002) find minimal problems (approximately 20%) with Plural, -*ing*, determiners and the possessive. Moreover, results appear to differ across languages; while the above studies report that inflectional impairment in Eng_{DS} affects both Tense and *S/V* agreement, Schaner-Wolles (2004) shows that German *DS* (henceforth, Ger_{DS}) surpass 98% accuracy in their use of *S/V* agreement. If this is indeed the case, then we may conclude that *DS* has different effects, depending on the target language, and perhaps the choice of experimental methods and stimuli.

1.2.1 Empirical Contributions

CG_{DS} allows us to test the three hypotheses concerning the nature of the hypothesised inflectional impairment. Three types of inflectional marking (the inflectional features of Tense, Person and Number (making up *S/V* agreement) for verbs and Case for nominal expressions) are examined in a variety of environments with all possible feature combinations. We observe that in case one type of inflection is not used as targeted (e.g. Tense), we do not necessarily see a simultaneous effect on the other types of inflection (*S/V* agreement and Case). Having examined a considerable number of factors external to morpho-syntax, like surrounding structure, elicitation methodology, and phonetic and phonological effects, the CG_{DS} Grammar and its interfaces (i.e., articulatory restrictions and vocabulary insertion) cannot be characterised by a general impairment of their inflectional system. Rather, it appears that inflection is in fact not impaired at all. This raises the question as to what is responsible for the differences between the adult CG_{DS} on the one hand and adult and child CG_{TD} productions on the other hand. I show that these differences are mostly due to articulatory restrictions and a different phonological system found in *DS*. In particular, the articulatory restrictions lead to different pronunciations of various inflected forms. The difference in pronunciation (either phoneme omission or substitution) causes the produced form to be homophonous with another form with different inflectional features. Thus, to a large extent the apparent inflectional impairment is phonetically and phonologically conditioned.

There is however a residue of cases (approximately 12% for Tense, 5% for Person, 3.5% for Number and 3% for Case for CG_{DS}), which cannot be accounted for in this way. These percentages consist of forms that exhibit a systematic use of an alternative form across all CG_{DS} participants. I argue that these cases instantiate the use of a default form. I propose that this can

be understood on the assumption that *Blocking* (a filtering device regulating the output generated from a derivation (Wunderlich 1996)) may not always be at work in the Grammar of *DS*.

Extensive morphological, syntactic, phonetic and phonological analyses verify that there are three main differences between the CG_{DS} and the adult CG_{TD} Grammar. First, articulatory limitations restrict the production of certain phonemes regardless of whether the phoneme occurs in inflectional or non-inflectional environments. Omission or substitution of phonemes in inflectional environments causes ambiguity. Second, *Blocking* failure allows the selection of the default form; a given morpho-syntactic or phonological feature is used in the place of the expected or targeted feature. Third, higher percentages of full-word and inflectional affix omission, especially with auxiliaries and copulas, were observed with CG_{DS}. I hypothesise that these result from problems with *Vocabulary Insertion*.

1.2.2 Methodological Contributions

The methodological goal of this study was to collect data involving all possible feature combinations available in the language in a large number of syntactic environments: simplex clauses and complex clauses in Indicative as well as Subjunctive Mood). More explicitly, I used simple one-clause stimuli as well as more complex main-subordinate clause stimuli with one or more subordinate clauses, and conjoined main clauses. Clauses included both the Indicative and Subjunctive in declarative, negative, and interrogative structures. In all the aforementioned structure types, I ensured there was a relatively even distribution of the tested features: Tense, Person, and Number for verbs and Case for nouns, determiners, adjectives, pronouns, etc.

To elicit the type of data needed for this study, I used several different methods of data collection. I used both controlled and free elicitation tasks. For controlled elicitation tasks, participants needed to either produce an utterance based on a visual stimulus or repeat a structure given to them. For free elicitation tasks, participants were only given a context (e.g. describe a typical weekday) and were free to construct the story and their utterances in any way they wanted, using vocabulary of their choice. This did not only aim in covering all grounds but also in eliminating the methodology of testing as a contributing factor to the differences observed between the two groups and with adult CG_{TD}. The choice of experimental stimuli was based on a pilot study (with five participants: three CG_{DS} and two CG_{TDC}), which was conducted prior to this study, to assess the level of the participants' linguistic skills.

This type of data collection differs from previous ones in the following way. First, it combines a variety of both free elicitation tasks and controlled elicitation tasks, whereas previous studies mostly used only controlled elicitation tasks. Results, however, verified that this combination is absolutely necessary. More explicitly, participants were more comfortable producing certain structures in free elicitation (e.g. Subjunctive clauses), while other structures and feature combinations were specifically absent in free elicitation, even though they were used accurately in controlled elicitation. This is possibly due to the restrictions imposed by the targeted topic.

As a result of eliciting data in this way, we benefit from the collection of a large and diverse corpus of data. Elicited productions allowed for a greater variety of syntactic environments, while free elicitation tasks provided a clearer picture of what is and what is not possible in the CG_{DS} Grammar. This allowed for more generalised conclusions, since it eliminated factors external to my research question, such those of (i) structural environment, (ii) phonetic and phonological restrictions, (iii) elicitation method and (iv) effects from specific feature

combinations (dis-)favoured due to either more or less frequent use. Additionally, throughout my dissertation I offer a large number of examples (over 150 examples) exhibiting the methodology employed and the participants' performance. This is systematically absent in previous work on *DS*, (apart from Schaner-Wolles (2004) and Tsakiridou (2006)); neither examples of experimental stimuli nor examples of the participants' productions are presented.

1.2.3 Analytical Contributions

To date, this is the first study that pursues a morpho-syntactic analysis of the *DS* Grammar taking into account phonetic and phonological effects on morpho-syntactic marking. This turns out to be significant, because we find that a large number of what has previously been assumed to be syntactically or morphologically conditioned differences between CG_{DS} and CG_{TD} Grammar are in fact the result of articulatory and phonological restrictions. Moreover, I argue that what appears to be inconsistent for one linguistic domain (i.e. phonological differences which cannot be explained by a set of phonological processes like devoicing or consonant harmony), when examined from a different perspective (i.e. morpho-syntactic), they are indeed part of a systematic pattern. This mainly concerns the hypothesised inconsistencies concerning the phonological limitations reported in previous work on Eng_{DS} (Dodd 1976, Kumin 2006), as well as the contradictions in morpho-syntactic results found in the *DS* literature within and across languages noted above. Finally, the separate phonetic and phonological analysis (in addition to the morpho-syntactic one) offers independent evidence for the proposed analysis. In particular, I show that CG_{DS} exhibit the same strategy of using phonological default features in non-expected or targeted environments, just as they do with morpho-syntactic features.

One of the major contributions of this study is that, though an utterance may not be produced as targeted by CG_{DS}, this does not mean that it is used incorrectly. Specifically, evidence from

previous work (Schaner-Wolles 2004) has shown that Ger_{DS} may alter the syntactic environment to accommodate an unexpected production. This environment may facilitate the new form. Therefore, the evaluation of productions is based on two criteria: (i) what is targeted but also (ii) the syntactic environment it is produced in. Hence, the focus of evaluation falls on what is actually produced, rather than only on what is targeted. I show that CG_{DS} are in fact able to (i) produce the targeted utterance accurately at a very high percentage and (ii) accommodate an alternative use of a feature through re-organization of the inflectional and syntactic environment in which it is produced.

Furthermore, after the participants' performance of the entire word is assessed, each feature inflected on a word is evaluated separately. The methodology of evaluating each individual feature helped to provide evidence against a syntactic impairment. If the functional category Tense/Infl was impaired we would assume that all features are simultaneously affected. However, this is not what I find. Instead, features are affected individually. In particular, I show that features that are associated with a single syntactic head, i.e. Tense/Infl, are simultaneously affected only at percentages lower than ***5% of the entire incorrect*** use of inflectional features.

1.2.4 Theoretical Contributions

This dissertation shows that CG_{DS} present problems at the *Spell Out* level. In particular, the ***Blocking*** mechanism sometimes fails for CG_{DS} (and CG_{TDC} to a lesser extent) and the *Subset Principle*[4] (a more refined version of *Blocking*) fails to resolve the competition in favour of the most specified form. As a result, a form carrying default feature value(s) and no contrasting

[4] According to the ***Subset Principle***, the appropriate phonological representation of a bundle of features resulting from a syntactic derivation is chosen if the vocabulary item matches all OR a subset of the features specified in that position. If more than one Vocabulary Items match the criteria for insertion, the item matching the greatest number of features must be chosen (Halle 1997).

features is used instead of the targeted one. Moreover, production of the phonological features by CG_{DS} exhibits similarities to the morphological features. That is, at the *Spell Out* level, we observe that the *Subset Principle* occasionally fails to apply, with both morpho-syntactic and phonological features. Finally, what is striking is that all the morphological, syntactic, phonetic, and phonological processes observed with CG_{DS} are also part of both CG_{TD} and CG_{TDC} Grammars. The difference is that they are (i) used at a greater extent by CG_{DS} and (ii) based on the CG_{TD} Grammar, they are sometimes found in unexpected environments. Hence, the differences between the two Grammars are unquestionably not syntactically conditioned.

Finally, I propose a unified analysis in progress under which all differences with morpho-syntactic and phonological features, as well as full-word omission, between the CG_{DS} and CG_{TD} Grammar, can be accounted for. Though at present the proposed analysis accounts for all the phenomena observed with CG_{DS} there is still need to test the proposed analysis across different languages, and different stages of language acquisition. Hence, these may suggest that (a) this is the full language acquisition CG_{DS} master and (b) CG_{TDC} at the tested ages present some morphological restrictions, at the vocabulary insertion place, which may extend to parallel restrictions, at higher percentages with younger CG_{TDC}.

All the above-mentioned facts clearly show that, when comparing the adult CG_{DS} and CG_{TD} productions, we do not conclude that the CG_{DS} Grammar is an impaired version of the CG_{TD} Grammar. Rather, what we find is that CG_{DS} is parallel to the CG_{TD} (and CG_{TDC}) Grammar with differentiating characteristics resulting from (i) articulatory restrictions, (ii) phonological difficulties, and (iii) occasional failure of the *Subset Principle* to filter the targeted form, or more generally, failure of the *Blocking* mechanism to rank *Expressiveness* over *Economy*, leading to the omission of the phonetic content of a word, but maintenance of the syntactic information.

1.3 THEORETICAL TOOLS FOR TESTING THE HYPOTHESES

In this section, I give a brief overview of the theoretical background considered to evaluate the three hypotheses. More explicitly, I investigate the following features: Tense, Person and Number in *S/V* agreement, as well as Case. I not only examine the expression of these features by means of overt morphology, but also the syntactic environment in which they occur as well as the syntactic relations that they enter during the syntactic derivation. This approach allows us to determine whether the differences between the CG_{DS} and CG_{TD} are syntactically, morphologically, phonetically or phonologically conditioned.

It is often assumed that the inflectional differences between CG_{DS} and CG_{TD} are triggered by an impairment of the functional category TENSE. According to this analysis, the differences are syntactically conditioned. However, if we only look at the overt manifestation of Tense inflection, we cannot determine whether these differences are indeed syntactically or morphologically conditioned. If these differences are syntactically conditioned, we would expect that not only the morphological manifestation of Tense is affected, but also the syntax of Tense. In particular, it is often assumed that the syntactic head TENSE does not only host Tense but also *S/V* agreement (Chomsky 1995, among many others).

In addition, it is often assumed that there is a connection between Tense and Case such that only tensed verbs can assign Nominative Case (Pesetsky and Torrego 2004, Rouveret and Vergnaud 1980, Vergnaud 1982, *inter alia*). Thus, if the differences in the morphological realisation of Tense are syntactically conditioned, we would expect that they should correlate with differences in *S/V* agreement as well as Nominative Case. Moreover, it has been argued Case is assigned to the entire DP. Therefore, Case features not only manifest themselves on the noun but also on the determiner head (henceforth, D) of a DP (Chomsky 1995). Hence, syntactically conditioned

difficulties with Case would mean that if problems with Case marking on a noun are observed then, we would expect to also observe effects on the determiner as well (D being the head of the phrase). I refer to this as bundling effects.

1.4 OVERVIEW OF THE THESIS

In this section, I give a brief overview of each chapter. In *Chapter 2,* I introduce the background that informs this dissertation. What do we gain by studying the language of atypical populations such as *DS*?

I present and discuss previous research on the phonetic, phonological and morpho-syntactic characteristics of typical language development and atypical populations in English, Greek and other languages. I conclude by raising a number of empirical, methodological and analytical issues resulting from previous work. First, contradictions between studies within and across languages are identified. Second, I argue for the necessity to study *DS* in a language with richer inflectional morphology than English. Third, I show that there is need for a greater variety (both in quantity and quality) of experimental stimuli and comprehensive methodology, than used in previous research, to address the research question. Fourth, I argue that we need an analysis that does not focus entirely on the target utterance (as previous studies do) but in addition, considers the structural and inflectional environment in which the productions are found. Fifth, I argue for the necessity to investigate the phonetic and phonological system of CG_{DS}, alongside with their inflectional system, to determine the nature of differences between the target and produced form. In following chapters, I show how these issues are addressed through my dissertation research.

In *Chapter 3*, I summarise the specifics of the verbal and nominal inflection in Greek. I then discuss the specific environments examined for the present study and I explain how these allow me to address the empirical issues raised in *Chapter 2*. The main purpose of *Chapter 3* is to provide the most relevant generalizations pertaining to Tense, *S/V* agreement and Case, and how these interact with each other. In particular, I show that Cypriot Greek (hereafter, CG) has the following properties which make it an ideal testing ground for our purposes: (i) there are environments where Tense and *S/V* agreement are fused (morphological dependency) and other environments where they surface independently, (ii) there are environments where *S/V* agreement and Tense co-occur (syntactic dependency) and others where *S/V* agreement alone is found, and (iii) nominal expressions are overtly morphologically marked for Case, along with Gender, Number and Person (for pronouns), creating a large variety of feature combinations.

In *Chapter 4*, I explain the methodology employed for data collection and data analysis. I give a detailed presentation of the four experiments and explain (i) the grammatical constructions targeted, (ii) the goal, (iii) the experimental design and how it served the purpose of each experiment, and (iv) how each experiment contributes to answering the research question. Furthermore, I provide information on the transcription conventions, data analysis, database construction and statistical analysis.

In *Chapter 5*, I discuss the phonetic and phonological results of the collected data. I show that certain sounds appear to be challenging for *DS* and are frequently either omitted or substituted. I conclude that the main differences between the CG_{DS} and the CG_{TDC} Grammar are phonetically and phonologically conditioned. I develop the argument as follows.

First, examining the phonological environments in which consonants are omitted or substituted, I show that CG_{DS} have a general problem with /s/, /ɾ/, /n/, /v/, /ð/, /t/ as well as other consonants, regardless of whether these are found in inflectional or non-inflectional environments. These are either omitted or, through a phonological process, substituted for other sounds. This is important not only because the same sounds are reported problematic in phonetic and phonological studies on Eng_{DS} but also because these are the sounds used for inflectional marking in English. Second, almost all substitutions are systematic in both groups. In particular, the target sounds share phonological features with the substituting sounds. Third, these results contradict previous claims about Eng_{DS} where the phonological patterns produced by Eng_{DS} are characterised as "inconsistent" (Dodd 1976, Kumin 2006). It is shown that non-consistent substitutions are morpho-syntactically, phonetically or phonologically conditioned and still display systematicity. The phonetic and phonological analysis is particularly important, as it is used as the foundation of the morpho-syntactic analysis. That is, phonetic and phonological restrictions are factored into the morpho-syntactic analysis.

In *Chapter 6*, I present the morpho-syntactic results. I start with a presentation of the participants' overall performance of standard and non-standard productions as well as omissions, and discuss the difference between considering and disregarding phonetically and phonologically triggered changes on produced forms. In particular, I show how results can be misinterpreted if phonetic and phonological problems are not considered. Moreover, I present the results on the participants' overall performance with Tense, *S/V* agreement and Case, as well as a detailed analysis of their performance of each feature value for Tense, Person, Number and Case. First, I show that overall – with almost all features or feature values – CG_{DS} and CG_{TDC} productions are almost at ceiling with accuracy of over 99%. Second, I observe and report three options when the

target is not met: (i) systematic use of feature values alternative to those targeted (based on controlled elicitation stimuli) or expected (based on the context and goal of free elicitation tasks) by experimental tasks; (ii) affix drop, and (iii) entire-word omission. Third, statistical comparison revealed non-significant differences (i.e. similar performance) between CG_{DS} and CG_{TDC} with Tense on verbs. Concerning individual feature values on verbs, I found non-significant differences with Present, Past, Imperative, 1st Person, and Plural, and Vocative for nominal expressions. Accusative revealed a marginally significant difference. However, with other features and feature values the two groups differ significantly. Therefore, based on the aforementioned facts, and a number of evidence from factors external to morpho-syntax, I argue that CG_{DS} do not exhibit a delayed version of the adult CG_{TD} Grammar, parallel to a specific stage of language acquisition. Rather, they exhibit a different development in particular aspects of their Grammar, that only slightly differ from the adult CG_{TD} Grammar morphologically, phonetically and phonologically.

Chapter 7 is divided into three parts: (i) a discussion on what conditions the differences between CG_{DS} and the CG_{TDC} by examining three hypotheses, (ii) a proposal for a unified analysis for morpho-syntactic and phonological features, as well as full-word omission and (iii) conclusions, predictions and my agenda for future research. Three main findings are reported in this chapter. First, the results from this research contradict the idea that the inflectional impairment described in previous work on Eng_{DS} is syntactically conditioned, or even morphologically conditioned to the degree that has been argued in previous work. Second, based on the analysis of the morpho-syntactic features provided, I explain that the residue of differences not phonetically or phonologically conditioned observed between the CG_{DS} and the CG_{TD} Grammar are not due to a breakdown during the syntactic derivation, but rather a failure of the *Subset Principle* to fully

apply after *Spell Out*. This results in the most underspecified (default) form for each feature becoming a probable choice. Third, I propose that a different realisation of the CG_{DS} Grammar is due to a breakdown at *Spell Out* where the phonological representation of the features resulting from the syntactic (or phonological) derivation occurs at the stage after features are derived. Specifically, phonological features of voiceless stop and fricative consonants exhibit the same phenomenon as morpho-syntactic features, due to underspecified phonological features. Fourth, the same analysis applies for the morphological differences found between the CG_{TDC} and the CG_{TD} Grammar, though differences are smaller than those seen with CG_{DS}. I propose that full-word and inflectional affix omissions also occur at this level. Finally, I conclude.

Throughout all steps undertaken for the realisation of this research, CG_{DS} Grammar is not studied with the notion that it is an impaired or incomplete version of the CG_{TD} Grammar and it is never characterised as such. Rather, I study and treat the CG_{DS} Grammar as one which (i) has a strikingly similar inflectional system to that of the CG_{TD} Grammar, (ii) has numerous common elements with CG_{TDC} Grammar, (iii) has morphologically conditioned differences with the CG_{TD} Grammar, where default values are used where not expected, and (iv) exhibits differences in its phonetic and phonological system; mostly structured differences, based on the articulatory restrictions characterising *DS*.

This dissertation offers a proposal for a unified analysis, which captures the morphology, syntax, phonetics and phonology of the CG_{DS} Grammar. In addition, this is the first study to consider interacting factors across different linguistic domains (morphology, syntax, phonetics and phonology), which allows for a more comprehensive analysis.

Chapter 2

Literature Review

2.1 INTRODUCTION

The main focus of this dissertation is the study of 19- to 45-year old adult CG_{DS}. The speech of individuals with Down Syndrome (henceforth, *DS*) has been reported to be characterised by specific problems with Tense and *S/V* agreement. I compare their performance with 7- to 8- year old CG_{TDC} at (or past) the final stage of language acquisition. The differences between Typically Developing (henceforth, *TD*) language and atypical language development have frequently been used as a window into the nature of language and cognition.

Previous work has shown that language impairments can give valuable information on language competence, the representation of language in the brain and language development of both typical and atypical populations. More specifically, by studying the language production we can draw conclusions about the nature of Grammar and the internal language system or competence.

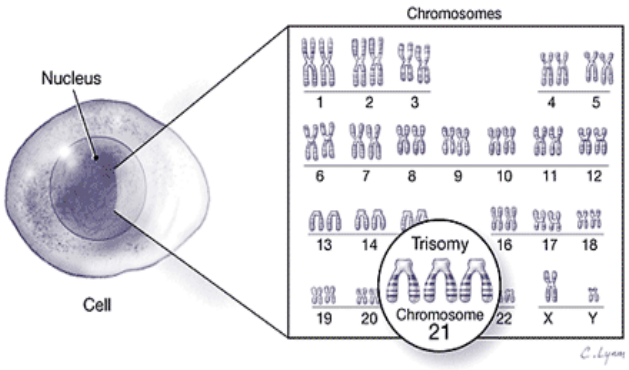
In this chapter I examine past research on *DS*, *TD* language acquisition, and atypical language development (e.g. Specific Language Impairment (hereinafter, *SLI*) and Williams Syndrome). It was considered crucial because the linguistic competence and performance of *DS* adults and children has often been associated with the aforementioned populations, where a number of

similarities has been reported. Furthermore, in my dissertation I examine the linguistic productions of adult CG_{DS} due to the fact that it has been hypothesised that *DS* individuals' performance and competence is similar to that of young children at an early stage of language acquisition, and therefore, their linguistic development is delayed or non-progressive after a certain stage. After presenting previous work in these areas, I discuss several problematic issues arising from previous work. In later chapters, I show how these issues are addressed in the current study.

This chapter is organised as follows. In *Section 2.2*, I present background information on *DS*. In *Section 2.3*, I explain in more detail how studying the language of individuals diagnosed with *DS* may serve as a window into the properties of the language faculty. In *Section 2.4*, I review the literature on articulation difficulties in *DS*. In *Section 2.5*, I explore the literature on the grammatical (morphological and syntactic) properties of *DS*. In *Section 2.6*, I review the literature on *TD* child language acquisition, *SLI* and Williams Syndrome. Finally, in *Section 2.7*, I assess the choice of language, methodology and analysis in previous studies, and discuss why we are unable to answer the research question explored in this dissertation through those studies.

2.2 MEDICAL AND COGNITIVE PROFILE OF DOWN SYNDROME

Down syndrome results from a genetic malfunction and has several characteristic symptoms and medical conditions associated with it, including memory limitations. *DS* is the most common genetic disorder (one in six to seven hundred births) that results in atypical cognitive and linguistic development. It is most commonly caused by the presence of an extra copy of the major portion of human chromosome 21 due to an atypical meiosis of the maternal egg cell (Epstein 2006, Hattori et al. 2000, Nelson and Gibbs 2004, Olson et al. 2004, Prasher 1995).



Source: http://www.gulfmd.com/pregnency/downsyndrome.asp

FIGURE 2.1: TRISOMY OF CHROMOSOME 21[5]

There are numerous symptoms associated with *DS*. However, I focus on the symptoms relevant to the acquisition and production of language. There is a characteristic craniofacial dysmorphology: flat face, small head, small mouth, upward slanting eyes, weak (facial) muscle tone and underlying skeleton (body) (Olson et al. 2004). Many differences in oral anatomy and physiology between *DS* and typically developing individuals are observed: absent or deficient bone growth, smaller oral cavity, more posterior tongue carriage, or large muscular tongue in general, skeletal and muscular problems (absent and extra muscles in facial regions, weak facial muscles and limited lip movement) (Prasher 1995, Stoel-Gammon 2001).

Apraxia of speech (also known as verbal apraxia) is one of the most common characteristics of *DS* and arguably one of the most recognised symptoms interfering with *DS* production skills (Dodd, 1976, Kumin 2006). They report that *DS* is characterised by decreased intelligibility with increased length of utterance, inconsistency of speech errors (which suggests an unstructured acquisition of phonological system), difficulty sequencing oral movements and sounds, a pattern

[5] Trisomy of the entire chromosome 21 is the cause of *DS* 90% of the time. The remaining 10% is caused by either translocation trisomy 21, where smaller portions of the chromosome are triplicated because of unbalanced translocations (Nelson and Gibbs 2004) or mosaic trisomy 21, where trisomy 21 is found in some but not all genes. Mosaic trisomy 21 is reported to result to a higher intellectual level and have fewer characteristic features than the other two types (Prasher 1995).

of receptive language superior to expressive language, as well as difficulty with oral motor skills (Dodd 1976:35,41, Kumin 2006:10-11). Participants diagnosed with *DS* are reported to:

(i) have problems with inflectional marking on both nouns and verbs
(ii) problems cannot be overcome even after reaching adulthood.

DS is also one of the most frequent genetic causes of mental disability. Mild to moderate hearing loss is also a symptom of this disorder, which is said to have a critical effect on language development (Nittrouer 1996, Roberts 1997, Stoel-Gammon 2001). The American Academy of Pediatrics, Committee on Genetics (2001) states that the degree of mental impairment in *DS* varies, ranging from mild Intelligence Quotient (henceforth, IQ) (IQ: 50-70) to moderate (IQ: 35-50), and only occasionally to severe (IQ: 20-35).

Problems with *DS* verbal short-term memory have been discussed by a number of researchers (Buckley 2008, Conners et al. 2001, Vicari 2001). *DS* individuals have a greater difficulty remembering verbal information than visuo-spatial information in short-term memory tests (Buckley 2008). It is also argued that the *DS* auditory working memory is weaker than the visual working memory (Connerset al. 2001). Buckley (2008) proposes that problems with verbal short-term memory can be minimised by training *DS* memory. However, she stresses the importance of constant training to avoid losing the benefits of memory training. Testing *DS* participants, who have undergone memory training, we may observe crucial effects on the data collection process, results and conclusions concerning the expressive skills of *DS*. Specificaly, major differences may be observed especially if the experimental tasks used require participants to memorise and repeat long and complex structures. It is likely that participants will either be unable to repeat the entire structure, as it was produced by the researcher, or may resolve to a more simplified syntactic structure, maintaining the general idea expressed by the experimental stimulus.

There is a lot of research on helping participants diagnosed with *DS* cope with their health issues. Ophthalmologic, audiological, thyroid dysfunction problems and obesity (Prasher 1995) are some of the medical conditions identified with *DS*. Impaired vision and problems associated with eyes, such as cataract, are also observed with *DS* (Prasher 1995). Finally, the psychiatric disorders of dementia and depression are common in *DS*.

2.3 PHONETICS AND PHONOLOGY

In this section I review previous research on the phonetic and phonological characteristics of *DS* language as well as studies on the acquisition of phonology in typically developing children. I start with a review on the problematic sounds found in the Eng_{DS} productions. I later discuss the difficulties observed with specific phonological environments. Moreover, I offer some general information on language acquisition of English *TDC* (henceforth, Eng_{TDC}) and then summarise studies on Standard Greek and Cypriot Greek acquisition of child phonology.

The characteristic physiology *DS* individuals' results in a distinct phonetic and phonological development (Dodd, 1976, Kumin, 2006, Stoel-Gammon 2001). To understand the nature of the Grammar of *DS*, it is paramount to understand the *DS* phonetic and phonological system. In particular, I will show in *Chapter 5* that, in many cases, data that appear to support *IIH* could in fact, be misanalyzed. That is, the differences between *TD* Grammar and *DS* Grammar are to a large extent phonologically and phonetically conditioned, rather than morphologically or syntactically conditioned. Without proper analysis of the CG_{DS} phonetic and phonological system this factor would have simply been overlooked.

2.3.1 Articulation Difficulties of Down Syndrome

Many of the problems contributing to the *DS* linguistic impairment are associated either with verbal memory impairment, apraxia of speech, or a deficit with the articulators (i.e. tongue volume, hypotonia around the mouth area, limited lip movement, etc). Though pre-linguistic development parallels that of *TD* infants, early linguistic development is delayed (Smith and Stoel-Gammon 1996, Steffens et al. 1992). There is a substantial delay in producing first words; in some (extreme) cases, first word production is delayed until as late as the age of 7 (Stoel-Gammon 2001). In this section, I present information on the problems *DS* face with language production as well as the cause and effects of these problems.

2.3.1.1 Problems with Specific Sounds

Physiological and anatomical differences between *TD* and *DS* are arguably the main reason we observe speech variation in Eng_{DS}. Problems with the articulators (oral cavity: tongue volume, smaller oral cavity, absent or deficient bone growth) as well as the area around the mouth (lack of certain facial muscles especially around the lip area) cause a different realisation, or omission of certain classes of sounds (Stoel-Gammon 2001).[6]

[6] Individuals diagnosed with Mosaic Trisomy 21 have been argued to also display differences in their physical, clinical, and cognitive characteristics (Baumeister and Williams 1967, Fishler 1975, Gibson and Pozsonyi 1965). Moreover, different types of Down Syndrome exhibit distinct language development and functioning. Specifically, it has been suggested that children and adolescents with Mosaic Down Syndrome present better lexical and semantic abilities, as well as more advanced intellectual abilities when compared with the other subtypes of Down syndrome, though they posses some but not all symptoms of distinct physiology (Fishler and Koch 1991). They argue that this is due to a neurological heterogeneity with the other subtypes of Down syndrome, which is genetically based and developmentally mediated.However, only a single study on Mosaic Down Syndrome is available to date; in that study, bilingual (sign language and English) identical twins were diagnosed with more advanced non-verbal cognitive skills than verbal skills (Woll and Grove 1996). No comparison between the language skills of *DS* subtypes is currently available.

Larger tongue size affects the production of lingual[7] consonants (/l/, /r/ (liquids), /k/, /g/, /t/, /d/ (stops), /s/, /x/ (fricatives) etc.). Moreover, hypotonicity of facial muscles and lip movement affect the production of labials and round vowels (/b/, /p/, /m/ and /o/, /u/). The physiological differences in the oral cavity and facial areas described above influence the motor movement and impact on the productions of the aforementioned sounds (Stoel-Gammon 2001). Stoel-Gammon states that while stops (/p/, /t/, /k/, /b/, /d/, /g/), nasals (/n/, /m/) and glides (/j/) are mostly preserved, fricatives, affricates and liquids are affected. Stops and nasals are the consonants typically acquired first by *TDC*; see *Section 2.3.2* below. Additionally, fricatives and affricates tend to be altered to stops, while *DS* individuals also tend to de-aspirate voiceless stops.

Finally, an ultrasound study of /r/, /l/, and /s/ confirms the difficulty Eng_{DS} have with these sounds (Bacsfalvi 2008). However, it is reported that the production of these sounds could be improved through speech-language pathology and the use of ultrasound equipment. Phonological and morpho-syntactic problems will more likely need a different approach. In the following section, I discuss the phonetic and phonological environments in which *DS* experience problems.

2.3.1.2 Problems with Phonological Environments

Most research on *DS* identifies problems mostly with consonants rather than with vowels. In addition to the omission of certain consonants, *DS* individuals also have problems with specific phonological environments, i.e. the word position or syllable a sound occurs in, surrounding syllables, adjacent sounds, and the syllable structure (Consonant-Consonant-Vowel (henceforth, CCV), Consonant-Vowel (hereafter, CV) and Consonant-Vowel-Consonant (henceforth, CVC)). Some parallel problems also appear with *TDC* at their early stages of language acquisition. In

[7] Lingual sounds include consonants involving the tip or blade of the tongue (or sometimes the back of the tongue). Such consonants may be dental, alveolar, alveopalatal, retroflex and palatal consonants (Odden 2005).

particular, *DS* individuals tend to transform clusters to singletons by omitting one or more consonants, as *TDC* do. Moreover, *DS* individuals frequently omit word-final consonants. Many changes with aspirated voiceless stops in word-initial position also occur. Word-initial liquids are pronounced as glides, and word-final liquids are often pronounced as vowels, or omitted. The last change is observed with word-final voiced obstruents, which are likely to be de-voiced.[8]

Table 2.1 below summarises the affected phonemes and the problematic environments Eng_{DS} have difficulties with.

Phoneme Omission/Substitution			Phonological Environment[9]	Syllable Environment
Stops	Voiceless	/p/	Omission word-initially	CCV → CV
	Voiced	/b/	Omission word-finally	CCVC → CV(C)
Fricatives		/x/, /s/	Changes with word-initial	CVCC → CV(C)
Nasals		/m/, /n/	/pʰ/, /tʰ/, /kʰ/	VCC → VC
Liquids		/l/, /r/	Word-initial /l/ and /r/ →/j/	CV → V
Vowels		/u/, /o/	Word-final obstruents → [-voice]	VC → V

TABLE 2.1: PROBELMATIC PHONEMES AND PHONOLOGICAL ENVIRONMENTS FOR ENG_{DS}

Dodd (1976) and Kumin (2006) suggest that the phonological patterns characterizing *DS* speech productions are inconsistent, such that a large proportion of them cannot be described by a set of common phonological processes. In later chapters I show that this is in fact not true: phonological inconsistencies can be categorised either under systematic morpho-syntactic or phonological processes. However, Dodd (1976) and Kumin (2006) also suggest that when participants produce utterances in controlled elicitation such as imitation, they tend to produce fewer mistakes than with spontaneous productions.

[8] See Cholmain (1994), Dodd (1976), Kumin, Councill and Goodman (1994), Mackay and Hodson (1982), Smith and Stoel-Gammon (1983), Stoel-Gammon (1980), Stoel-Gammon (1981), Van Borsel (1996) for more detailed description of aforementioned problems.

[9] "→" indicates a change from what is located on the left of the arrow, to what appears on the right.

2.3.2 Acquisition of Phonology and Phonetics in Typically Developing Children

Examining the acquisition of the phonetic and phonological system of typically developing children offers a basis for testing the sources of the phonological differences between CG_{DS} and CG_{TDC}. Studies on the acquisition of phonology by English speaking children report that stops, glides and nasals (/p/, /b/, /t/, /d/, /m/, /n/, /w/) are acquired before velars, labials, alveolar fricatives and glottals (/k/,/g/,/f/,/h/,/j/, /s/, /ŋ/, /l/, /r/, /θ/, /ð/) (Grunwell 1985, Robb and Bleile 1994, Stoel-Gammon 1985). Moreover, it has been shown that Eng_{TDC} tend to substitute /k/ with [t]. There are two potential reasons for this. First, in English /t/ has underspecified phonological features (Stemberger and Stoel-Gammon 1991, Stoel-Gammon and Stemberger 1994) relative to all other consonants, specifically, relative to those sharing the same manner of articulation (i.e. plosives). Second, /t/ (coronals in general) appears at higher frequency relative to /k/ (dorsals in general) (Stemberger and Bernhardt 1999). Similarly, /s/ is also been argued to be underspecified in terms of phonological features (Stemberger and Stoel-Gammon 1991, *inter alia*).

In a cross linguistic study of 2- to 3- year old children, designed to replicate previous research, in four languages, including Greek, Edwards and Beckman (2008) found both language-universal (based on the physiology of speech production and perception, e.g. tongue size) and language-specific (production and perception of phonemes based on the lexicon of a language) effects in phonological acquisition. They tested stops, fricatives, and affricates in Cantonese, English, Greek, and Japanese. They found that the overall frequency of a consonant affects (increases or decreases) the occurrence of syllables (CV) containing the specific consonant. Language-universal factors are reported to influence the production accuracy for languages like Greek and Japanese, while language-specific phonotactic frequencies influence the production accuracy for languages like English. They found /s/ to be more frequent and more accurate than /θ/ in both

English and Greek, a difference that results from language-specific frequency effects (/s/ being more common than /θ/). However, they argue that "a universal perceptual salience effect" (Edwards and Beckman (2008: 142) is also responsible for the fact that /θ/ is infrequent in English and Greek, and not attested in Cantonese and Japanese. Finally, universal characteristics of sounds, like stops being easier to produce than affricates, predict accuracy and frequency.

In one of the biggest phonetic studies in the child language acquisition of Greek, with 300 participants aged 2;6 – 6;0 years old, Levanti et al. (1998) identified seven stages of phonetic acquisition with /m/, /ɲ/, /p/, /t/, /b/, /k/ and /g/ acquired at the first stage, between the ages of 2;6 – 3;0 years old. Greek children acquire fricatives and the lateral approximate at the remaining stages, with /ɾ/ being the last sound established in their phonetic inventory. Further, Nicolaidis et al. (2003) found Dorsal sounds (like /k/) to be used more accurately than Coronal sounds (like /t/). They argue that this is due to the fact that /k/ is more frequently used by Greek children aged 2- to 5-years old than /t/. Magoula (2000) reports that /p/, /b/, /m/, /n/, /j/, /k/, /t/, /d/ and /l/ are acquired between the ages of 1;6 and 2;2, while Papadopoulou (2000) states that, these sounds are already present at ages 3;4 to 4;0, not having tested participants at a younger age. Combining results from a number of studies, Mennen and Okalidou (2006) summarise the acquisition of Greek consonants as given in *Table 2.2*.

Age	**1;5 - 1;8**	**1;9 - 2;0**	**2;1 - 2;2**	**2;3 - 2;6**	**3;7 - 4;0**	**4;1 - 4;6**
Consonants Acquired	**p, d, t**[10] **m, n, l, j**	p, d, t m, n, l, j **b, k, c, v**	p, d, t m, n, l, j b, k, c, v, **f**	p, d, t m, n, l, j b, k, c, v, f, **ð, ɹ**	p, d, t m, n, l, j b, k, c, v, f, ð, ɹ, **ɾ , g,** **θ, s, z, ç,** **x, ɣ, ɲ, ʎ, ts**	p, d, t m, n, l, j b, k, c, v, f, ð, ɹ, g, θ, s, z, ç, x, ɣ, ɲ, ʎ ts, **dz**

TABLE 2.2: PHONETIC INVENTORY OF GREEK CHILDREN (BASED ON MENNEN AND OKALIDOU (2006))

[10] The sounds in boldface represent the newly acquired sounds at each age level.

Finally, on the basis of a case study of a single Greek child (Sofia), Kappa (1999, 2002) shows that open syllables (CV) are preferred at Sofia's earlier stages of language acquisition. In particular, Sofia starts at age 1;10 with one syllable (CV) words with initial stops, nasals and laterals. At this stage and until age 2;6, fricative consonants are quite rare and the output of a targeted fricative is usually a stop. Complex onsets do not appear until the ages of 2;4 – 2;8. Sofia reduces complex onsets to less sonorous or less marked segments. She also later produces disyllabic and tri-syllablic words with open syllables. Codas are not part of her phonotactics until after age 2;2. Finally, Kappa notes that fricatives are acquired earlier in word-final position (codas) than in word-medial position and even later in word-initial position. Parallel results are also reported by Magoula (2000). These results are also consistent with the most common patterns in English.

Not much research on the acquisition of CG_{TDC} phonology is available; therefore, firm predictions or expectations on the CG_{DS} are not possible. However, a longitudinal case study on the phonetic development of CG_{TDC} (aged 2;0 to 3;0), offers some basic information on the CG_{TDC} acquisition of phonology. Theodorou (2007) shows that while front consonants, like labial, labiodentals and dental, are more likely to appear first, while plosives, nasals and the lateral approximant also appear earlier in a child's inventory. Despite the fact that dental consonants appear quite early in CG_{TDC}, percentages of correct production remain low throughout the various stages of acquisition until the age of 3;0. Moreover, fricatives surface at the age of 2;4 and voiceless consonants are preferred until the age of 2;8. Furthermore, the tap /ɾ/ is not mastered until after the age of 3;0 with percentages of 75% accuracy, and is reported to be more widely used in word medial than word initial positions.

2.3.3 Summary

DS have more difficulties with consonants rather than vowels. In particular, consonants whose production requires the tip of the tongue are most affected. Moreover, in word-final position as well as within consonant clusters these difficulties are increased. The major causes of all the problems listed above are attributed to apraxia of speech and the physiological/anatomical differences cased by the genetic malfunction. Based on a phonetic and phonological analysis of the data collected for the purposes of this study, I will argue that *DS* show an atypical (but systematic) phonological development, based on the aforementioned physiological issues characterising the syndrome. Moreover, they also have common phonetic and phonological similarities with the *TD* phonetic and phonological development, but are not 100% match to a specific *TDC* acquisition level of phonology, matching a certain age range.

2.4 THE MORPHO-SYNTACTIC PROFILE OF DOWN SYNDROME

The central goal of this thesis is to explore the linguistic abilities of adult CG_{DS} and 7- to 8-year old CG_{TDC} (at or past their final stages of language acquisition), with respect to Tense, *S/V* agreement and Case. Existing studies on *DS* tell us very little concerning Tense, *S/V* agreement, and Case, due to the poverty of inflectional marking in the languages that have been investigated. Cypriot Greek (hereinafter, CG) exhibits rich inflection in all three domains (see *Chapter 3*).

Tense, *S/V* agreement and Case have been studied extensively in English *DS* (Chapman 1995, Chapman and Hesketh 2001, Chapman et al. 1998, Eadie et al. 2002, Joffe and Varlokosta 2007, Kay-Raining Bird et al. 2005, Kumin 1986, Laws and Bishop 2003, Perovic 2006, Ring and Clahsen 2005, Van Borsel 1996, *inter alia*). There are also some studies on Italian *DS* (Vallar and Papagno 1993, Verucci et al. 2006, Vicari et al. 2000; Vicari et al. 2002), German *DS*

(Schaner-Wolles 2004), Spanish *DS* (Galeote et al. 2008) and Greek *DS* (Stathopoulou 2009, Stathopoulou and Clahsen 2009, Tsakiridou 2006). Unlike many studies on English, the study of German *DS* (henceforth, Ger_{DS}) and some Greek studies, *DS* studies on other languages do not focus on how individuals with *DS* use inflectional marking (i.e. Tense, *S/V* agreement and Case). Instead, they examine reading speed, naming speed, phonological problems, or lexical development in relation to cognition and performance in oral and written narratives. I review only those studies which investigate the hypothesised linguistic impairments of *DS*. The goal is to determine whether there are any cross-linguistic patterns in the way *DS* individuals acquire, and use language. This is particularly important because of the dearth of information on *DS* linguistic production and Grammar coming from languages with rich inflectional marking.

2.4.1 English Down Syndrome

Studies on Eng_{DS} report significant differences between the language of Eng_{DS} and Eng_{TDC} on the one hand and English individuals past the language acquisition stage (henceforth, Eng_{TD}), on the other. In particular, inflection for Tense and *S/V* agreement, along with other syntactic operations, is reported to be impaired. These studies converge on the conclusion that in Eng_{DS} inflection is optional. That is, in contrast to Eng_{TD}, Eng_{DS} may or may not mark inflection; that said, if they do mark it, they always mark it correctly (Ring and Clahsen 2005). In addition to differences in the use of the inflectional system, some studies also report that complex syntactic structures (involving movement, clausal embedding etc.) are absent in Eng_{DS}. However, a number of contradicting results are observed across different studies. The present study draws and builds on these studies, but differs in that it attempts to identify the cause for the observed differences.

Below, I give a brief summary of the results and main claims of the studies on English *DS*. While some studies argue for a breakdown of the entire inflectional system of *DS*, others focus specifically on Tense and report an impairment in this domain alone. Let us call this general claim the Inflectional Impairment Hypothesis (hereinafter, *IIH*).

Chapman (1995:248) states that function words in Eng_{DS} do not occur frequently. Moreover, Chapman et al. (1998) argue that the entire inflectional system of Eng_{DS} is affected. More specifically, they conclude that Eng_{DS} present an expressive language deficit with function words as well as words carrying inflectional marking are frequently omitted. In the spontaneous speech of 47 Eng_{DS} children and adolescents, aged 5- to 20- years old, they found inconsistent use of bound inflectional morphemes: Plural -*s*, possessive -*s*, 3rd Person Singular, contractible auxiliaries and copulas, Present progressive -*ing*, and regular Past Tense –*ed*. They also report problems with free function words: copulas, auxiliaries, modals, articles, prepositions, pronouns, adverbial adjuncts, conjunctions, and infinitive *to*. Crucially, they note that "low phonetic substance" (word-final consonants and mono-syllabic words, per Leonard (1989) for *SLI*, discussed in *Section 2.5.2*, below) has significant effects to the omission of grammatical morphemes. Finally, contrary to Fowler (1990), Chapman et al. (1998) argue that Eng_{DS} do not present a critical period for language production. That is, their older Eng_{DS} participants present linear improvement with their language skills. Similarly, in question formation, Fowler (1988) observes that her participants fail to do auxiliary inversion and *do*- support. Contrastively, Thordardottir et al. (2002) found that, in narrative discourse, Eng_{DS} are as competent in using complex sentences as Eng_{TDC} controls matched for Mean Length of Utterance (MLU).

Eadie et al. (2002) and Laws and Bishop (2003) report similar results with a specific focus on the Tense inflection. In both studies problems with 3rd Person Singular -*s* (*S/V* agreement) were

apparent. In contrast, they found relatively strong performance for irregular Past, modals and 3rd Person irregular Present Tense forms (*does* and *has*). While they report problems with Past *–ed* and 3rd Person Singular Present*–s*, they also report that the use of *–ing*, regular Plural as well as the use of determiners is less affected. Eadie et al. (2002) hypothesise that the relatively accurate performance of Eng_{DS} with irregular verb forms compared to the regular *–ed* (89.25% versus 38.1% (Eadie et al. 2002:727)) could imply a difference in storing versus acquiring inflected forms. Note that while on the one hand Eadie et al. (2002) report poor performance with Past Tense *–ed*, on the other hand, Laws and Bishop (2003)'s results evidence that their participants did well with Past Tense *–ed*. As a consequence, results are inconclusive with respect to the nature of the Tense impairment: some Tense related inflection is affected while non-Tense related inflection, as well as irregular Past, and the copular *be* are not affected. Results from these studies are partially in agreement with previous claims by Chapman et al. (1998) which argue that a wide spread of effects is found, across the entire inflectional system of Eng_{DS}.

Moreover, when comparing the performance of Eng_{DS} to Eng_{TD} with inflectional morphology – Past Tense, noun Plurals, and comparative adjectives– Ring and Clahsen (2005) have argued, contrary to Eadie et al. (2002) and Laws and Bishop (2003) that non-Tense-related morphemes (e.g. comparative, superlative, Plural *-s*) are affected similarly to Tense-related morphemes. Ring and Clahsen (2005) generalise that Eng_{DS} classify verbs and nominals as marked (overt inflectional morphemes marked on roots) and unmarked (absence of overt inflectional morphemes). Ring and Clahsen (2005) state that their analysis is based on results by Eadie et al. (2002) and Laws and Bishop (2003) in addition to the results from their study. Ring and Clahsen (2005) conclude that their Eng_{DS} participants showed a preference for using unmarked forms (bare stem). However, Eng_{DS}, like their mental aged-matched controls, make no incorrect use of

S/V agreement and do not use non-existing forms (e.g. verbal inflectional morphemes used with nominals) when using inflected/marked forms.

Moreover, there have been suggestions that problems with inflection in Eng_{DS} might not be entirely due to a morpho-syntactic (syntactically and morphologically conditioned) or a cognitive deficit, but to perceptual and articulation problems (i.e. they are phonetically conditioned), causing atypical construction of morpho-phonological representations (Chapman 1995). However, there is no available study which examines the morpho-phonological changes in depth to determine the extent to which the linguistic deficit of Eng_{DS} is syntactically and morphologically conditioned and how phonetically conditioned difficulties contribute to the overall production impairment.

In sum, the results reported for English suggest that the crucial characteristic of Eng_{DS} is optional use of inflectional marking, and functional categories in general. However, there is a discrepancy across reported results, as to what the inflectional impairment is conditioned by. This research aims to resolve this discrepancy by evaluating the three hypotheses presented in *Chapter 1*.

2.4.2 German Down Syndrome

German is a language where inflectional marking is richer than that in English. A study by Schaner-Wolles (2004) on adult Ger_{DS} shows that, similarly to Ger_{TD} controls, omission of determiners, auxiliaries, prepositions and pronouns by Ger_{DS} is more frequent than incorrect use. While function words (auxiliaries, determiners, prepositions, pronouns) are more frequently omitted by Ger_{DS}, neither statistical differences nor qualitative differences between Ger_{DS} and Ger_{TD} are reported. She found neither statistically significant differences, not qualitative

differences between Ger_{DS} and Ger_{TDC}, with regards to omission of obligatory (subjects and some Accusative objects) and optional (remaining Accusative objects and Dative phrases) arguments. However, phrases inflected with Dative were omitted more frequently than all remaining argument phrases. The lowest percentage of omission was observed with obligatory Accusative arguments.

Schaner-Wolles finds the Ger_{DS} and Ger_{TDC} performance with finite and non-finite verb forms "strikingly parallel" (p.113). Additionally, a small percentage of optionality in *S/V* agreement is observed, while incorrect use of *S/V* agreement morphemes is scarce, parallel to their matched-age controls. The use of finite verbs in finite clauses (verb second) by Ger_{DS} is accurate with a percentage of 98.4% (out of 1766 occurrences) and 99.6% for the control group (2-year old Ger_{TDC}).[11] This appears to contradict the *IIH*, which is mainly based on the Eng_{DS} performance with *S/V* agreement. Most of the overall verb productions (90.6% or 1600 occurrences), were used as targeted. However, some verb productions occurred when a non-finite verb (*-en* suffix for infinitives or bare stem) was used in finite clauses. Moreover, Ger_{DS} tend to use non-finite marking at a much higher rate than their matched-age controls (7.8% versus 1.0%). This is in agreement with the *IIH*, where we also find use of non-inflected verbs in clauses where inflection is required. Overall, verbs are rarely used in clause-final position (both finite and non-finite[12]) by both groups. However, the difference between Ger_{DS} and studies supporting the *IIH* is that when non-finite verbs are used in finite clauses, they may be used correctly, due to syntactic and morphological reorganisation. More explicitly, according to the author, results show that the Ger_{DS} succeed in restructuring the grammatical pattern to accommodate a verb second

[11] Though no explicit reference to Tense performance is made, I am assuming that this statement also includes/implies an accurate use of Tense by Ger_{DS}.
[12] Finite verbs in German are typically found in second position; that is, after a subject, or a topicalised element, while non-finite verbs are typically found in clause-final position.

construction. This observation is crucial because it implies that Ger_{DS} are able to apply alternative methods to achieve the production of a structure they are facing morpho-syntactic difficulties with, like omission of arguments. Moreover, Schaner-Wolles examined both the difference between targeted and produced forms in addition to the production of the targeted utterance, contrary to the method utilised in the past for data analysis (i.e. *IIH*). Her results verify that the structural environment a verb surfaces can accommodate an inflectional change of a targeted form. Therefore, this observation makes the study of an inflected form within the produced environment critical. Schaner-Wolles (2004:115) considers that the application of restoration techniques to avoid ungrammaticality (i.e. altering the targeted structure) exhibits "the mastering of some essential syntactic principles", contrary to the *IIH* which argues for an overall inflectional impairment, including syntactic operations. Importantly, Shaner-Wolles notes that there is no specific child language acquisition stage that an individual diagnosed with *DS* will ever be fully parallel to.

She notes that morphological and mopho-syntactic skills are the most affected for Ger_{DS}, however, verb placement and *S/V* agreement are mastered, despite the severe limitations in the morpho-syntactic abilities of Ger_{DS}. She concludes by saying that the results from her study contradict Fowler (1990) who proposes a severe syntactic deficit and a critical acquisition stage, also suggesting that a verbal short-term memory problem may potentially be responsible for the problems we find with morph-syntactic marking.

2.4.3 Greek Down Syndrome

The syntactic abilities of Greek individuals diagnosed with *DS* (henceforth, $Greek_{DS}$) is a relatively understudied area. Results from Tsakiridou (2006) show problems with nominal Case-

marking. In particular, the study focuses on the production of referential (*which-NP* questions: does not require auxiliary inversion) and non-referential (*who-NP* questions) *wh-* questions, which are fully inflected with Gender, Number and Case features. This study concludes that Case marking is often used incorrectly, such that a Case value other than the one targeted by the experimental stimuli is used. However, crucially for our purposes, Tsakiridou's research question is dependent on the Case of the noun; with subject *which-NP and who-NP* questions, Nominative is the targeted Case and for object *which-NP and who-NP* questions Accusative is the targeted Case. Both subject and object *which-NP and who-NP* questions are problematic for Greek_{DS}, with object *who-NP* questions being the most problematic. Tsakiridou states that errors almost always involved a problem with Case assignment. Nonetheless, it is unclear whether the poor performance on Case with Greek_{DS} correlates with a problem in forming this type of questions or whether it is indicative of a more general problem with Case.

Unlike what studies on Eng_{DS} report on Tense marking, Tsakiridou (2006) argues that Tense on verbs appears to be slightly affected with one reported error throughout the study. There is no reference to the performance of Greek_{DS} with respect to *S/V* agreement, or with agreement in nominal phrases. Based on a comprehension task (i.e. *Picture Matching*), Stathopoulou (2009) reports that even though the 8 Greek_{DS} adolescents participating in her study had somewhat lower percentages of accuracy with reflexives, referential and quantificational antecedents and binding. When compared to their matched control group, they still performed at higher rates than what has been argued in the past by Perovic (2001) and Ring and Clahsen (2005a) for Eng_{DS}. Moreover, Stathopoulou (2009) reports the lowest accuracy rates with binding conditions were observed with Subjunctive clauses, where the picture did not match the sentence. This was a comprehension task, with a yes/no response. Concerning relative clauses, she found that Greek_{DS}

exhibit poor performance with relative clauses, such that in a comprehension task (enactment with figures) when participants needed to enact a stimulus (relative clause: subject head-subject gap, subject head-object gap, object head-subject gap, etc.) they performed fairly poorly in all conditions, with the subject head-object gap being the worst. With regards to the production of relative clauses, percentages of accuracy were once again considerably low (mean accuracy: 18%), exhibiting their lowest performance with subject head-object gap relative clauses. Finally, using the same testing materials used by Tsakiridou (2006), Stathopoulou (2009) reports that her Greek_{DS} participants performed fairly good with accuracy percentages surpassing 72%. She concludes that the linguistic development of Greek_{DS} is "not only generally delayed but also different from normal with respect to particular phenomena." (p.274).

Stathopoulou (2009) and Stathopoulou and Clahsen (2009) show that Greek_{DS} achieve high scores with Past Perfective verbs. They perform as well as their age-matched controls on (i) verbs for Aspect (which involves an -s- suffix), and (ii) verbs where Aspect is encoded in the verbal root. However, they found a significant difference between the two categories, such that participants (Greek_{DS} and Greek_{TDC}) are significantly better with verbs that include -s- than with verbs that do not. It should be noted that this is *not* a production task but an *acceptability judgement task*, where the participants need to decide whether the utterance produced by the experimenter is grammatical or not. Therefore, it cannot safely be argued that Greek_{DS} are able to produce aspectual marking as accurately as Greek_{TD}. Given results on /s/ production from phonological studies on *DS*, we would expect that if this were a production task, the participants' performance with this aspectual suffix would most likely appear noticeably lower. Nonetheless, more extensive research would be necessary, to determine whether potential problems with the inflection of the aspectual marker are phonetically, morphologically or syntactically conditioned.

2.4.4 Down Syndrome Studies on Other Languages

For ***French*** individuals diagnosed with *DS*, Tager-Flusberg (1994) reports very poor performance with subordinate and relative clauses, negation and passive constructions.

For ***Dutch*** individuals diagnosed with *DS*, Bol and Kuiken (1990) find a significant impairment with inflectional marking and syntactic structures. They observe impairment with verbal (Past-Tense and *S/V* agreement) and nominal inflection (declension of nouns and adjectives). Bol and Kuiken (1990) report problems with the Dutch *DS* pronominal system and use of auxiliaries. While there is an overuse of verb-object constructions, Dutch *DS* avoid using interrogatives, negation and subject-predicate constructions.

It was determined that, ***Italian*** individuals diagnosed with *DS* (hereinafter, It_{DS}), compared to their control group, make more use of inflection, but more omissions of free standing morphemes are observed (morphemes which can stand alone as words). Caselli et al. (2008) hypothesise that memory span restrictions affect results.[13] Thus, It_{DS} use simpler, telegraphic sentences, and when compared to It_{TDC} on the performance of complete sentences, they perform significantly worse (Caselli et al. 2008, Vicari et al. 2000, Vicari et al. 2002). Omission of words based on their lexical category was statistically significant (Caselli et al. 2008: 31) between groups, such that It_{DS} omit more words, especially prepositions, articles and verbs, than It_{TDC} and It_{SLI}. Moreover, they argue that their results are consistent with Eadie et al. (2002) and Laws and Bishop (2003).

In a parallel study, Vicari et al. (2000) report lexical and morpho-syntactic comprehension and production problems. Vicari et al. (2000: 614) and Vicari et al. (2002: 2468) propose a discrepancy between lexical and grammatical development in It_{DS} populations, such that

[13] Caselli et al. (2008) argue that an auditory-processing deficit negatively influences language development.

grammatical development is more delayed than lexical.[14] Vicari et al. (2000) suggest an additional possible explanation for this phenomenon, to the one given above; perceptual/articulatory problems (processing of acoustic information) could be preventing It_{DS} individuals from using the appropriate "morpho-phonological models", which in turn prevents them from using inflectional marking correctly. In conclusion, Vicari et al. (2000) suggest that recent studies on atypical populations lean more towards an explanation involving perceptual/articulatory problems, rather than morpho-syntactic problems, though their data are not sufficient to argue in favour of either.

2.4.5 Summary

The studies reviewed above argue for a general impairment in the inflectional system of the Grammar, without clarifying whether the differences are syntactically or morphologically conditioned. One of the purposes of this dissertation is to test the *IIH* in CG_{DS} and to evaluate whether (i) the same type of differences are observed between the GC_{DS} and CG_{TDC} groups and (ii) whether the potential differences are phonetically, phonologically, syntactically or morphologically conditioned. From the reviewed literature I acknowledge that while some claims are straightforward and provide invaluable information on the production performance of *DS*, a number of inconsistencies across languages and across different studies are found. In particular, while cross-linguistically *DS* individuals (i) may use inflectional marking accurately and (ii) do tend to use an alternative form (i.e. unmarked) to the one targeted, I find discrepancies in claims as to which inflectional marking is absent or impaired. Moreover, no claims are made as to what is the source of the observed differences between *DS* and *TDC* productions. It should

[14] They also argue for a "robust correlation between grammatical and lexical performance" such that the observed impairment of the inflectional system could be due to the limited vocabulary size, as proposed by a number of studies looking at It_{TDC} and It_{SLI} at the stages of language acquisition (see also Caselli et al. (2008).

also be noted that the overwhelming majority of studies on *DS,* give no linguistic examples of the *DS* or *TDC* participants' productions. My dissertation research is primarily concerned with the adult CG_{DS} morpho-syntactic performance. Nonetheless, it is the first study to explore the phonetic and phonological performance of *DS* individuals in depth in addition to the morpho-phonemic and morpho-phonological effects on the *DS* morphological and syntactic performance.

2.5 TENSE, *S/V* AGREEMENT, AND CASE IN TYPICAL AND ATYPICAL LANGUAGE DEVELOPMENT

It has been argued that the morpho-syntactic characteristics of Eng_{DS} are parallel to those found in *TDC* language acquisition and a delayed stage of *TDC* language acquisition,[15] typically observed with *SLI* (Ring and Clahsen (2005). Moreover, other studies have often compared the *DS* linguistic performance to that of individuals diagnosed with Williams Syndrome. For this reason, I present the results of several studies examining the domains of Tense, *S/V* agreement and Case in *TDC* language acquisition, *SLI* and Williams Syndrome.

Much focus has been placed on disorders like Autism, Specific Language Impairment, and Williams Syndrome. For these atypical populations, results show impairment in the inflectional system as well. Regarding Tense, *S/V* agreement and Case, Williams Syndrome and *SLI* can offer some information but they are still not ideal. It is argued that children diagnosed with *SLI* are likely to overcome (with speech therapy) most, if not all, language limitations before reaching adulthood. Concerning Williams Syndrome, individuals diagnosed with this Syndrome exhibit very minimal linguistic challenges despite their attested low IQ.

[15] *TDC* commonly function as a control group in studies on *DS*, as seen in all aforementioned studies on *DS*.

2.5.1 Tense, *S/V* Agreement and Case in Typical Child Language Acquisition

Based on the Ring and Clahsen (2005) analysis, the Eng_{DS} expressive skills appear parallel to that of children in an early language acquisition stage. However, if the language development of Eng_{DS} is non-progressive and can be compared to an early stage of development, then it is crucial to determine what such an early stage would look like. This, in turn, could help determine whether the Grammar of *DS* is indeed characterised in similar ways to that of *TDC*.

2.5.1.1 Theories on Language Development

There are three prevailing analyses on the acquisition of functional categories (especially Tense and *S/V* agreement) in child language acquisition: Radford (1988), Rizzi (1994) and Wexler (1994). In this section I discuss each of these analyses, in turn.

The Lack of Functional Structure. Radford (1988) suggests that functional projections are not present at the early stages of language acquisition. He proposes a truncated form of the adult structure, where only lexical categories are present in a syntactic structure. Based on his view "Small children speak Small clauses" Radford (1988): 1); that is, children's early speech resembles that of the adults' 'small clause' structures:

(2.1) Minimal predicates: subject + predicate = [NP+XP] ➡ AP, PP, VP, NP

The set of examples below illustrate how "small clauses" are realised in adult Eng_{TD} speech.

(2.2) a. Pearl saw $_{VP}$[Peter/him swim].
b. Dan saw $_{PP}$[Lena in a fabric store].
c. George considers $_{AP}$[Andreas stupid].
d. We elected $_{NP}$[Sonja president].

These minimal predicates lack functional content. He argues that *TDC*'s speech does not include functional projections (no DP, IP, CP), which become available only at a later stage.

The Truncation of Functional Structure. An alternative view on the nature of language acquisition is Rizzi's (1994) Truncation Hypothesis. According to Rizzi, children's clauses may be headed by C, forming a CP, but they may also be truncated, such that the highest projection could be AgrP, TP or VP. This is due to the option of "stripping off external clausal layers" (p.372) in the children's Grammar. As a consequence, children omit subjects in root contexts. He argues that in general, *TDC* Grammar has all the functional and lexical projections available in adult Grammar. However, children are not always able to use all functional projections at a given time. That is, in the case of truncation, information and functional projections above the given cut-off point (see (2.3)) is not available. Only information up to the highest functional projection used by the child is accessible. Hence, the child has the option of a"starting point" a functional category lower than CP. According to Rizzi (1994), the use of infinitival verbs without 'to', described as root infinitives, in structures where a finite verb is required, is explained as the child's choice to have a starting point a layer lower than TP (i.e. only information up to the VP projection is available to the child), as represented in example (2.3) below:

(2.3) CP[Agr_SP[$_{TP}$[$_{VP}$[V, DP]]]]

Rizzi argues that the *Truncation Hypothesis* accounts for the existence of root infinitives; if the maximal projection is VP, Tense inflection cannot be marked on the verb. Moreover, he notes that this theory explains lack of auxiliaries, modals, and subject clitics in early French and Dutch.

The Optionality of Functional Structure. The third analysis is the Optional Infinitive Hypothesis proposed by Wexler (1994). According to Wexler, *TDC* have all projections in their

Grammar, both lexical and functional. The difference observed between adult Grammar and the child language acquisition stage called Root Infinitive or Optional Infinitive (henceforth, *OI*) stage is that while lexical categories are obligatory in the child's Grammar, functional projections are optional. Contrary to Rizzi (1994), information above the underspecified feature is still available. In Wexler's model optionality is implemented by means of underspecification of Tense. Therefore, functional features and surfacing inflectional morphology may or may not appear in the children's productions but information above the underspecified functional category can still be accessed.

Wexler argues that the absence of Tense and *S/V* agreement markers signifies a problem with expressing finiteness, and that this is due to an underspecified feature. Moreover, when Tense inflections (finite forms) do appear, they are used with finite clauses, rather than non-finite ones. That is, children do not wrongly inflect Tense or *S/V* agreement on verbs where inflection should not appear. In fact, in a grammaticality judgement task children are likely to reject a sentence which marks an incorrect inflection as with *He are mad* (Rice et al. 1999: 951). As (Rice et al. 1999) note, incorrect inflection is not characteristic of the *OI* stage. However, children are more prone to accepting sentences they produce themselves like *He running away* (p.951). There is extensive research on Ger_{TDC} language acquisition and *SLI* (Clahsen 1982, Clahsen et al. 1997, Poeppel and Wexler 1993, *inter alia*). Given the fact that findings and argumentation mostly parallels the literature on English, I will not go into details. The *OI* stage is considered a syntactically conditioned difference between *TDC* and adults because it is arguing that syntactic categories are optional, as opposed to incomplete acquisition of either the phonological or morphological system.

In order to explain the surfacing of nominal subjects in the *OI* stage, Schutze and Wexler (1996) propose the *Agreement/Tense Omission Model* (*ATOM*) revised later by Schutze (1997). In particular, they argue[16] that Tense and agreement can be independently underspecified in children's root clauses. This allows them to explain that, in the *OI* stage, (i) subjects are available even with underspecified Tense and (ii) subjects are only optionally marked for Nominative Case. During the *OI* stage, either Tense or agreement is marked, while the other category is underspecified. If the [-AGR, +TENSE][17] combination is used, children are expected to use the default Case for the subject. If the [+AGR, -TENSE] combination is used, the child produces the correct inflection for the subject, but the infinitival form of the verb is used. The combinations for English proposed by Schutze and Wexler (1996) can be found in (2.4) below:

(2.4a) INFL description examples (Schutze and Wexler 1996: 678)

i. [+TENSE, +AGR] NOM assigned *he cries*

ii. [+TENSE, -AGR] NOM unassignable, default ACC surfaces *him cry, him cried*

iii. [-TENSE, +AGR] NOM assigned, agreement invisible *he cry*

iv. [-TENSE, -AGR] NOM unassignable, GEN assigned *my cry, my crying*

(2.4b) Lexical Entries

i. [+TENSE = Present, + AGR = 3sg] ➡ *-s*

ii. [+TENSE = Past] ➡ *-ed*

iii. [TENSE, AGR] ➡ ∅

In a recent study, Orfitelli and Hyams (2008) provide evidence that the *OI* stage and the null subject stage, where children produce subject-less clauses, are linked. That is, the two occur at

[16] Their argumentation is based on three theoretical assumptions: (i) [TENSE] and [AGR] are two separate functional categories (Chomsky 1993); (ii) separation between morphological case marking and structural licensing (per Marantz (1992), Schütze (1993), Harley (1995)), which allows overt DPs to be realised in particular positions, independent of what is responsible for assigning morphological Case features to DPs; and (iii) [±AGR] assigns/checks NOM Case (cf. Chomsky (1981: 52), Pesetsky (1982: 202), Radford (1990), Radford (1994), Schütze (1993)).

[17] The squared [ ] bracket notation is used to indicate inflectional features in the syntax. + signifies presence of an inflectional feature (e.g. [+Tense] for Past), while – signifies absence of an inflectional feature.

the same language acquisition stage. Evidence comes from both production and comprehension data where children at ages 2;6–2;11 and 3;0–3;5 fail to produce inflected verbs in finite environments and perform poorly with null subjects. This is attributed to a different realisation between the child and adult Grammars. Orfitelli and Hyams (2008) suggest that only under an analysis such as that of Rizzi (2000) and Rizzi (1994) can this performance be accounted for. When a structure is truncated, information above the truncation (e.g. VP see example (2.3)) is not accessible to the child. Hence, a subject cannot surface due to the absence of a TP projection. *Table 2.3* below summarises the main points addressed by the three above noted analyses.

Effects[18]	**Radford (1988)**	**Rizzi (1994)**	**Wexler (1994)**
Lexical Categories Present	✓	✓	✓
Functional Categories Present	×	✓	✓
Info above Higher Projection Available	×	×	✓

TABLE 2.3: ANALYSES ON CHILD LANGUAGE ACQUISITION OF MORPHO-SYNTACTIC FEATURES

In *Chapters 5* and *6* I show that the CG_{DS} performance is not an exact match to that of CG_{TDC}. I provide evidence supporting that the differences observed between and CG_{DS} Grammar, CG_{TDC}, and adult CG_{TD} are not syntactically conditioned, as all three of the above mentioned studies suggest for the stage where inflectional marking in *TDC* is optional.

2.5.1.2 *Language Development in Greek Typically Developing Children*

This section offers information on $Greek_{TDC}$ language acquisition. This information is important for two reasons. First, I am examining the inflectional patterns of CG_{TDC} (functioning as the

[18] There is an alternative viewpoint on the optional marking of inflectional morphology in children's Grammar. Marchman et al. (1999) and Marchman et al. (2004) consider that increase in vocabulary learning improves the children's ability to use morphological inflection. Testing Past-Tense inflection, Marchman et al. (1999) and Marchman et al. (2004) argue that during language acquisition Eng_{TDC}'s problems with inflectional marking are strongly associated with difficulties in lexical learning, such that the limited vocabulary use causes problems with the use of Past inflection. This analysis cannot account for the productions of CG_{DS} tested in the study, as we will see in following chapters.

control group) at the end of their language acquisition period. This will serve as a means of comparison for CG_{DS}. Secondly, the linguistic patterns associated with *DS* have been characterised parallel to an early stage of child language acquisition, specifically the *OI* stage.

Stephany (1997) investigates the morpho-syntactic development of $Greek_{TDC}$ aged 1;9–2;10 at three different stages of language acquisition. Concerning their use of Case, $Greek_{TDC}$ inflect Singular or Plural Accusative forms on nominals in all stages of language acquisition. At Stage I, $Greek_{TDC}$ also show Gender and Case underspecification (Stephany 1997).

Concerning *S/V* agreement, children in both *TD* Stage I and II have an evident preference for 3rd Person. $Greek_{TDC}$ develop 2nd Person singular next, with a slower mastering of the Plural, towards the end of Stage II (Tsimpli 2001).

Concerning the acquisition of Tense marking, $Greek_{TDC}$ use Tense as early as 1;10, though Tense distinctions (e.g. Present, versus Past) are not seen until Stage II (2;3) . Moreover, Varlokosta et al. (1996) show that $Greek_{TDC}$ make more use of the Imperfective Present Tense, rather than the so-called Dependent[19] verbal construction. In addition, $Greek_{TDC}$ are more successful when using the Imperfective rather than the Perfective: the two participants produce Imperfective 78% (Child A) and 83% (Child B) correctly. This contrasts with the production of Perfective Aspect which is only 47% (Child A) and 35% (Child B) accurate. Varlokosta and colleagues argue that despite the fact that Standard Greek (hereinafter, SG) does not have infinitives, children make use of the verbal suffix *–i*. When this suffix is combined with a verbal root carrying Perfective Aspect it forms Dependent 3rd Person Singular, and when it is combined with an Imperfective verbal root, it forms the Present 3rd Person Singular. Though *OI* is not a possible analysis for a

[19] Dependent, when used in a Subjunctive clause, is in some ways parallel to the English Infinitive, with the difference that the verb still receives *S/V* agreement.

$Greek_{TDC}$ and CG_{TDC} because Greek, does not have non-finite verbs equivalent to the English infinitive, they argue that the stage described above can be considered parallel to the *OI* stage found in English and German.

If the *IIH* holds for CG_{DS} then the majority of their productions will either lack inflectional marking altogether or will present a generic form, analogous to the one reported by Varlokosta et al. (1996). Therefore, if differences between CG_{DS} and CG_{TDC} are syntactically conditioned, and further, if the *OI* does not hold for SG and CG, based on the Varlokosta et al. (1996) study, we should then expect to find something parallel to the *OI*; namely, a single form, either Present, or Dependent 3rd Person Singular (verbs), similar to what they have found for $Greek_{TDC}$ at age 2;3.

Concerning the Perfective Past Tense, (Stavrakaki and Clahsen (2009b) found that 3;5 to 8;5 year old children showed a preference for the production and comprehension of the Past Perfective forms including the aspectual suffix *-s-* rather than those encoding Aspect in the verbal root. They observed that the younger the group, the stronger the preference.

2.5.2 Language Development in Specific Language Impairment

Studies on *SLI* report comparable language problems to those of individuals with *DS*. In fact, it has been proposed that the performance of Eng_{DS} can be compared to the one reported for Eng_{SLI} (Ring and Clahsen (2005), parallel to the *OI* stage for Eng_{TDC}. The purpose of this section is to examine whether (i) results from these studies show similarities with results from studies on *DS* and hence, a similar analysis can be employed to explain the different grammatical development of these atypical populations, and (ii) whether the analyses used to account for results on *SLI* can contribute to an analysis of the CG_{DS} Grammar.

2.5.2.1 Specific Language Impairment

There is a consensus in the literature regarding the linguistic skills of individuals diagnosed with *SLI*. Numerous studies agree that *SLI* linguistic impairment involves a lack of functional morphological marking (Bishop and Bishop 1997, Marchman et al. 1999, Marchman et al. 2004, Rice et al. 1995, Rice and Wexler 1996, Rice et al. 1998, Rice et al. 1999, *inter alia*). More explicitly, just as *TD* children in an earlier stage of language acquisition omit inflectional marking, *SLI* exhibit the exact same behaviour at an older age. What is the significance of this fact? There are several analyses available, which I review immediately below.

Rice and Wexler (1996) name this period the Extended Optional Infinitive stage (henceforth *EOI*), due to the fact that the *OI* stage "extends" beyond the period it appears in *TD* language acquisition. According to *EOI*, Eng_{SLI} and Ger_{SLI} productions are characterised by the underspecification of optional non-interpretable inflectional features on verbs, corresponding to an earlier stage of language acquisition of the *TD* Grammar (Clahsen et al. 1997, Rice and Wexler 1996, Rice et al. 1995, Rice et al. 1998, Rice et al. 1999). In particular, they argue that the frequent omission of inflectional marking in children with *SLI* parallels the *OI* stage in younger *TDC*. This includes not only 3rd Person Singular *–s*, Past Tense inflection *–ed*, the copula *be* and auxiliary *do*, but also the determiners *a/the*. Note however, that they perform highly accurately with Plural *-s*, *-ing* and prepositions *in* and *on*. While *TDC* show *OI* at around 4-years old, *SLI* reach the *OI* stage after the age of 7. Rice et al. (1995) eliminate articulatory restrictions (difficulty producing /s/, /z/, /t/, /d/) as a contributing factor to the production problems observed with the affected morphemes.[20] Rice et al. (1995), among others, argue that

[20] This is one of the few morpho-syntactic studies, which has taken potential articulation difficulties into consideration. Rice et al. (1998) also exclude articulatory delay or impairment of the phonetic realisation of the morpho-syntactic elements by testing the English "Tense and agreement" related sounds: /s/, /z/, /t/, /d/. The

the differences found between Eng_{SLI} and Eng_{TDC} are syntactically conditioned. More explicitly, the grammatical function of the Tense marking, and more generally absence of functional projections, is the primary reason for the impairment differences observed between their Eng_{SLI} and Eng_{TDC} matched-age controls.[21],[22]

Leonard (1989) argues that *SLI* children present problems with word-final consonants and weak, non-lengthened syllables when these are used as inflectional morphemes (e.g. Past Tense *–ed* pronounced as /d/ or /t/). He concludes that limited use of inflections in *SLI* is related to perceptual factors such as low acoustic salience. He applies acoustic salience to contrast the performance of English, Italian, and Hebrew *SLI*. He suggests that *SLI* children are characterised by a limited processing capacity, such that they find it challenging when these environments play a morphological role, e.g. word-final consonants have an inflectional "value" like the final /s/ in nominal Plural and *S/V* agreement or /t/ and /d/ in regular Past Tense inflection. In order to understand and apply the grammatical forms, children need to apply additional operations. This, in turn, creates an overload and may result in incomplete processing of the morphemes.

One of the general conclusions of Rice and Wexler (1996) and Rice et al. (1998) is that the problems with inflectional marking in *SLI* can be used as a clinical marker to diagnose *SLI* in pre-school ages, but also as a means of educating parents. This receives further support from the fact that the inflectional morphemes mentioned above are observed to "grow together over time", i.e. to either be absent, partially or fully acquired at the same time, as a group (Rice et al. 1998:

Goldman-Fristoe Test of Articulation (GFTA) (Goldman, Fristoe and American Guidance Service 1986) was used in both studies.

[21] Rice and Wexler (1996) provide evidence for this claim with data collected from both controlled (probe item) and spontaneous elicitation.

[22] Parallel claims are also made by Marchman et al. (1999) and Marchman et al. (2004); and stress that while *TD* overgeneralise Past inflection, *SLI* present zero inflectional marking, even with irregular Past Tense forms.

1426). Specifically, in a longitudinal study, they observe that these morphemes bundle together, that is, when one is missing, the others are more likely to be missing as well, and vice versa.

2.5.2.2 *Studies and Analyses on Greek Specific Language Impairment*

Studies report general problems in Greek children diagnosed with *SLI* (henceforth, $\text{Greek}_{\text{SLI}}$) with relative clauses, question formation, verbal and nominal inflectional marking and clitic misplacement (Clahsen and Dalalakis 1999, Petinou and Terzi 2002, Stavrakaki 2001, Stavrakaki 2006, Tsimpli 2001, Tsimpli and Stavrakaki 1999). Further, all studies, regardless of their focus, report problems with Case assignment.

Concerning verbal inflection, $\text{Greek}_{\text{SLI}}$ mark both non-Past and Past inflection (95% of their Tense inflection is correct). Inconsistencies with the use of Future particle *a* and Subjunctive particle *na* are observed: they are either omitted or only the vowel *–a* is produced (Tsimpli, 2001). With regards to *S/V* agreement, while 1st and 3rd Person Singular and Plural are used like in Greek_{TD}, 2nd Person (both Singular and Plural) is not. A comparison shows that $\text{Greek}_{\text{TDC}}$ in both Stage I and II have a preference for 3rd Person. This is not the case for $\text{Greek}_{\text{SLI}}$; 2nd Person Singular and Plural are only acquired at Stage II by $\text{Greek}_{\text{SLI}}$ (Tsimpli 2001). Hence, the performance of $\text{Greek}_{\text{SLI}}$ is mostly parallel to that of $\text{Greek}_{\text{TDC}}$ at Stage II. In a case study on the verbal inflection of a $\text{Greek}_{\text{SLI}}$ child, Clahsen and Dalalakis (1999) report Tense to be intact, while *S/V* agreement features are reported impaired. Specifically, Eva inflected Person and Number features on the verb correctly only 50% of the time. More evident problems manifest with 2nd Person Singular and Plural.

Concerning the nominal domain, Tsimpli (2001) notes that $Greek_{SLI}$ children exhibit a very low performance with the definite article. On the contrary, the indefinite article is applied appropriately on most targets, parallel to $Greek_{TDC}$ Stage I. Regarding clitics, at first glance, there seems to be a clear preference towards using 1st and 2nd Person clitics, while the use of 3rd Person clitics is substantially low. Further analysis, however, established that this preference is due to "repetitions of formulaic utterances" (Tsimpli 2001: 440). In fact, when the participants' overall performance with clitics was considered, it was observed that there is a clear tendency to omit the 1st and 2nd Person clitics. Tsimpli additionally notes that the use of Genitive on stems (clitics, strong pronouns etc.) is quite rare. $Greek_{SLI}$ children choose forms with the least distinct morphological marking (unmarked/default) suggesting that to be Accusative (Singular or Plural) for nominals and non-past for verbs, rather than another form like Genitive, which makes a distinction in the inflectional paradigm. This is also observed with *S/V* agreement (Clahsen and Dalalakis 1999). The above results show that $Greek_{TDC}$ have a selected preference in using a feature value for either *S/V* agreement (3rd Person) or Case (Accusative). If the linguistic development of *SLI* and *DS* is parallel to *TDC* stage as argued in past literature we would expect that CG_{DS} also show a preference towards unmarked forms. If this is the case and we observe the same phenomenon across different languages and different populations this potentially means that a tendency towards unmarked forms with both verbal and nominal features is a general property of *UG* and it results from a mechanism that functions the exact same way across different languages and different populations. However, based on the above, we cannot clearly conclude whether the preference to unmarked/underspecified forms is syntactically or morphologically conditioned.

Based on the above results Tsimpli (2001) concludes that language acquisition in $Greek_{SLI}$ is distinct from that of $Greek_{TDC}$, such that the characteristics of their language development deviate from those observed with the typical developmental pattern. While nominal inflection of $Greek_{SLI}$ parallels that of Stage I of $Greek_{TDC}$, verbal inflection is comparable to that of Stage II of $Greek_{TDC}$. Based on this, Tsimpli suggests that the results from her study do not support the *EOI* hypothesis (Rice and Wexler 1996, Rice et al. 1995).

2.5.3 Language Development in Williams Syndrome

Williams Syndrome is a neurodevelopmental disorder caused by a micro-deletion of genetic material in chromosome 7. Individuals diagnosed with Williams Syndrome (henceforth, *WS*) are considered to have good short-term memory for words and digits. Previous research on *WS* is divided into studies which argue for typically developing language (Clahsen and Almazan 1998, Clahsen and Almazan 2001, Clahsen and Temple 2003, Clahsen et al. 2004) and studies supporting atypical language development with particular problems with functional categories (Karmiloff-Smith et al. 1997, Thomas and Karmiloff-Smith 2002, Thomas et al. 2001). Specifically, Clahsen and colleagues argue for typical language development, parallel to *TD* individuals, with regard to functional categories as well as complex syntactic phenomena. However, evident problems with stored forms like irregular Past Tense, comparative-superlative forms and irregular nominal Plural forms are reported. They argue that problems with irregular forms are due to an impairment with the information retrieval mechanism from the lexicon. This contradicts results reported for Eng_{DS} by Eadie et al. (2002) and Laws and Bishop (2003).

Karmiloff-Smith, Thomas and colleagues report problems not only with irregular but also with regular inflection. Their explanation for the grammatical impairment observed with *WS* involves

"with as yet circumstantial evidence" a delayed language development due to atypical semantic and phonological constraints (Thomas et al. 2001:170), relying mostly on phonological constraints, than semantics. That is, they consider that vocabulary growth relies mostly on phonology, rather than semantics. They conclude that *WS* present "language development, following an atypical developmental trajectory" (Thomas et al. 2001:169). They point that short-term memory may have a significant effect on results, and that results from research conducted with atypical populations should not be based solely on a single task, because other factors, like short term-memory limitations and metacognition may affect results significantly. Finally, (Zukowski 2004) observed that children diagnosed with *WS* have parallel, yet delayed, language acquisition to *TDC*.

A study of Greek children diagnosed with Williams Syndrome (ages 6;5 to 16;11) (henceforth, Greek_{WS}) evidenced parallel development between Greek_{WS} and $\text{Greek}_{\text{TDC}}$ concerning Past Perfective, and the acquisition of inflection in general (Stavrakaki and Clahsen 2009a). Specifically, Greek_{WS} performed accurately with productions of regular Past Perfective that require the addition of the -*s*- suffix. Some problems were observed with the irregular[23] Past Perfective. They conclude that there is an impairment, which affects the retrieval of irregular forms from the lexicon. These results are in agreement with results from Greek_{DS} where the same types of inflectional environments are studied (Stathopoulou and Clahsen 2009) with an acceptability judgement task. They argue that the difference in performance between the two types of Perfective Past is mainly due to "a selective impairment of lexically-based (irregular) inflection, with rule-based (regular) inflection being unimpaired" (p.230). Moreover, Stavrakaki and Clahsen (2009a) observed that Greek_{WS} commonly use Past Imperfective instead of the non-

[23] For irregular Past Perfective, Aspect is encoded in the verbal root. These forms are also referred to as non-sigmatic, since the extra addition of the aspecual suffix -*s*- is not required.

sigmatic forms. On the basis of Perfective Past Tense, the authors argue that the problems described above are specific to the particular environment and overall Greek_{WS} present typical language development, comparable to their Greek_{TDC} controls.

While we are still far from reaching definitive answers to the complex motivations of such different developmental patterns, such cross-population studies of children and adults with different neurodevelopmental profiles can provide useful information regarding the relation between language and general cognition and how those relationships change over the course of language learning and development and across different disorders. Though diversity of reported results is evident, what most studies seem to agree on is that *DS*, *SLI*, *TDC* and *WS*, have a tendency to select an unmarked or underspecified form, when the targeted form is not produced. However, it is difficult to distinguish whether this choice is made during the syntactic derivation process, and is thus syntactically conditioned, or whether it is selected after *Spell Out*, where the bundle of features resulting from the syntactic derivation are seeking for a phonetic exponent, and is thus, morphologically conditioned. As a final note, both methodology and results from the above studies help with the methodology of data collection and stimulus selection of this study.

2.6 WHAT IS THE SIGNIFICANCE OF THE INFLECTIONAL IMPAIRMENT?

As presented above, many studies in several languages have looked at *DS* language production. They concluded that inflectional marking is either absent or impaired.

To the best of my knowledge, there is only one proposed analysis within a theoretical framework of the significance of *IIH* in *DS*. Ring and Clahsen (2005) employ a theory based on child language acquisition to explain the results from their study and argue that the differences,

observed between the Eng_{DS} and their control group, are syntactically conditioned. More explicitly, they argue that Wexler's (1994) *OI* hypothesis (*Section 2.6.1.1*) and later the *EOI* Hypothesis (originally used to account for the Grammar of Eng_{SLI}, (Rice et al. 1999), *Section 2.6.2.1*) can best describe why Eng_{DS} make a distinction between marked and unmarked forms (lacking inflectional marking for Ring and Clahsen 2005). Ring and Clahsen (2005:9) propose that the *EOI* can "extend to other functional categories" and features hosted under those categories, like Number and Degree (for comparative/superlative), can also be underspecified, just as Tense is underspecified. No reference to agreement is made. Furthermore, the hypothesis has also not been tested with nominal Case and nominal agreement.

I briefly summarise previous research on Eng_{DS}, Eng_{SLI} and Eng_{TDC} as a means of comparison.[24] This was not possible for Greek due to lack of sufficient information. *Table 2.4* provides a summary of all reported results on the three aforementioned populations with typical and atypical language development at different ages.[25] I give the acquisition stage code I used to categorise the level of acquisition at a particular age right below. When two choices are available, the produced form depends on the type of elicitation used for data collection: spontaneous or control elicitation data collection.

[24] Information on Eng_{SLI} ages 2;6 to 6;5 is not available.

[25] For the formulation of the table a large number of studies were consulted. For Eng_{DS}: (Chapman 1995, Chapman and Hesketh 2001, Chapman et al. 1998, Eadie et al. 2002, Joffe and Varlokosta 2007, Kay-Raining Bird et al. 2005, Kumin 1986, Laws and Bishop 2003, Perovic 2006, Ring and Clahsen 2005,Van Borsel 1996) for Eng_{SLI} and Eng_{TDC}: (Bishop and Bishop 1997, Marchman et al. 1999, Marchman et al. 2004, Rice et al. 1999, Orfitelli and Hyams 2008, Rice 1996, Rice and Wexler 1996, Rice et al. 1995, Rice et al. 1998, Schutze and Wexler 1996, Wexler 1994).

English	DS[26]		TDC			SLI	
	Child 6;6 – 8;9	Adolescent 10 - 19	Child S1 2;6 – 3;5	Child S2 3;6 – 4;4	Child S3 4;5- 8;9	Child S2 4;5 – 6;5	Child S3 6;6 – 8;9
3rd Person *–s*	P-A1	P-A1/2	P-A2	P-A3	F-A	P-A2/3	P-A3
Past *-ed*	P-A1	P-A1/2	P-A2	F-A2/3	F-A	P-A2	P-A3
Irregular Past	P-A3	P-A1/2	P-A1/3	P-A1/3	F-A	P-A1/3	P-A1
BE/DO	P-A3	P-A3	P-A3	P-A2/3/F-A	F-A	P-A2/3	P-A2/3
Modals	P-A3	P-A1	P-A3	P-A3/ F-A	F-A	P-A3	P-A3
-ing	P-A3	P-A3	F-A	P-A3 /F-A	F-A	P-A3	P-A3
Case	N-I	N-I	P-A1	P-A3	F-A	P-A1	P-A/23
Plural *-s*	P-A3	P-A2/3	F-A	P-A3/F-A	F-A	P-A3	P-A3
Determiners	P-A3	P-A3	P-A3	P-A3/ F-A	F-A	P-A2	P-A3
Possessive *-s*	F-A	P-A1	P-A3	P-A1	F-A	P-A3	P-A3

TABLE 2.4: SUMMARY OF LANGUAGE ACQUISITION STAGES BY ENG_{DS}, ENG_{SLI} AND ENG_{TDC}

(2.5) Acquisition Stage Code

(a)	Partly acquired	P-A1 (20 % - 49%)	(e)	No Information	N-I
(b)	Partly acquired	P-A2 (50 % - 74%)	(f)	Not acquired	N-A
(c)	Partly acquired	P-A3 (75% - 94%)			
(d)	Fully acquired	F-A (95% - 100%)			

Based on *Table 2.4*, according to the literature consulted, no specific age or stage of language acquisition by either Eng_{SLI} or Eng_{TDC} is an exact match to the performance of Eng_{DS}.

In sum, throughout this chapter, we identified the following shortcomings with previous studies. These are summarised below and a more extensive discussion follows in *Sections 2.6.1* through *2.6.3*.

(i) Empirical

language under investigation makes it impossible to decide whether the hypothesised differences between the CG_{DS} and CG_{TD} (and CG_{TDC}) Grammar are morphologically, syntactically or phonetically and phonologically conditioned (*Section 2.6.1*)

[26] Some studies note that Eng_{DS} continue learning throughout adulthood. However, only a small number of studies on adult Eng_{DS} inflectional marking are available (Kernan and Sabsay 1996, Miles and Chapman 2002, Perovic 2006, among others), and some of those do not specifically study or give specific information on these grammatical elements. They simply say less expressive linguistic competence, considering at times the production of only one morpheme per participant. Therefore, it's impossible to know the level of language acquisition, based on these studies.

(ii) Methodological

(a) the choice of experimental stimuli

(b) the method of data collection (*Section 2.6.2*)

(iii) Analytical

(a) the analysis of the data did not take into account that when the target was not met, the results could still be grammatical,

(b) previous studies did not control for articulatory restrictions (*Section 2.6.3*)

2.6.1 Empirical Issues

First, in Eng_{DS}, inflectional impairment manifests itself as follows:

(2.6) Last night I ***study(ed)*** till late.[27] ➡ *optional use of Past marking in* Eng_{DS}

(2.7) Peter ***go(es)*** camping every summer ➡ *optional use of S/V agreement marking in* Eng_{DS}

In (2.6), Past inflection on the verb is optional, and in (2.7), 3rd Person Singular *S/V* agreement is optional. For English, Present Tense and *S/V* agreement surface on verbs as an unanalyzable portmanteau morpheme *–s*. Thus, on the basis of the English studies, it is not clear whether the inflectional impairment affects Tense, *S/V* agreement, or both. Therefore, to determine the significance of inflectional impairment in *DS* we need to study *S/V* agreement in a language where *S/V* agreement and Tense can be clearly isolated. (Cypriot) Greek is such a language. Tense and *S/V* agreement in CG ***do not*** always co-occur as I will show in *Chapter 3* below.[28]

Second, an additional empirical shortcoming resulting from previous literature concerns the relation between Tense and Case. In most Indo-European languages there appears to be a

[27] No Linguistic examples are available in any of the English studies. These examples are a mere presumption of how the productions look like based on the reported results.

[28] Since there does not exist a Grammar on CG, I use 'Greek' to refer to both SG and CG. Note that Tense, *S/V* agreement and Case have the same properties across the two dialects. When there is a difference between the two Grammars, I will point that out.

correlation between the availability of Tense and Nominative Case such that in the absence of Tense, Nominative Case is not available (Rouveret and Vergnaud 1980). This is seen with lack of subjects in infinitival clauses:

(2.8) (a) $_{CP}$[Konrad$_i$ promised $_{IP}$[***to finish*** his homework]].

(b) $_{CP}$[Vanora asked Dan$_i$ $_{IP}$[***to walk*** the dog]].

In both structures above the infinitival clause lacks an overt subject. It has been proposed that the absence of an overt subject follows from the fact that non-finite verbs cannot assign Nominative Case (Rouveret and Vergnaud 1980). If this is so, we might expect that inflectional impairment affects Case-marking as well. There are two potential reasons as to why we might expect Case-marking to be affected; it may either be morphologically conditioned (Case being an instance of nominal inflection), or else it may be syntactically conditioned, pertaining to the functional category Tense. To the best of my knowledge, there is no research (for English or other languages) on the performance of *DS* with Case. Again, (Cypriot) Greek is an ideal language to study the relation between inflectional impairment and Case marking because there are environments where Case marking is available in the presence and absence of Tense-marking. More explicitly, in Greek Nominative is assigned to the subject in clauses where the verb carries Dependent or Imperative inflection.

Third, another problem that arises in the context of studying *DS* in English concerns a reported impairment of Plural inflection. Recall that the *IIH* is supported by the fact that Eng_{DS} have problems with verbal inflection (Past Tense *–ed,* 3rd Singular *–s*) as well as nominal inflection (Plural *–s*). If *IIH* reduces to *EOI* (c.f. Ring and Clahsen 2005), and differences between the CG_{DS} and the CG_{TD} (and CG_{TDC}) Grammar are syntactically conditioned, then the simultaneous impairment of Plural marking would be either coincidental or lead us to postulate an "Early Optional Number" stage (the nominal equivalent of *EOI*), as Ring and Clahsen (2005) propose.

Finally, in English, infinitives have no overt inflectional marking. This means that a verb without inflectional marking could, in principle, be an infinitive verb or else an unmarked (bare) root. *Table 2.5* shows the English inflectional paradigm for regular and irregular verbs. Note that the root, Imperative, Infinitive and most Present Tense forms (apart from 3rd Person Singular) have the exact same form.

(2.9) (a) $[\sqrt{\text{SING}}]_{\text{V.INF}}$

(b) $\sqrt{\text{SING}}$

Root	Present	Past	Infinitive	Participle	Imperative
WALK	*be* ***WALK****-ing*	***WALK*** *-ed*	*(to)* $\textbf{\textit{WALK}}_{\textbf{\textit{INF}}}$	*has* ***WALK*** *-ed*	***WALK***
SING	*be* SING *-ing*	S*a*NG	*(to)* SING_{INF}	S*u*NG	SING

TABLE 2.5: ENGLISH INFLECTIONAL PARADIGM

Recall that, according to Ring and Clahsen (2005), *IIH* reduces to *EOI*; it is thus essential to know whether we are indeed dealing with an infinitive, which is, however, not possible to know when studying *DS* speakers of English.

The infinitive and all other Person-Number combinations in English, apart from the 3rd Person Singular, have exactly the same form. Therefore, in the absence of 'to' we do not know whether the unmarked form produced by Eng_{DS} is marked as infinitive with a zero morpheme, or whether the production is a bare root. The same question arises in cases where Eng_{DS} need to use Past. In the absence of Past inflection, we cannot know whether Eng_{DS} are using an infinitive instead of a Present form (excluding 3rd Person - Singular) or a bare root.

Concerning German, Schaner-Wolles (2004) shows that Ger_{DS} participants use non-finite forms (***either*** bare root ***or*** inflected with the infinitival suffix) in finite clauses. This is detectable in

German since the infinitive carries inflection. *Table 2.6* shows the German inflectional paradigm for a regular and an irregular verb.

Root	Present	Past	Infinitive	Participle	Imperative
LIEB 'love'	***LIEB**-e/-st/-t*	***LIEB**-te/-est/-te*	***LIEB-en***	***LIEB** -end*	***LIEB**-(e)*
	***LIEB** -en/-t/-en*	***LIEB**-ten/-tet/-ten*			***LIEB**--en/-t/-en*
GEB 'born'	GEB-*e/-st/-t*	G*a*B *-te/-est/-te*	GEB-*en*	GEB-*end*	GiB
	GEB-*en /-t'/-en*	G*a*B-*ten/-tet/-ten*			GEB-*en /-t/-en*

TABLE 2.6: GERMAN INFLECTIONAL PARADIGM

A bare root in German does not correspond to a full verbal form as it does in English (apart from the Imperative in some cases). In English in all cases apart from 3rd Person Singular in Present Tense the verb has no overt marking and has the same form as the infinitive. In contrast, for German, overt inflection is always necessary. However, the suffix *–en* used for the infinitive in German is homophonous with the *–en* suffix used for 1st and 3rd Plural, Present. Therefore, we cannot be certain whether Ger_{DS} are using an infinitive when suffixing *–en* on a verb, or whether they are using 1st or 3rd Person Plural.

In sum, the languages where *DS* has been studied thus far are not ideal to determine the significance and nature of the hypothesised inflectional impairment. In addition, as can easily be observed above (*Section 2.5*), results from languages other than English and German with richer inflectional morphology like Italian, do not give detailed information on exactly what morpho-syntactic (i.e. verbal and nominal inflection) and structural environments they observed problems with, not do they conclude whether differences between *DS* and controlled groups are syntactically or morphologically conditioned. In *Chapter 3*, I show how these empirical issues are addressed in the present research.

2.6.2 Methodological Issues

The choice of the experimental tasks for the collection of data as well as the experimental stimuli is paramount. It can ultimately determine and define a study's overall results and conclusions. Before presenting the methodological issues resulting from previous work, it should be noted that in almost all studies (excluding Tsakiridou (2006) and Schaner-Wolles (2004)) there is a notable lack of linguistic examples to illustrate both experimental stimuli and *DS* productions.

In previous work on *DS*, data collection is either done via free or controlled elicitation. The former is characterised by the collection of spontaneous data typically through story telling. In contrast, in controlled elicitation tasks, data collection is done through a pre-determined context selected by the researcher, either by asking the participant to repeat words or sentences or by responding to a specific stimulus. Very rarely is there a combination of the two types of elicitation to study the domains of Tense and *S/V* agreement or nominal inflection.

Caselli et al. (2008) use lexical (*Picture Vocabulary Test*) and morpho-syntactic (*Linguistic Comprehension Test*) comprehension tasks, as well as lexical (*Boston Naming Test*) and morpho-syntactic (*Phrase Repetition Test*) production tasks. Chapman *et al.* (1998) use an *elicited production task* (with a puppet). Eadie et al. (2002) use *picture description activities*, *spontaneous conversation* using toys and a *sentence repetition task*. Laws and Bishop (2003) use *comprehension and naming tasks*, *story narratives, a gap filling elicitation test* and *word and non-word repetition test*. Ring and Clahsen (2005) use a *gap-filling task*. Schaner-Wolles (2004) uses a *sentence imitation* task. Stathopoulou and Clahsen (2009) use an *acceptability judgement* task. Tsakiridou (2006) uses an *elicited production* task. Vicari et al. (2000) and Vicari et al. (2002) use a *communicative development inventory*, where parents are required to note the vocabulary and grammar production of their children. They also conducted a *verbal*

comprehension task, a *word and phrase repetition test* and *MLU*. Of the studies mentioned above, only Caselli et al. (2008), Eadie et al. (2002), Laws and Bishop (2003), Vicari et al. (2000) and Vicari et al. (2002) use a combination of free and controlled elicitation tasks. None of the studies on *DS* report any differences as to whether the elicitation method functions as a contributing factor to the participant's performance. However, Rice and Wexler (1996) do find differences between controlled and spontaneous elicitation with their participants' performance.

On the one hand, *controlled elicitation* allows the testing of structures that might not be frequently used by the participant in everyday speech. Controlled elicitation tasks are able to test the participants' performance and competence, as in many cases participants may be able to comprehend a specific morpho-syntactic phenomenon but do not commonly (or are unable to) use it in their productions. An illustration of how this study controls and tests for a variety of possible grammatical combinations to avoid gaps in the data collection and analysis is given in *Chapter 4* where methodology is outlined. On the other hand, when using pre-fabricated stimuli or when giving a frame in which participants have to restrict their productions, researchers take away the participants' freedom to choose between a number of alternatives which participants might have the ability to produce under other contexts or in their everyday conversations. In addition, the structural environment in which, for example, Tense is tested might be the reason the domain appears to be impaired, and not Tense as feature-marking or a functional category.

With *free elicitation* participants are given more freedom to express themselves in any way they choose, with structures and vocabulary they are familiar with and are more comfortable using. With free elicitation, all we can do is to construct a context or offer background information (i.e. with story-telling, we instruct participants to narrate a story about what they did last summer). While participants may not produce the target inflection in controlled elicitation, the use of

everyday speech without the pressure of providing a requested structure might allow participants to use the appropriate inflection accurately.

Combining the two different types of elicitation offers the best possible way to collect relatively unconstrained data but also target certain grammatical constructions to get a more inclusive idea of the target group's performance and their competence. More explicitly, we can test whether participants are simply unable to produce something in a certain structure through e.g. a repetition task or elicited production task. Alternatively, participants might be facing a general problem with a specific grammatical domain or feature, such that the tested element is lacking altogether (i.e. lack of competence). A combination of free and controlled elicitation combines the benefits and minimises the weaknesses. Results from the current study do show that the elicitation method may play a vital role in generalised conclusions.

2.6.3 The Significance of Articulatory Limitations and Data Analysis

As Vicari et al. (2000) note phonological and articulatory restrictions may have an effect on the morpho-syntactic abilities of It_{DS}, without going into further details, so does Chapman (1995) for Eng_{DS}. In fact, many of the inflectional forms in English involve sounds that are difficult for *DS* to produce. In *Chapter 5* I show that the hypothesised inflectional impairment is indeed mostly a result of articulatory problems and therefore the vast majority of differences observed between the two participant groups are purely phonetically conditioned. As discussed in *Section 2.4* there are several studies on the phonological and articulatory limitations of Eng_{DS}. However, to date only one study, Eadie et al. (2002), argues that they have considered the role of the phonological and/or articulatory competence on the hypothesised inflectional impairment in Eng_{DS} where participants completed a phonological screening procedure for the sounds /s/, /z/, /d/, /t/ and /ŋ/.

However, no explicit reference as to what the results were, and whether there is a potential relevance to the morpho-syntactic results, is made.

One of the most significant findings of the present study is the fact that articulatory restrictions are in fact largely responsible for the inflectional impairment found with *DS*. As stated above, this was confirmed by the phonetic and phonological analysis, where I show that the overwhelming majority of differences between the CG_{DS} and the CG_{TD} Grammar are phonetically and phonologically conditioned. For this reason, I decided to pursue a detailed analysis on the CG_{DS} and CG_{TDC} phonetic and phonological system (*Chapter 5*).

Previous studies lack a thorough description and categorization of the data based on how productions deviate from target or expected forms. A target form mainly concerns controlled elicitation experiments where participants must respond appropriately to a given stimulus, while expected forms refer to free elicitation experiments. That is, what we would expect to observe, in a particular/given context, by adult CG_{TD}. Hence, past data analyses are based on the differences between target or expected forms and the produced form with no consideration of the surrounding structural environment in which a form is produced. I consider this to be paramount because, as with Ger_{DS} (Schaner-Wolles 2004), participants could potentially restructure a syntactic environment to accommodate a produced form, and in the newly structured sentence the form may (or may not) be grammatical. Moreover, by simply categorising forms as correct or incorrect without exploring the cause of the "incorrectness" we could be missing valuable information with respect to the nature of the linguistic challenges and effects from factors external to morpho-syntax (e.g. phonetic/phonological, or other). In this study I consider both to be significant factors and include them in the data analysis by (a) conducting a detailed phonetic and phonological analysis of the collected data, and (b) categorising productions and reported

results based on (i) whether they match the targeted form, and (ii) in what way (phonetic or morpho-syntactic) they differed from the target/expected form.

The following chapters address the issues raised in this section. First, I show how CG is an appropriate choice for studying Tense, *S/V* agreement and Case in *DS* (*Chapter 3*) due to its rich overt inflectional marking. Second, I combine free and controlled elicitation for data collection, with extensive use of numerous diverse linguistic environments in the experimental tasks and stimuli (*Chapter 4*). Third, I consider CG_{DS} articulation problems and pursue an analysis based on both how productions deviate from the target form but also how they are used in a specific structure (*Chapter 5*). Fourth, I evaluate data based on whether they matched the targeted/expected form ***and*** the structural environment they surfaced in (*Chapter 6*). Finally, based on the results provided by the detailed phonetic, phonological and morpho-syntactic analysis, I propose a unified analysis (in progress), under which results from both phonological and morpho-syntactic analyses can be best accounted for (*Chapter 7*).

Chapter 3

Greek Morpho-Syntax

3.1 INTRODUCTION

Investigating Down Syndrome within a Greek dialect has an advantage over English in that Greek is inflectionally rich. As such, it provides a good testing ground for the Inflectional Impairment Hypothesis (*IIH*). In this chapter, I show how the study of CG_{DS} allows us to address the *empirical issues* identified above.

In *Chapter 2*, I identified a number of *shortcomings* in evaluating the Inflectional Impairment Hypothesis (*IIH*) on the basis of English. First, it was noted that English has restricted morphology and it is thus not an ideal language in which to investigate the inflectional system of *DS*. Second, the unanalyzable portmanteau morpheme *–s* encoding both Tense and *S/V* agreement prevents us from drawing conclusions on the nature of the impairment; it is not possible to tease apart effects of Tense vs. *S/V* agreement. Third, accurate use of irregular forms is reported for Eng_{DS}, while regular forms are argued to be impaired and the reason for this is not clear. Fourth, there is no overt inflectional marking for cases like Infinitives, all Person-Number combinations other than 3rd Person Singular for Present, or Singular Number for nouns. Fifth, the relation between Tense and Case, such that it has been argued that Nominative Case depends on the surfacing of Tense, has not been tested in *DS*. If Tense is truly impaired, this

could easily be observed through the assignment of Nominative Case. Sixth, overt inflection with infinitives creates doubt as to whether *DS* are really using infinitives, as argued in previous literature, a Present form (except 3rd Person), or a bare root.

In this chapter I show that the inflectional system of Cypriot Greek allows the investigation of each of these issues. This chapter is organised as follows: in *Section 3.2*, I outline the basics of Greek (Cypriot and Standard) verbal inflection.[29] This will serve to identify the syntactic constructions relevant for the present study. In *Section 3.3*, I discuss the form and distribution of nominal inflection (mostly Case). Again, this will serve to identify the syntactic constructions relevant to our purposes. In *Section 3.4*, I conclude.

3.2 VERBAL INFLECTION: TENSE AND *S/V* AGREEMENT

Cypriot Greek is a dialect of Standard Greek spoken on the island of Cyprus. While the Standard Greek dialect is the official dialect of both countries (Cyprus being a diglossic community), CG is for the most part not intelligible by speakers of Standard Greek. Moreover, there are significant differences which make CG a well-suited language to evaluate *IIH* and thus to determine the conditioning factors for the differences between the Grammar of CG_{DS} and CG_{TD} (and CG_{TDC}).

3.2.1 Verbal Inflection in (Cypriot) Greek[30]

A verb in Greek is composed according to the following template.

(3.1) MOOD + (TENSE-)ROOT-ASPECT-VOICE-TENSE-/.PERSON.NUMBER

[29] I use Greek to refer to both CG and SG. If a CG form deviates from SG, I make a note of the fact. If no reference is made, it either means that SG and CG are identical in that respect, or the difference is irrelevant for our purposes.
[30] See *Appendix A* for a comparison of the inflectional Systems of SG and CG.

Aside from the verbal root, we find the following derivational and inflectional affixes. **ASPECT:** Perfective vs. Imperfective. Aspect is either encoded in the root as in (3.2) or in an affix as in (3.3).

(3.2) Perfective root: *tro-* 'eat'
Imperfective root: *fa-* 'eat'

(3.3) Perfective Root-*s-* *or -is-*
Imperfective ∅

Aspectual features express the temporal properties of an eventuality (i.e. duration (atelic) or completion (telic) of an event). (3.4) provides examples of how Perfective and Imperfective Aspect are encoded in SG and CG. While with the verbal construction *kan-o* (SG) or *kamn-o* (CG) 'I do/make' the aspectual features are encoded in the root, with the verb *perpat-o* 'I walk' a suffix is added to mark Imperfective Aspect.

(3.4)	SG_{TD}	CG_{TD}	SG_{TD} and CG_{TD}		Aspect - Tense
	ká***n***-o	ká***mn***-o	perpat-ó	➡	*Impf - Pres*
	*do.**IMPF**-PRES.1.SG*	*do.**IMPF**-PRES.1.SG*	*walk.**IMPF**-PRES.1.SG*		
	'I am doing.'	'I am doing.'	'I am walking.'		
	é-ka***n***-a	é-ka***mn***-a	(e-)perpat-ús-a	➡	*Impf - Past*
	*PAST-do.**IMPF**-PAST.1.SG*	*PAST-do.**IMPF**-PAST.1.SG*	*(PAST-)walk.**IMPF**-PAST.1.SG*		
	'I was doing.'	'I was doing.'	'I was walking.'		
	é-ka***n***-a	é-ka***m***-a	(e-)perpát-***is***-a	➡	*Prf - Past*
	*PAST-do.**PRF**-PAST.1.SG*	*PAST-do.**PRF**-PAST.1.SG*	*(PAST-)walk-**PRF**-PAST.1.SG*		
	'I did.'	'I did.'	'I walked.'		

A **VOICE** (Active/Passive) suffix immediately follows the aspectual suffix (if available) or else the verbal root. Suffixes may differ depending on the Tense, Person, and Number combination

(Holton et al. 1997/2006). A Voice suffix always precedes the Tense and Person–Number suffix, as shown below:

(3.5)	Active	Passive		
(a)	ðiavaz-i	ðiavaz-e-te	➡	*Present*
	read.IMRF-PRES-3.SG	*read.IMRF-**PASS**.PRES-3.SG*		
	'They ate.'	'It was eaten.'		
(b)	ðiava-s-e	ðiava-st-*ik*-e	➡	*Past*
	read-PRF-PAST.3.SG	*read-PRF-**PASS**-PAST.3.SG*		
	'They ate.'	'It was eaten.'		

As observed in the examples in (3.5), on some cases the Passive feature is part of a portmanteau morpheme (3.5a), while on other occasions it surfaces as an independent morpheme (3.5b).

TENSE marking in the form of ([±PAST]), is either marked on the verb (immediately following Aspect marking) or else on the auxiliary.

(3.6)	SG_{TD}		CG_{TD}		
(a)	ę́-faγ-es		é-fa-es	➡	*Past*
	*PAST-eat.PRF-**PAST**.2.SG*		*PAST-eat.**PRF**-PAST.2.SG*		
	'You ate.'		'You ate.'		
(b)	éx-is	fá-***i***	----------	➡	*Present Perfect*
	*have.IMPF-**PRES**.2.SG*	*eat.PRF-DEP-3.SG*			
	'You have eaten.'				

While in (3.6a) *–es* marks Past, 2nd Person, Singular Number, (3.6b) shows that the inflectional features of both Tense and *S/V* agreement are marked on the auxiliary, instead of the main verb.

CG lacks both Present and Past Perfect. Past Tense is also expressed with an augment, the prefix *e-*, as shown in the verbs presented in (3.6). This prefix marks only Tense, i.e. Past.[31]

In casual speech in CG (as well as SG), the Past prefix can be dropped, either to prevent hiatus across word boundaries (the surfacing of two adjacent vowels as individual syllables), or at the beginning of an utterance for no evident phonological or morpho-syntactic reason. This is possible also in cases where *e-* is morphologically obligatory, but the phonological environment (i.e. hiatus resolution) triggers its deletion, for both CG and SG.

(3.8)	(a)	ti	ná	∅-γraf-e(n)	otan	ton	ið-a-me?	*SG/CG*
		what	*SUBJ*	*write-IMPF-PAST.3.SG*	*when*	*3.SG.ACC*	*see-PRF-PAST-2.SG*	
		'What could he be writing when we saw him?'						
	(b)	*(e-)/é-γrap-s-es			s-to		ðiaγonism-a?	*SG*
		***PAST**-write-PRF-PAST.2.SG*			*at-DET.NEU.ACC.SG*		*test-NEU.ACC.SG*	
		'Did you do well at the test?'						
	(c)	(é-)γrap-s-es			s-to		ðiaγonism-a?	*CG*
		*(**PAST**-)write-PRF-PAST.2.SG*			*at-DET.NEU.ACC.SG*		*test-NEU.ACC.SG*	
		'Did you do well at the test?'						

In the examples above, (3.8a) shows hiatus resolution. That is, the Past prefix does not surface due to the existence of a preceding syllable ending in a vowel. The same structure is used in both SG, and CG. In (3.8b), we see that if we attempt to omit the Past prefix in SG, the result is ungrammatical, while in CG (3.8c), the result is grammatical. This difference between the two dialects is particularly important because, in such cases, CG speakers are producing an

[31] In both CG and SG there is a small number of verbs starting with a vowel which receive a vocalic augment. This means that the initial vowel changes to i- (η-) to mark Past Tense:

(3.7) *elpiz-o* 'I hope' → ***i**-lpiz-a* 'I hoped'

acceptable form based on the CG dialect, but not based on SG. This is frequently observed in dialects across different languages. Therefore, there needs to be a distinction between optional and obligatory *e-* affixation, to avoid incorrectly labelling a Past production as ungrammatical. As explained above, in some of the experimental data *e-* is optional, while in other cases it is obligatory. A record of these differences was kept. The purpose of this distinction was to test a potential difference between the two. In most cases, the optionality or obligatoriness of the augment on a verb, apart from the phonological environment, is also dependent on the structural environment in which it occurs. While in isolation, a Past prefix may be considered necessary, in a certain phonological context (i.e. following another vowel, to avoid hiatus), its production can be considered redundant.

It should be mentioned that CG does not have the Future marker ***θa*** found in SG.[32] Instead, to express future-oriented events, CG uses the construction [*en* + *Subjunctive na*+ *verb*]. This construction is not available in SG. Hence, [*θa* + verb] and [*en* + *na* + verb] are in complementary distribution across the two dialects. Like,***θa***, [*en* + *Subjunctive na*+ *verb*] may express certainty that an event will occur, or describe an intention or prediction. There is currently only one analysis on [*en* + *na* + *verb*]. Terzi (1997) considers this construction to be one word, *enna,* as a compound resulting from the verb *thel-i* 's/he wants' + *na* (Subjunctive marker). However, I question this analysis. I give a number of counter examples below showing that [*en* + *na* + *verb*] expresses something more than a desire. It may be used to talk about a forthcoming event, or to describe an intention of doing something or being in a state in the immediate or far Future, without expressing a meaning related to the verb *θel-o* 'I want' expressing volition. Based on the use of [*en* + *na* + *verb*], I find it to be parallel to the English

[32] ***θa*** is often used by CG speakers (though not as frequently as *en na*), but it is believed to be a borrowing from SG.

[*be going to + verb*]. The structure in (3.9) expresses a forthcoming event and the 'desire factor' is not found in structures like:

(3.9) *En* *na* *vrek-s-i.*[33]
be-IMPF-PRES.3.SG/PL *SUBJ* *rain-PRF-DEP.3.SG*
'It is going to rain.'

The covert subject *pro* 'it' does not have an animate reference, nor does the structure describe an action; it is just a mere prediction of a future state/event. The use of 'want' in this would give you not only a different meaning but it will turn this from one clause to two clauses. Also if we consider *enna* as Terzi (1997) suggests, we should be getting a structure with an obligatory control verb ('want', in all Person-Number combinations) in the main clause, and the verb in the Subjunctive clause must agree in Tense, but not necessarily *S/V* agreement. However, this is not the case. We only get one form, *en* corresponding to the 3rd Person of the Present copula, and find no restrictions with regards to the Tense and *S/V* agreement inflection on the accompanying verb.

Another counterexample to the Terzi (1997) analysis is:

(3.10) *En* *na* pek-s-i ...
be-IMPF-PRES.3.SG/PL *SUBJ* *play-PRF-DEP.3.SG*

... o Panaθinaik-os popse?
DET.MASC.NOM.SG *Panathinaikos-MASC.NOM.SG* *tonight*
'Is Panathnaikos going to play (football) tonight?'

The question is inquiring as to whether an event will occur, not whether someone (the subject of the verb is *Panathnaikos* (the team's name) or the speaker) desires the event to occur.

[33] There are countless counter examples involving inanimate nominal phrases, where actions and states are described and it cannot be argued that the *en na* construction expresses the speakers' volition or desire.

Third, the strongest evidence suggesting that *en* is an auxiliary is that it inflects for Tense. In particular, apart from *e(n)*, which I argue is the Present-3rd Person form of the copula, we also find that *ita(n)*, the Past Tense equivalent for 3rd Person is also used with a Subjunctive clause. If en signified a reduction of the verb *θeli* 'want' we would expect that in the following example we would either have a for which resembled the Past Tense of *θeli* 'want' or another form with phonological content but no relation to another existing form marked with Past. Instead, what we find is the Past Tense form of the 3rd Person Singular/Plural of the copula. Note that unlike the SG auxiliary *exo* 'have' the agreement features are marked on the main verb, not the auxiliary.

(3.11) Itan na (e)rt-o, alla telika allak-s-a γnom-i.
be-IMPF-PAST.3.SG/PLSUBJ come-PRF-DEP.1.SG but finally change-PRF-PAST.1.SG opinion-FEM.ACC.SG
'I was planning to come but I finally changed my mind.'

In (3.11), while *I was intending to come*, but this intention was never realised. Instances as in (3.11) express a type of a counter-factual, where the subject of the sentence was intending or had planned to do something and the action or event was never realised due to an interruption. This is parallel to the SG counter factual (Christodoulou and Wiltschko 2010), where the Past inflectional marking has no Past force.

Therefore, I propose that the *en* is a "dummy" auxiliary just like English *do* in question or negation formation. The CG auxiliary has the exact same form as the Copula form used for 3rd Person Singular and Plural for Present and Past.[34] Defining the status of [*en/itan* + *na*+ *verb*] is crucial for our purposes because a separate analysis needs to be pursed for auxiliaries. Unlike the copula, where Person and Number agreement is found, the auxiliary only has two forms,

[34] The auxiliary *e(n)* is, at times, either entirely omitted or reduced to /n/, through germination of the initial /n/ found in the Subjunctive marker *na*. This is particularly common is rapid/colloquial speech. Depending on the environment, neither of the two aforementioned occurrences results to ungrammaticality. This is only possible with the Present auxiliary and it is usually a result of hiatus resolution.

corresponding to the copulas 3rd Person agreement forms for Present and Past. Thus, auxiliary verbs are categorised separately from copulas and full verbs.

Lack of Tense can also be expressed morphologically as an inflectional suffix on a verb. Dependent in Greek is argued to express absence of semantic Tense (Varlokosta 1994).[35] The use of the Dependent inflection on a verb is always accompanied by either the Subjunctive marker *na*, the Future marker *θa*, or auxiliary *exo* 'I have'. Examples are given in (3.19) below.

Following Tense, we find an **AGREEMENT** suffix, which fuses **PERSON** (1st, 2nd and 3rd) and **NUMBER** (Singular/Plural). An example for each combination is given in (3.12).

(3.12)	1st Person	2nd Person	3rd Person
(a)	ðiavaz-o	ðiavaz-is	ðiavaz-i
	*read.IMRF-PRES.**1.SG***	*read.IMRF-PRES.**2.SG***	*read.IMRF-PRES.**3.SG***
	'I read.'	'You read.'	'S/he reads.'
(b)	ðiavaz-u-me	ðiavaz-e-te	ðiavaz-un
	*read.IMRF-PRES-**1.PL***	*read.IMRF-PRES-**2.PL***	*read.IMRF-PRES.**3.PL***
	'We read.'	'You read.'	'They read.'

In all examples in (3.12), the final suffix inflected on the verbal root encodes both Person and Number, i.e. *–o* for 1st Person Singular, or *–te* for 2nd Person Plural. Notice that for 1st and 2nd Person Plural there is a distinct inflectional suffix for Tense (Spyropoulos 1999), i.e. the features of Tense and *S/V* agreement do not surface fused in a portmanteau morpheme. In (3.13a), the suffix *–e* on the verb shows that the subject is 3rd Person Singular by agreeing in Person and Number with the *o Petr-os*. What is more, in (3.12b), the suffix *–me* marks 1st Person Plural.

[35] The Dependent has also been frequently called the Perfective Non-Past (Giannakidou 2009, among others).

(3.12) Subject Person and Number Features Agree with Features Inflected on Verb

(a) [DP[O Petr-os] **e**-faγ-*e*].
DET.MASC.NOM.SG *Petros-MASC.NOM.SG* *PAST-eat.PRF-PAST.3.SG*
'Petros ate.'

(b) [DP[O Petr-os ke eγo] faγ-***a***-*me*].
DET.MASC.NOM.SG *Petros.MASC.NOM.SG* *and* *1.SG.NOM* *eat.PRF-PAST.1.PL*
'Petros and I ate.'

Finally, CG verbs inflect for **MOOD**: Indicative, Subjunctive, or Imperative.[36] The formal realisation of each of these Moods is as follows. The Indicative is the unmarked form (Holton et al. 1997/2006). Consider the example in (3.14): the Indicative verb *pez-un* 'they are playing' bears no distinctive morphology marking for Indicative.

(3.14) Indicative

O γiorγ-os ke i Len-a ...
DET.MASC.NOM.SG *Giorgos-MASC.NOM.SG* *and* *DET.FEM.NOM.SG* *Lena-FEM.NOM.SG*

... ***pez-un*** s-ton kip-o.
play.IMPF-PRES.3.PL *in-DET.MASC.ACC.SG* *garden-MASC.ACC.SG*

'Giorgos and Lena are playing in the garden.'

The Subjunctive in the embedded clause is encoded by means of the Subjunctive marker *na* and a verb, which may in principle occur in any Tense. However, Tense restrictions are sometimes imposed by the verb in the main clause, as shown in *Section 3.2.2.2* below.

(3.15) Subjunctive

O γiorγ-os ke i Len-a ...
DET.MASC.NOM.SG *Giorgos-MASC.NOM.SG* *and* *DET.FEM.NOM-SG* *Lena-FEM.NOM.SG*

... θel-un ***na*** ***pek-s-un*** s-ton kip-o.
want.IMPF-PRES.3.PL *SUBJ* *play-PRF-DEP.3.PL* *in-DET.MASC.ACC.SG* *garden-MASC.ACC.SG*

'Giorgos and Lena want to play in the garden.'

[36] There is a forth value for Mood, namely Optative, which is rarely used and not examined in this Thesis.

Finally, the Imperative Mood surfaces as verbal inflection. An example is given in (3.16) below, where the verb is inflected for 2nd Person Plural Imperative (*-(e)te*):

(3.16) Imperative

(γiorγ-o	ke	Len-a)	***pek-s-(e)te*** ...
Giorgos-MASC.VOC.SG	*and*	*Lena-FEM.NOM.SG*	*play-PRF-IMP.2.PL*
... s-ton	kip-o.		
in-DET.MASC.ACC.SG	*garden-MASC.ACC.SG*		

'Giorgos and Lena, play in the garden.'

The last type of verbal inflectional marking in Greek is the Gerund. The Gerund suffix carries neither Tense nor *S/V* agreement. It should be noted that CG_{TD} speakers rarely use Gerunds.

(3.17) Gerund

E-fta-s-e	s-to	nis-i	kolimb-ondas.
PAST-arrive.PRF-PRES.3.SG	*on -DET.MASC-SG-ACC*	*street-MASC-SG-ACC*	*swim-GER*

'S/he swam to the island. (Lit. S/he arrived on the island by swimming)'

Greek has eighty-six combinations of verbal inflection for each Voice (86 x 2 = 172). There are two conjugations which suffixes fall under: 1st Conjugation paroxytone verbs (stressed on the penultimate syllable) and 2nd Conjugation oxytone verbs (stressed on the final syllable). The 2nd Conjugation is divided into Type A and Type B, and suffixes for each type are different (Holton et al. 1997/2006). Moreover, the copula has a distinct inflectional paradigm. Inflectional paradigms are given in *Appendix A*. This diversity of morpho-syntactic marking shows how the domains on Tense and *S/V* agreement can be studied in a wide variety of inflectional suffixes, with a large number of combinations, to examine whether a particular feature or a particular combination of features poses a problem for CG_{DS}. This chapter shows the richness of inflectional environments that are used to form the experimental stimuli, for the purposes of data collection in this study.

In this section, I showed how selecting CG to study *DS* addresses the first four issues summarised in the *Section 3.1*:

(i) richer inflectional morphology
(ii) separate morphemes for Tense and *S/V* agreement
(iii) obligatory inflectional marking for all verbs
(iv) lack of irregular forms.

Greek has rich inflectional morphology through which the domains of Tense and *S/V* agreement can be studied. Moreover, Tense, and *S/V* agreement can be found in a fused morpheme or surface as separate morphemes (see also the discussion in *3.2.2.1*). There is also obligatory inflectional marking for all verbs in Greek. Finally, we do not find a regular versus irregular inflectional distinction. Therefore, the contradicting results found on problematic use of regular and irregular Past inflection in previous studies, are eliminated with the use of CG. Addressing these issues helped distinguish whether a non-standard use of a targeted form was phonetically, phonologically, morphologically, or syntactically conditioned, since all feature combinations examined resulted to the use of a large number of phonological representations. Therefore, I was able to distinguish whether something was consistently used incorrectly, in terms of the inflectional features marked, or in terms of the sounds used to represent it.

3.2.2 Isolating Tense and *S/V* Agreement

Unlike in English, Tense and *S/V* agreement can be isolated in Greek, despite the fact that Greek morphology is mostly fusional. Hence, Tense can inflect on a verb without *S/V* agreement, while in other environments *S/V* agreement is used without Tense. I discuss each of these in turn.

3.2.2.1 Tense without S/V Agreement

This section shows how studying CG_{DS} addresses the issues resulting from the study of Eng_{DS} concerning poor morphological marking, the relation between Tense and Case and overt inflection with Infinitives. In Greek, we find a considerable number of environments where Tense fuses with Person and Number features as in (3.17a), but also environments where they surface as separate suffixes (Spyropoulos 1999), as in (3.17b):

(3.17)	*CG*	*SG*		
(a)	é-fa-es *PAST-eat.PRF-PAST.2.SG* 'You ate.'	é-faγ-es *PAST-eat.PRF-PAST.2.SG* 'You ate.'	➡	*Tense fused with S/V agr*
(b)	é-fa-***a***-me *PAST-eat.PRF-PAST-1.PL* 'We ate.'	fáγ-***a***-me *eat.PRF-PAST-1.PL* 'We ate.'	➡	*Tense separated from S/V Agr*

While in (3.17a) -*es* marks Past ***and*** 2nd Person ***and*** Singular Number, in (3.17b), Tense surfaces as a *separate* morpheme, where -*a*- marks ***only*** Past, and -*me* marks 1st Person and Plural Number. In such cases we can evaluate whether the *IIH* could be reduced to an impairment of Tense alone or to an impairment of *S/V* agreement alone. If only Tense but not *S/V* agreement is affected in CG_{DS}, we would expect the Past markers (prefix *e*- and suffix -*a*-) in (3.17b) to be optional, when the phonological and structural environment requires their use. If on the other hand, *S/V* agreement but not Tense is affected in CG_{DS}, we would expect the Past marker to be used just like in CG_{TD}, but instead *S/V* agreement would only be realised optionally.

3.2.2.2 S/V Agreement without Tense

Greek, unlike English, has Tenseless constructions where the verb still agrees with the subject: Imperatives and clauses where the verb is inflected with Dependent (e.g. Subjunctive). As in

English, Imperatives in Greek are Tenseless. Unlike in English however, Imperative verbs inflect for Person and Number. This is illustrated in (3.18) below:

(3.18) Imperative → Agreement, no Tense

ðiavaz-e	ðiava-s-e
read-IMPF-IMP-2SG	*eat-PFR-IMP-2SG*
'Keep reading.'	'Read.'

The second type of agreeing, yet Tenseless, construction is found in the context of the Future modal *θa* (3.19b), the Subjunctive particle *na*, (319c) the Optative *as* (3.19d), and the Subjunctive Negative marker *mi(n)* 'not or don't', as seen in (3.19f) and (3.19g). Subjunctive clauses can be found as complements of volition, modal, aspectual, causative, perceptual and experiencer verbs (Malagardi 1994, Roussou 1999, Roussou 2009 *inter alia*). It has been argued in the past that *na* is a modal or an Inflectional marker which either surfaces under Mood (Alexiadou 1994) or INFL (Malagardi 1994). In particular, if the *IIH* is morphologically conditioned, then *na* should be used accurately; if it is syntactically conditioned, then *na* should be problematic or absent, because it is associated with the functional head INFL. A final construction that disallows Past marking is the Perfect Tenses constructed with the auxiliary *ex-o* 'I have': (3.19h), (3.19i) and (3.19j). In (3.19), I give examples with possible Tense, Mood, and Aspect combinations with the verb *aγap-o* 'I love':

(3.19) *Imperfective* *Perfective*

(a) Indicative- Present

(eγo)	aγap-o	➡	(eγo)	*aγap-is-o
(1.SG.NOM)	*love.IMPF-PRES.1.SG*		*(1.SG.NOM)*	*love.PRF-DEP.1.SG*
'I love.'				

(b) Indicative – Future

(eγo)	*θa*	aγap-o	➡	(eγo)	*θa*	aγap-is-o
(1.SG.NOM)	*FUT*	*love.IMPF-PRES.1.SG*		*(1.SG.NOM)*	*FUT*	*love.PRF-DEP.1.SG*
'I will love.'				'I will love.'		

(c) Subjunctive

... (eγo)	na	aγap-o	➡	... (eγo)	na	aγap-is-o
(1.SG.NOM)	*SUBJ*	*love.IMPF-PRES.1.SG*		*(1.SG.NOM)*	*SUBJ*	*love.PRF-DEP.1.SG*
'... for me to love'				'... for me to love'		

(d) Optative

(eγo)	as	aγap-o	➡	(eγo)	as	aγap-is-o
(1.SG.NOM)	*OPT*	*love.IMPF-PRES.1.SG*		*(1.SG.NOM)*	*OPT*	*love.PRF-DEP.1.SG*
'I might as well/ let me love.'				'I might as well/ let me love.'		

(e) Indicative – Negation

(eγo)	ðen	aγap-o	➡	(eγo)	*ðe(n)	aγap-is-o
(1.SG.NOM)	*NEG*	*love.IMPF-PRES.1.SG*		*(1.SG.NOM)*	*NEG*	*love.PRF-DEP.1.SG*
'I do not love.'						

(f) Subjunctive – Negation

...(eγo)	na	min	aγap-o	➡	... (eγo)	na	min	aγap-is-o
(1.SG.NOM)	*SUBJ*	*NEG*	*love.IMPF-PRES.1.SG*		*(1.SG.NOM)*	*SUBJ*	*NEG*	*love.PRF-DEP.1.SG*
'...not to love.'					'...not to love.'			

(g) Present Perfect[37]

ex-o	*aγap-a(i)	➡	ex-o	aγap-is-i
have.IMPF-PRES.1.SG	*love.IMPF-PRES.3.SG*		*have.IMPF-PRES.1.SG*	*love.PRF-DEP.3.SG*
			'I have loved.'	

[37] For the formation of Perfect Tenses the main verb for all Person–Number combinations receives the same form which is the 3rd Person Singular of the Dependent Perfective, and the auxiliary *ex-o* 'I have' is inflected for Tense, Person and Number accordingly.

(h) Past Perfect

ix-a *aγap-a(i) ➡ ixa aγap-is-i

have.IMPF-PAST.1.SG *love*.IMPF-PRES.3.SG *have*.IMPF-PAST.1.SG *love*.PRF-DEP.3.SG

'I had loved.'

(i) Present Perfect– Negation

ðen ex-o *aγap-a(i) ➡ *min/ðen ex-o aγap-is-i

NEG *have*.IMPF-PRES.1.SG *love*.IMPF-PRES.3.SG NEG *have*.IMPF-PRES.1.SG *love*.PRF-DEP.3.SG

'I have not loved.'

(j) Past Perfect – Negation

ðen ix-a *aγap-a(i) ➡ *min/ðen ixa aγap-is-i

NEG *have*.IMPF-PAST.1.SG *love*.IMPF-PRES.3.SG NEG *have*.IMPF-PAST.1.SG *love*.PRF-DEP.3.SG

'I had not loved.'

From the examples above we observe that Dependent inflectional marking can only surface in the presence of an inflectional or Mood particle, whereas that is not the case for Indicative, which can surface both independently and combined with an inflectional or Mood particle. In the Perfect, the auxiliary can combine with the Dependent and the negative particle ðe(n), while *mi(n)* can only be used with the Subjunctive and Optative Moods.

	ASPECT		TENSE				NEGATION	
	IMPF	PRF	PRES	DEP	PAST	*S/V* Agr	ðe(n)	mi(n)
Indicative	✓	✓	✓	×	✓	✓	✓	×
Subjunctive	✓	✓	✓	✓	✓	✓	×	✓
Imperative	✓	✓	×	×	×	✓	×	×
Optative	✓	✓	✓	✓	✓	✓	×	✓
Auxiliary 'exo'	×	✓	✓	✓	×	✓	✓	×

TABLE 3.1: SUMMARY OF MOOD, TENSE, *S/V* AGREEMENT ENVIRONMENTS

The so-called agreeing infinitives, otherwise known as Subjunctive, introduced in *Section 3.2.1*[38], have a use that corresponds to English infinitives. We find two types of Subjunctive

[38] They have been named as such because, despite the fact that they do not carry Tense as the English infinitives, the verb is inflected with an *S/V* agreement suffix to mark the Person and Number features of the subject (Alexiadou & Anagnostopoulou, 2002).

constructions in Greek: optional and obligatory control, where control is imposed by the verb in the main clause of a sentence. A verb in an *Optional Control* Subjunctive (3.20) can be fully inflected for Tense and *S/V* agreement and may or may not agree with the equivalent features of the verb in the matrix clause. *Obligatory Control* verbs (3.21) on the other hand, prohibit that the verb in Subjunctive is inflected for Tense, but can still carry *S/V* agreement.

(3.20) Optional Control Subjunctives

(a) Elpiz-o na kam-i kal-in ...
hope.IMPF-PRES.1.SG SUBJ do. PRF-DEP.3.SG good-FEM.ACC.SG

... entipos-in o Petr-os.
impression FEM.ACC.SG DET.MASC.NOM.SG Petros-MASC.NOM.SG
'I hope Petros makes a good impression.'

(b) i ðor-a θa i-θel-e na ...
DET.FEM.NOM.SG Dora-FEM.NOM.SG FUT PAST-want.IMPF-PAST.3.SG SUBJ
... piγen-a-me se mia ðialeks-i.
go.IMPF-PAST-1.PL at one-FEM.ACC.SG lecture-FEM.ACC.SG
'Dora would (have) like us to go/ to have gone to a lecture.'

(3.21) Obligatory Control Subjunctive

i Efklið-i apofasi-s-***e(n)*** ...
DET.FEM.NOM.SG Efklides-GEN.SG decide-PRF-PAST.3.SG

... ***na*** γrap-s-***i*** k(e) all-o vivli-o.
SUBJ write-PRF-DEP.3.SG and other-.NEU.ACC.SG book-NEU.ACC.SG
'Efklides decided to write (yet) another book'.

Thus, in (3.20a) the verb *kam-i* is marked for *S/V* agreement but no Tense and its feature values do not agree with those inflected on the verb in the main clause. (3.20b) shows that the verb of the matrix clause could be inflected with Past Tense inflection. However, as Christodoulou and

Wiltschko (2010) discuss, the Past in such cases has a counter-factual force. Though the verb in the Subjunctive clause in (3.20b) is inflected with Past, it can also be inflected with Dependent (*pa-me*). Also, *S/V* agreement or Tense features can be the same or different than those inflected on the main verb. In (3.21) however, the verb in the Subjunctive clause is inflected with Dependent, i.e. the suffix ***–i*** (in γrap-s-***i***) is not inflected for Tense but it is inflected for Person and Number to agree with the subject ***i Efkliði***. The use of Present (or Past) suffix in this structure is ungrammatical. Moreover, we see that despite the fact that the verb is not inflected for Tense (i.e. Present or Past), Nominative Case is still assigned to the subject. All Subjunctive clauses above can also be found in a single, main clause without the main-subordinate dependency (i.e. no main clause is present).[39] These do not allow for Past-Tense marking on the verb. This is important because it cannot be argued that Nominative Case is assigned by the verb of the main clause.

(3.22)	***Na***	***p-a(i)s***	spit-i	su.
	SUBJ	*go-PRF-DEP.2.SG*	*home-NEU.ACC.SG*	*2.GEN.SG*

'Go home/ you should go home.'

In this section I showed how choosing CG to study *DS* addresses some of the empirical issues raised in *Section 2.6.1*, and help determine whether the differences observed between adult CG_{DS}, CG_{TDC}, and CG_{TD} are phonetically and phonologically, syntactically or morphologically conditioned. More specifically, Tense and *S/V* agreement in Greek do sometimes surface as a portmanteau morpheme, but can also be found with two separate suffixes. Moreover, there are cases like the Imperative and the Subjunctive where *S/V* agreement can be used with or without Tense inflection on the verb. I then showed how in CG Tense and Case are not as closely

[39] Such cases are sometimes referred to as embedded Imperatives, i.e. while their Mood is associated with Imperative (Roussou 2009), the structure is Subjunctive. What they express in reality is the 'less than a forceful command' use of the Subjunctive (Holton 1997/2006).

connected as in English, such that Case can be assigned by a verb, marked with Dependent. Finally, I showed that in the case of Imperatives and obligatory control Subjunctives (sometimes equivalent to the English Infinitive), the verb is inflected with *S/V* agreement (i.e. there is no bare form marking with the 'infinitive-like' interpretation). Since Tense and *S/V* agreement can be separated, I was able to determine whether Tense was affected independently of *S/V* agreement and vice versa. Further, if the differences between the two groups are syntactically conditioned, we then should expect the CG_{DS} participants' performance to be better with Tenseless inflectional marking (i.e., Dependent and tenseless constructions), a phenomenon not attested in the results of this study. Whereas, if differences between the two groups are morphologically conditioned, we should not expect problems with Tense to affect either Tense or *S/V* agreement, and this is in fact what I find. Below, I summarise the environments discussed in this section for Greek and comparable environments for English, where we find Tense and *S/V* agreement:

		English		Greek	
		Tense	*S/V* Agr	Tense	*S/V* Agr
PRESENT	Fused	✓	✓	✓	✓
	Separate	--	--	✓	✓
PAST	Fused	✓	×	✓	✓
	Separate	--	--	✓	✓
Infinitive		×	×	--	--
Imperative		×	×	×	✓
Optional Control Subjunctive		--	--	✓	✓
Obligatory Control Subjunctive		--	--	×	✓
Gerund		×	×	×	×

TABLE 3.2: GREEK VS. ENGLISH VERBAL INFLECTION

(Legend: -- = Non-applicable, × = not possible, and ✓ = possible)

Table 3.2 shows that there are only a few similarities between Greek and English inflection. Additionally, we observed that with Greek obligatory control Subjunctives inflected with Dependent as well as Imperatives, we find agreement inflection despite the absence of Tense inflection. Moreover, with verbal inflection in Greek, contrary to English, there are

environments were Tense and *S/V* agreement can be found fused or separated, surfacing with two independent suffixes. Studying these environments helps determine that a potential discrepancy with Tense inflection is syntactically (i.e. only Present and Past is problematic) or morphologically (i.e. some issues with all inflectional marking, even the Tenseless ones) conditioned. Finally, the use of the Subjunctive marker *na*, an inflectional marker, helps determine if differences are morphologically or syntactically conditioned; a consistent absence of the Subjunctive *na* would suggest that the differences are syntactically conditioned, because it would imply problems with the INFL/T head.

3.3 NOMINAL INFLECTION: CASE AND AGREEMENT

Within a nominal phrase, the noun is inflected, along with the preceding determiners, quantifiers, numerals and adjectives. Moreover, all types of pronouns (personal, demonstrative, clitic, relative, interrogative, indefinite and reflexive) are inflected. I first identify the features participating in nominal inflection (*Section 3.3.1*). Second, I identify the distribution of nominal inflection (*Section 3.3.2*). This section addresses two issues for nominal inflection resulting from the evaluation of *IIH*, which is based on English:

(i) poor nominal morphology
(ii) relation between Tense and Nominative Case.

3.3.1 The Features of Nominal Inflection in (Cypriot) Greek

There is only one inflectional suffix on the noun, namely a portmanteau morpheme, which encodes: Gender (Masculine, Feminine, Neuter), Number (Singular, Plural), Case (Nominative, Accusative, Genitive, Vocative) and Person (1st, 2nd, 3rd) for pronouns.

There are three main inflectional classes which then sub-divide based on Gender, the suffix they receive, and stress patterns. According to (Holton et al. 1997/2006), there are at least twenty-one inflectional paradigms of nominal inflection in total, when considering stress patterns as well. Ralli (1998) and Ralli (2000) has a more concise categorization. Focusing on only the suffixes and disregarding the stress patterns, she suggests eight inflectional paradigms for nominal inflection. According to Thomadaki (1994), there are nine inflectional classes for nouns. [40]

While GENDER (Masculine, Feminine, Neuter) is inherent to nouns, it can be seen on the basis of the inflectional suffix. All other categories receiving nominal inflection are inflected for as a matter of agreement. That is, an adjective is marked with Neuter if the noun it modifies is Neuter:

(3.23)	γlik-***a***	frut-***a***	γlik-***os***	pirasm-***os***
	sweet-NEU.PL.NOM	*fruit*-NEU.PL.NOM	*sweet*.NEU.PL.NOM	*temptation*-NEU.PL.NOM
	'Sweet fruit'		'Sweet temptation'	

NUMBER (Singular/Plural) marking is also fused in the inflectional suffix for all nominals. The final feature found on a nominal suffix is CASE (Nominative, Accusative, Genitive, Vocative). Greek nominal expressions exhibit syncretism. There is either a two-, three- or four-way distinction for each Gender-Case-Number combination, i.e. there are up to four different suffixes for the four different Cases in Singular and Plural. However, only certain Masculine and Feminine paradigms exhibit a four-way distinction. The diversity of suffixes provides rich overt inflectional paradigms. As such we can test if a specific Case value is affected, as with the assignment of Nominative Case in the absence of Tense. This avoids the issues we find in English, which lacks Case morphology, excluding pronouns.

[40] An example on each categorised nominal paradigm is given in the *Appendix A*.

3.3.1.1 Nouns

Nominal inflection varies across different nominal types. Below, I give the inflectional paradigm of the determiner (definite (DEF) and indefinite (IND)) in *Table 3.3*, and a two-, three- and four-way distinction for Masculine, Feminine and Neuter nouns in *Table 3.4*. Three-way distinctions are usually observed with Masculine Plural.

Definite Determiner							
		Masculine		Feminine		Neuter	
		DEF	IND	DEF	IND	DEF	IND
Singular	NOM	o	enas	i	mia	to	ena
	ACC	to(n)	ena(n)	ti(n)	mia(n)	to	ena
	GEN	tu	enos	tis	mias	tu	enos
Plural	NOM	i	--	i	--	ta	--
	ACC	tus	--	tes/tis	--	ta	--
	GEN	ton	--	ton	--	to(n)	--

TABLE 3.3: DEFINITE DETERMINER – INFLECTIONAL PARADIGM

	3-way(SG) & 4-way (PL)				*2-way (SG & PL)*	
	Masculine		Feminine		Neuter	
	Singular	Plural	Singular	Plural	Singular	Plural
NOM	ðáskal–***os***	ðáskal–***i***	ðaskál–***a***	ðaskál–***es***	vivlí–***o***	vivlí–***a***
ACC	ðáskal–***o(n)***	ðaskál–***us***	ðaskál–***a(n)***	ðaskál–***es***	vivlí–***o***	vivlí–***a***
GEN	ðaskál–***u***	ðaskál–***o(n)***	ðaskál–***as***	ðaskál–***o(n)***	vivlí–***u***	vivlí–***on***
VOC	ðáskal–***e***	ðáskal–***i***	ðaskál–***a***	ðaskál–***es***	vivlí–***o***	vivlí–***a***

TABLE 3.4: NOUNS – INFLECTIONAL PARADIGM

For demonstratives, relative, interrogative, reflexive and indefinite pronouns, the universal quantifier and ordinal numerals the same inflectional paradigms as with nouns are used. Pronouns and adjectives have separate inflectional paradigms. I discuss those immediately below.

3.3.1.2 Pronouns and Adjectives

Adjectival inflection, numerals, clitics, 1st and 2nd and 3rd Person pronouns (also serving as demonstratives), and cardinal numerals have individual declinations (distinct from the ones seen

for nouns above), which in turn do not resemble each other's declinations. The diversity of these inflectional paradigms adds to the variety and richness of inflectional paradigms that can be studied in (Cypriot) Greek. In *Table 3.5*, I list the inflectional paradigm for the personal pronoun.

	Case	*1st Person*	*2nd Person*	*3rd Person*		
				MASC	FEM	NEU
Singular	NOM	eγo	esi	aft-os	aft-i	aft-o
	ACC	emena	esena	aft-o(n)	afti(n)	aft-o
	GEN	emena	esena	aft-u	aft-is	aft-u
Plural	NOM	emis	esis	aft-i	aft-es	aft-a
	ACC	emas	esas	aft-us	aft-es	aft-a
	GEN	emas	esas	aft-on	aft-on	aft-on

TABLE 3.5: PERSONAL PRONOUNS (EMPHATIC FORMS) – INFLECTIONAL PARADIGM

Notice that while the 3rd Person Singular pronouns have a root and an inflectional suffix, the 1st and 2nd Person pronouns do not. The pronoun form changes depending on Person, Number and Case. *Table 3.6* presents the inflectional paradigm for weak pronouns, commonly known as clitics.

	1st Person		*2nd Person*		*3rd Person*					
					SG			PL		
	SG	PL	SG	PL	MASC	FEM	NEU	MASC	FEM	NEU
NOM	--	--	--	--	tos	ti	to	ti	tes	ta
ACC	me	mas	se	sas	ton	ti(n)	to	tus	tes/tis	ta
GEN	me	mas	se	sas	tu	tis	tu	tus	tus	tus

TABLE 3.6: PERSONAL PRONOUNS (CLITIC FORMS) – INFLECTIONAL PARADIGM

Notice that the clitic forms for 3rd Person are comparable to the full forms of the Personal pronouns. The inflectional paradigms for full and weak pronouns in Greek add to the diversity of inflectional environments where Case can be studied. In addition, the effects of a hypothesised Tense impairment on Case inflectional marking can also be tested through inflectional marking on pronouns. Case has been extensively studied neither in Eng_{DS} nor in atypical populations in general. No arguments on Case are made by the *IIH* perhaps, because overt Case inflection is limited to pronouns in English. However, according to the *IIH*, we should expect Case to be

problematic, due to difficulties with Tense. Such a result would verify syntactically conditioned differences between CG_{DS} and CG_{TDC}, an expectation not supported by the results of this study.

Adjectives have separate inflectional paradigms (Holton et al. 1997/2006) from those presented so far on nouns and pronouns. Even though some adjectival suffixes parallel those of the nominal inflectional system, others have a different phonological representation from the inflectional paradigms found for nouns. Therefore, despite the fact that all inflectional features marked on an adjective must agree with a determiner and a noun in a DP, the phonetic exponent (i.e. surfacing morpho-phonological representation) of an adjective may differ from that of a noun.

(3.24) Mia eksipn-***i*** ðaskal ***-a***.
one.FEM.NOM.SG *smart-FEM.NOM.SG* *teacher-FEM.NOM.SG*
'A smart teacher'

(3.25) O siniθ-***is*** ipopt ***-os***.
DET.MASC.NOM.SG *usual-MASC.NOM.SG* *suspect-MASC.NOM.SG*
'The usual suspect.'

Full inflectional paradigms for all Genders, for adjectives and nouns are given in *Appendix A*. In sum, the inflectional environments presented in this section offer a great variety with which the three hypotheses are evaluated.

3.3.2 Distribution of Nominal Inflection

As illustrated above, in Greek all nominals in a nominal phrase must agree in Gender, Number and Case. In this section I discuss two environments where nominal inflectional features are found.

3.3.2.1 Nominal Inflection within a DP

Nominal inflection (Gender, Number and Case) is found on all nominals whether in a subject, object, or adjunct phrase. Moreover, within a DP all constituents must agree in Gender, Number, and Case. An example is given below:

(3.26) DP[o aγapimen-*os* piit-*is* mu] ...
DET.FEM.NOM.SG *favoutite-MASC.NOM.SG* *poet-MASC.NOM.SG* *1.GEN.SG*

... ine o Elit-is.
be.IMPF.PRES.3SG/PL *DET.MASC.NOM.SG* *Elitis-MASC.NOM.SG*
'My favourite poet is Elitis.'

In (26), the determiner, the adjective and the noun are fully inflected for and agree in Gender (Masculine), Number (Singular), and Case (Nominative). The phonetic exponent of the agreement markers however, differs across the three categories.

However, this is not the case for different words across conjoined DPs. This is illustrated in (3.27). With conjoined DPs I tested whether participants maintain the appropriate inflection of the different elements of a DP or whether they assign the same features across the coordinated DPs, which could suggest that differences between the targeted and produced inflection are syntactically conditioned. I found that in the majority of cases, CG_{DS} do inflect the targeted nominal inflection.

(3.27) <u>Conjoined Subject DPs</u>
DP[DP[To ðendr-o] ke DP[o θamn-os]] ...
DET.NEU.SG.NOM *tree-**NEU**.SG.NOM* *and* *DET.MASC.SG.NOM* *bush-**MASC**.SG.NOM*

... ine *olo-prasin-**a**.*
be-IMPF-PRES.3.SG/PL *all-green-**NEU**.PL.NOM*
'The tree and the bush are green all over.'

In (3.27), the determiner and the noun of the conjoined DPs are inflected for Gender, Number, and Case. While the features agree in Number and Case, they do not agree in Gender.[41]

3.3.2.2 Nominal Inflection with Nominal and Adjectival Predicates

A second environment where we find nominal inflection concerns nominal and adjectival predicates. Nominal and adjectival predicates in Greek are marked for Gender, Number, and Case via agreement with the inflectional features of the clausal subject. This merely gives a wider range of environments where nominal inflection can be tested. This is illustrated in (3.28):

(3.28a) Adjectival Predicate

[***o***	meγal-***os***	aðerf-***os***	mu] ...
DET.MASC.SG.NOM	*big-MASC.SG.NOM*	*brother-MASC.SG.NOM*	*1.GEN.SG*

... in ***-e***	[kal-***os***	poðosferist-***is***].
be.IMPF.PRES.3.SG/PL	*good-MASC.SG.NOM*	*football.player-MASC.SG.NOM*

'My big brother is a good football player.'

(3.28b) Nominal Predicate

[o	γiorγ-***os***]	ine	[oðondiatr-***os***].
DET.MASC-SG-NOM	*Giorgos-MASC.SG.NOM*	*be.IMPF.PRES.3.SG/PL*	*dentist-MASC.SG.NOM*

'Giorgos is a dentist.'

3.4. SUMMARY

In this chapter, I have shown how the six empirical issues resulting from previous research can be addressed through the study of CG_{DS} and CG_{TDC}. Looking at the *DS* linguistic impairment on the basis of CG allows us to answer questions that cannot be answered on the basis of English

[41] It has been suggested that conjoined [+animate] DPs (regardless of gender) trigger the inflection of masculine Gender in the adjectival or nominal predicate, while [-animate] DPs trigger the inflection of Neuter gender in the adjectival or nominal predicate. For discussion, see Spyropoulos (2007).

alone. Through the verbal and nominal inflectional paradigms at hand and the great number of environments in which these can be tested, it is easier to determine in what way the CG_{DS} Grammar and its interfaces (i.e., articulatory restrictions and vocabulary insertion) deviates from CG_{TD} Grammar. Based on the relations formed between Tense, S/V agreement and Case, alongside with the wide variety of combinations and phonological representation we can make the following predictions:

(i) If the differences between the two groups are syntactically conditioned, we should expect problems with Tense to also affect problems with Case and S/V agreement, due to the fact that Case is assigned by T/INFL.

(ii) If the differences are morphologically conditioned, then we expect to see the four features (Tense, Person, Number for verbs and Case for nominal expressions) to present independent problems. In other words, we would expect problems with the aforementioned features to not be correlated.

(iii) If the differences between CG_{DS} and CG_{TDC} are phonetically and phonologically conditioned, we expect some consistency with regards to the phonological environment (i.e., syllable structure and word position), as well as consistency with the consonants and vowels omitted or substituted.

The first prediction suggests problems with the inflectional system and syntax, while the second prediction suggests that the difficulties are caused independently of the syntactic derivation. The third prediction points towards issues with the physiology of the articulation apparatus, as well as the participants' phonological system. The fourth prediction concerns the phonological representation of inflectional marking. That is, a problematic sound or phonological environment may cause ambiguity as to whether an inflectional feature or combination of features is problematic for the CG_{DS} participants, and whether the problem is syntactically or phonologically conditioned. This, in turn, suggests that a thorough phonological analysis is paramount.

Chapter 4

Methodology of Data Collection and Data Analysis

4.1 INTRODUCTION

The main goal of this research is to investigate the performance of CG_{DS} and CG_{TDC}. Specifically, I am testing the use of Tense, *S/V* agreement and Case across these two groups and whether the differences between the CG_{DS} and CG_{TD} Grammar are syntactically, morphologically, or phonetically and phonologically conditioned. The methodology employed for this dissertation's data collection does not only serve the purpose of answering the research question and address the issue at hand, but it also considers additional factors external to my morpho-syntax, which could have a major or minor effect on the results of the study. Therefore, the results of this study are highly dependent on the innovative methodology employed for collecting and testing data.

In most studies, the preferred choice of data collection is controlled elicitation. With this, type of elicitation, researchers can target specific types of data they are interested in. Indeed, the potential difficulties of repeating a given target utterance could tell us whether CG_{DS} participants have acquired a particular structure, inflectional marking or syntactic process (e.g. movement) in the same way as CG_{TD} or whether they exhibit differences with a specific domain or their entire grammatical system. However, the pressure of having a novel utterance repeated could cause

stress or confusion. In addition, the fact that they repeat a structure does not necessarily mean that they have acquired the syntactic mechanisms related to the formation of the structure. This verifies the significance of using a combination of controlled and free elicitation tasks. In this chapter I introduce the methodology used for the present study. This includes:

I. the elicitation methods (i.e., the methods for collecting data),
II. the construction of a Relational DataBase Management System (RDBMS),
III. the system formulated to tag data in the database.

These methods were designed to overcome the methodological issues identified with previous studies raised in *Chapter 2*.

The chapter is organised as follows. I first introduce the two participant groups, and the Intelligence Quotient (henceforward, IQ) analysis used as a basis to compare the two groups (*Section 4.2*). In *Section 4.3*, I summarise the procedure used to elicit the data. In *Section 4.4*, I introduce the elicitation methods and linguistic environments elicited to evaluate the three hypotheses. In *Section 4.5*, I explain the transcription procedures. In *Section 4.6*, I explain how the database was constructed and how data are tagged for analysis. Finally, I discuss the statistical analysis employed to draw conclusions on each group as well as to compare the two groups (*Section 4.7*) and in *Section 4.8* I conclude.

4.2 PARTICIPANT GROUPS AND METHOD OF RECRUITMENT

Six months prior to data collection, a pilot study preceded, to asses the populations' linguistic production skills and design the experimental stimuli accordingly. A sample of three CG_{DS} and two CG_{TDC} participated. Participants are divided into two groups. Group A includes sixteen adult CG_{DS} aged 19;0 to 45;11. Inclusion criteria were age and fluency of speech. Basic intelligible

utterances were sufficient.[42] A short interview with each of the participants was conducted prior to data collection to determine whether they fit the inclusion criteria. The mental age of Ger_{DS} participating in Schaner-Wolles (2004): 108) experiment ranged between 2;5 and 7;4 (chronological age: 7;3 to 41;10). Moreover, Stoel-Gammon (2001: 96) reports that it is possible for DS to reach the mental age of 7 or 8 years. The only exclusion criteria set were: (i) participants needed to be aged 19;0 to 45;11 and (ii) their speech had to be intelligible. All Group A CG individuals participating in this study had previously been diagnosed with *DS* and mild to moderate mental diability. Relevant records of their diagnosis as well as a detailed file with the Raven's IQ test and other information were held by the Foundation the participants attended. Due to protection of privacy, I had no access to the participants' files. However, I was assured by the institution's authorities that the selected participants were confirmed with a diagnosis prior to their participation in this study. Moreover, all participants had undergone auditory screening. One of the participants exhibited hearing loss and used a hearing aid. No problems were observed, however, during elicitation.

All participants of Group A live in the broader area of Lefkosia and attend classes (including language classes) in a foundation for people with mental disabilities. For all participants, both the experiments for data collection and the IQ test were conducted in a quiet classroom in the educational building of the Foundation. While some participants live with their families and depart from the Foundation at 2:30pm when classes end, others live at the Foundation's boarding facilities, and visit their families on weekends.

[42] Data from a greater number of participants were collected but some participants were excluded because they did not fulfill the inclusion criteria: age and/or fluency of speech.

The control group, Group B, includes seventeen CG_{TDC}, students at an elementary school aged 7;0 to 8;11, who match the suggested mental age of the CG_{DS} participants. Since I am examining adult CG_{DS}, control participants should approximately match the highest mental age reported (7;4). Therefore, I decided to use CG_{TDC} controls aged 7;0 to 8;11. Participants from Group B live in the broader area of Lefkosia and Larnaca and come from families with a similar socio-economic background.

All participants were recruited following the University of British Columbia Ethics Board guidelines (see *Preface* for file reference number).

For purposes of comparison between the two Groups, a standardised IQ test for Greek was administered to determine the mental age of the participants. The *WISC-III* Wechsler Intelligence Quotient test for ages 6-16 was used. The choice of the IQ test was made based on two factors: (i) the availability of a version standardised for Greek, and (ii) the IQ test includes both verbal and practical tests. Results on the IQ test for each group can be found in *Appendix B*.

4.3 PROCEDURE

In this section, I introduce the equipment used to record the participants' productions in the four experiments conducted as well as the recording procedure. Information on how each experiment was introduced as well as the instructions given for each experiment is embedded in the sub-sections of each experiment in *Section 4.4*.

For the completion of all four experiments, participants needed approximately forty-five minutes to two hours and thirty minutes, depending on which group they belonged to as well as the

duration and number of breaks between tasks. All participants took at least three or four breaks. The IQ test was conducted at a separate session and duration also varied.

4.3.1 Recording Equipment

Two recording devices were used: a laptop and a digital recorder. Materials were recorded in Praat or Audacity at a sampling rate of 22,050 Hz directly onto a Sony Vaio laptop (VGN FS 640), with an attached microphone (Logitech 980240-0914 analog desktop microphone with mono recording[43]) plugged directly into the laptop. As a supplementary device, in case of technical failure, I used an external digital recording device (an Olympus16 GB handheld stereo voice recorder). None of the analysis is based on the back-up recordings, as I did not face any problems with the primary recording device. At the end of each fieldwork day, all files were downloaded onto the computer and labelled. All files for all four experiments were saved in *.wav* format in multiple storing devices.

4.3.2 Recording Procedure

Recording for all four experiments commenced just before the investigator started giving instructions. Each experiment was recorded onto a separate file (as well as a different file for each Video of *Experiment #1*), comprising a total of six audio files for each participant. Recording was not paused or stopped at any point until the completion of each experimental task. Instructions, as well as any discussion or additional clarification that appeared necessary, were also recorded.

[43] The microphone included Noise-cancelling properties, which filter out unwanted background noise. Its frequency response was 100–16,000 Hz and the Sensitivity was -67dB/ubar, -47dBV/Pascal +/-4dB.

4.4 ELICITATION METHODS

In this section I present the four experiments and discuss in detail which morpho-syntactic environments are targeted in each experiment.

I designed four tasks to elicit relevant data in a way that would target specific grammatical constructions. For a more detailed description of the inflectional marking and the environments discussed in this section see *Chapter 3*. Tasks were formulated to test whether the differences between CG_{DS}, CG_{TDC} and CG_{TDC} are syntactically, morphologically, phonetically or phonologically conditioned. More explicitly, I aimed in testing whether the *Group A* and *Group B* presented different or similar performance and whether the differences are:

(i) *syntactically conditioned* such that, Tense, *S/V* agreement, and Case are problematic due problems during the syntactic derivation (e.g. problems with Tense have a direct effect in the production *S/V* agreement, and Case)

(ii) *morphologically conditioned* such that, Tense, *S/V* agreement, and Case are affected independently of one another

(iii) *phonetically and phonologically conditioned*, such that, either Tense, *S/V* agreement, and Case seem to be affected but this is a by-product of articulatory and phonological restrictions creating ambiguity or, we only find differences which deviate from the target but do not affect inflectional marking.

Though this is the general idea behind the experiments, each task has a specific purpose.

Different elicitation methods are used for each of the four experiments to provide a variety of environments in which the use of Tense, *S/V* agreement, and Case can be examined. The first two experiments involve controlled elicitation tasks, whereas in the last two experiments participants are free to choose their own vocabulary and clausal structures in contexts of story-telling and an "interview". This is one of the first studies on *DS* which utilises a variety of both

controlled and free elicitation tasks, as well as a variety of experimental stimuli controlling for a large number of parameters. *Sections 4.4.1* through *4.4.4* give details on the four experiments.

4.4.1 Experiment #1: Visual Stimuli

The first experiment is a controlled elicitation task where three distinct videos were used to elicit specific kinds of inflection. For Experiment #1, participants were seated in front of a laptop computer located on a desk. Participants were shown a video with a sequence of video clips and asked to describe each video clip in turn. All videos were shown on a 15.4 " screen.

Participants were required to watch each video twice – once to familiarise themselves with the experimental stimuli and procedure and a second time to produce an utterance describing each video clip. They were instructed to pay close attention to the video each time and to speak loudly and clearly when describing what they saw. In what follows I describe each experimental task's:

I. Grammatical construction targeted
II. Goal
III. Experimental design
IV. Instructions given to participants

Participants had five seconds to view each example stimulus and ten seconds to view and describe each of the experimental stimuli. The same procedure was followed for all three videos. Through each experimental stimulus, participants were expected to produce an utterance, which fulfilled each experiment's target. The target is defined by each experiment's specific or general goal(s). The main goal of *Video I* is to elicit the use of Subjunctive (subordinate) clauses. *Video II* targets nominal inflection (i.e. Gender, Number and Case) on the objects in subordinate clauses and Present. Finally, *Video III* was designed to elicit the use of Past Tense. A detailed

overview of the goal and purpose of each experimental task, as well as the experimental design for each video is given below.

4.4.1.1 Video I: Targeting the Use of Subjunctive, Present and Dependent

The first video is designed to target the use of Subjunctive clauses, as well as nominal inflection with subjects and objects. It showed thirteen video clips of a man named *Nikos* who is watching his friends and himself on television perform certain actions.

Experiment #1 - Video I: Goal

This part of *Experiment 1* mainly targets verbal and nominal inflection in Subjunctive, subordinate clauses. Additional targets of this experiment are the 2nd and 3rd personal pronoun, and simple and complex nominal phrases as sentential subjects and objects.

Experiment #1 - Video I: Experimental Design

The setup of the stimuli involves two events:

(i) someone is watching people on television,
(ii) people on television are performing certain activities like eating, drinking, playing etc.

This makes it possible to elicit sentences with main and subordinate clauses. The most likely construction to use in this context is a Subjunctive clause: the verb *vlep-o* 'I am watching' usually takes a Subjunctive subordinate clause. Because *vlep-o* is an optional control verb, the Subjunctive in the subordinate clause is generally combined with a verb inflected with Tense (i.e. Present). It also allows for a subject other than the one found in the main clause. A less likely choice than a subordinate clause is a relative clause, which was, in fact, the choice of some participants. The experiment is exemplified below in detail.

Step 1 – Video I: Introduction and Example A

FIGURE 4.1 – VIDEO CLIP 1: EXAMPLE B – VIDEO II

Kitakse afto(n)/tuton to agori. Ton lene Niko. O Nikos parakoluthi tileorasin ke vlepi tus filus tu ke ton eafton tu stin tileorasin na kamnun kapia pragmata. Thelo na kitaksis prosektika ke na mu pis ti vlepi o Nikos tus filus tu ke ton eafton tu na kamnun stin tileorasi. En na kamo ego to proto gia sena.

'Look at this boy. His name is Nikos. Nikos is watching TV and he is watching his friends and himself on TV doing a series of things. I want you to look very closely and tell me what Nikos is seeing his friends and himself do on TV. I am going to do the first one for you.'

(4.1)

O	Nikos	vlep-i	emena	na ...
DET.MASC.SG.NOM	*Nikos-MASC.SG.NOM*	*see.IMPF-PRES.3.SG*	*1.SG.ACC*	*SUBJ*

... ben-o	s-to	gri	aftokinit-o	mu.
enter.IMPF-PRES.1.SG	*in-DET.NEU.SG.ACC*	*grey*	*car-NEU.SG.ACC*	*1.SG.GEN*

'Nikos is watching me get into my grey car.'

Step 2, Video I: Example B

FIGURE 4.2 –VIDEO CLIP 2: EXAMPLE B – VIDEO I

As dokimasumen to deftero mazi. To koritsi(n) to lene Maria. Ti vlepi o Nikos tin Maria na kamni stin tileorasi?

'Let's try the second one together. The girl's name is Maria. What is Nikos watching Maria do on TV?'

In case the participant did not respond, I performed the second example for them as well:

(4.2) O Nikos vlep-i ti Mari-an ...
DET.MASC.SG.NOM Nikos-MASC.SG.NOM see.IMPF-PRES3.SG DET.FEM.SG.ACC Maria-FEM.SG.ACC

... na krat-a(i)[44] mian pen-an ke ...
SUBJ hold.IMPF-PRES.3.SG one.FEM.SG.ACC pen-FEM.SG.ACC and

... na kath-ete s-ton kanap-e.
SUBJ sit.IMPF-PRES.3.SG on -DET.MASC.SG.ACC sofa.MASC.SG.ACC

'Nikos is watching Maria (who is) holding a pen and sitting on the sofa.'

Step 3, Video I: First Viewing

As a next step, I explained to participants that we will be watching the entire video once, and during the first viewing they were free to ask questions in case there was something they could not see clearly or could not understand. While the video was playing for the first time I would say in Greek: "now let me introduce you to the characters of the story, this is Nikos; we already met Nikos." A video clip of the main character, Nikos, appeared on the screen, as shown below.

[44] Sounds in parentheses signify that they are optional.

FIGURE 4.3 –VIDEO CLIP 3: INTRODUCING THE CHARACTERS (I)

Next, another video clip appeared on the screen.

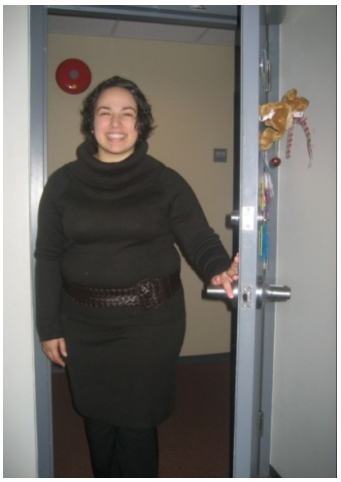


FIGURE 4.4 –VIDEO CLIP 4: INTRODUCING THE CHARACTERS (II)

I then said in Greek: 'This is Dora'. Dora and Nikos are friends.'

The same procedure would follow for all the characters that appeared in the video. There was a five-second interval between each video clip of the 'introduction set' comprising examples and character introductions.[45] Participants were instructed that during a task they could use: (i) either the names of the characters or (ii) a pronoun instead.

[45] For a full presentation of all stimuli included in this video see *Appendix B*.

Step 4, Video I: Second Viewing

Video I includes thirteen video clip stimuli of Nikos sitting in front of the television set watching people (including himself) perform certain actions, as illustrated in *Video Clip 1* and *Video Clip 2*. The combination of people and actions in each video differed. Before showing *Video I* for the second time, participants were once again reminded that they needed to start their sentences with *o Nikos vlepi*… 'Nikos is watching/seeing…' After ensuring that participants understood the task, I played the video a second time.

4.4.1.2 Video II: Targeting Nominal Inflection and Main-Subordinate Constructions

The aim of *Video II* is to elicit conjoined complex nominal phrases to test nominal inflection. Specifically, it is designed to target different nominal features with all of the values associated with a given feature. *Video II* includes thirteen video clips of the same character as in *Video I*. *Nikos* is looking outside a window, while images outside the window change in each *Video Clip*.

Experiment #1 – Video II: Goal

Video II mostly focuses on the structure of the internal argument in the subordinate clause. The main clause is again *o Nikos vlepi*... 'Nikos is watching…' for all thirteen productions. With regards to Number marking, the experiment targets both Singular and Plural Number, 2nd and 3rd Person (for both verbal and nominal phrases), Accusative and Genitive Case, and all three different Gender values (Masculine, Feminine, and Neuter). Moreover, it tests argument-types: subjects, direct objects, and indirect objects. Specific syntactic structures – formation of main-subordinate clauses and subject-to-object-raising – are also tested through this video task.

Experiment #1 -Video II: Experimental Design

For the purposes of this task, *Nikos* has a magic window, where every time he looks outside this window he can see different things. This set up targets main-subordinate constructions in combination with nominal phrases rich in inflectional features.

> Nikos is looking outside his window and is seeing *a big grey house with a red car* and *a big green tree outside the house*.

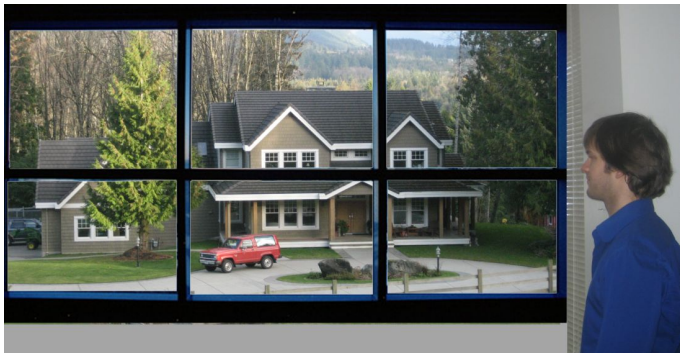


FIGURE 4.5 –VIDEO CLIP 5: VIDEO II – EXAMPLE A

The elicitation process is exemplified below step-by-step.

Step 1, Video II: Introduction and Example A

I started the elicitation of stimuli in *Video II* by introducing the context of the video to the participants.

> *Se afton/tuton to video en na dumen kai pali to Niko o opios exi ena magikon parathiro sto spiti(n) tu. Kathe mera to topio(n) ekso apo to magiko(n) tu parathiro(n) allazi. Etsi, kathe mera pu o Nikos kitazi ekso apo to magiko(n) tu parathiro vlepi kati diaforetiko.*
>
> 'In this video we will once again see Nikos who has a magic window at his house. Every day the scenery outside his magic window would change. So, every day that Nikos looks outside his magic window he sees something different.'

Step 2, Video II: Example

There were two viewings of this video with similar instructions. An example is given in (4.3).

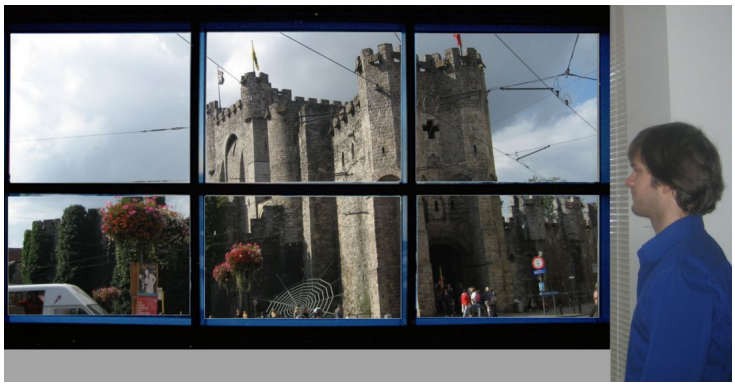


FIGURE 4.6 –VIDEO CLIP 6: VIDEO II – EXAMPLE B

(4.3) O Nik-os vlep-i (ekso apo to ...
DET.MASC.SG.NOM Nikos-MASC.SG.NOM see.IMPF-.PRES.3.SG (outside from DET.NEU.SG.ACC

... maγik-on tu paraθir-o(n)) enan ...
magic-NEU.SG.ACC DET.NEU.SG.ACC window-NEU.SG.ACC) one.NEU.SG.ACC

... kastr-o me poll-a luluð-ia γiro γiro ke ...
castle-NEU.SG.ACC with many- NEU.PL.ACC flower-NEU.PL.ACC around around and

... anthrop-us na ben-un mesa s-to kastr-o.
person-MASC.PL.ACC SUBJ enter.IMPF-.PRES.3.PL into to-DET.NEU.SG.ACC castle-NEU.SG.ACC
'Nikos sees (outside his magic window) a castle with many flowers around it and people entering the castle.'

A second example was given where participants were required to produce the sentence for the example, as with *Video I*.

The same procedure as with *Video I* was followed for the first and second viewing. The second video includes thirteen *Video Clips* - stimuli of Nikos standing in front of a window looking outside. For each stimulus the view outside the window is different. Due to the variety of figures

appearing outside the window and the number of things happening in each picture, many different inflectional and vocabulary combinations were possible to describe each video clip. Stimuli resemble the two examples shown in *Video Clip 5* and *Video Clip 6* above.

4.4.1.3 Video III: Targeting the Use of Past Tense

Video III is designed to target the use of Past-Tense inflection as well as the inflection of the appropriate Case for nominal subjects and objects. In *Video III*, participants viewed a sequence of video clips that add up to a story. The video consists of twenty-five video clips.

Experiment #1 - Video III: Goal

This video is designed to elicit the use of Past Tense as well as the use of possessive pronouns. I was also aiming to examine the use of nominal inflection, in particular whether potential problems with Past Tense would correlate with problems with Nominative Case on subject DPs.

Experiment #1 - Video III: Experimental Design

The story told by the video clips is about a party that happened the night before at my house. During that party my friends were misbehaving. Because my friends' behaviour was upsetting, a forgetting fairy appeared to teach them a lesson. She put fairy-powder on her arrows and touched them with the arrows to make them forget what had happened the night before. Participants were asked to remind my friends and me what they each did the night before. As with the other two experiments, there were two viewings of *Video III*.

First, by giving them the story in the first viewing, I ensured that participants were familiarised with the vocabulary and the type of structures they were expected to use. Second, I introduced the story in Present Tense. By doing so, I avoided influencing the inflection they needed to use

on the verb. Third, I requested the use of the adverbial phrase *xthes to vrad-i* SG or *extes ti nixt-a/epses* CG 'last night' at the beginning of each utterance to ensure that the participants would need to use Past Tense inflection on the verb. Fourth, I informed the participants that these were ***my*** friends. This aimed in triggering the use of the possessive, as in *i fil-i su* 'your friends'. Fifth, the number of video clips included in the video as well as the diversity of events and people depicted (hence greater vocabulary use) aimed toward acquiring a rich array of diverse data.

Step 1, Video III: Introduction

The first step, when introducing the third elicitation video, was to explain to the participants the story they were about to watch on this third video.

> *Xthes to vradi ekana ena party sto spiti mu. Itan oli i fili mu eki alla ekanan polles ataksies. Thimosa kai ithela na tus doso ena mathima. Metamorfothika se neraida tis amnhsias ke tus ekana olus na ksexasun ti ekanan to proigoumeno vradi. Thelo esi na tus thimisis i na mu thimisis ti ekanen o kathenas tus xthes to vradi.*
>
> 'Last night I had a party at my house. All my friends were there but they were misbehaving. I was upset by my friends' behaviour and I wanted to teach them a lesson. I turned into a forgetting fairy and made them all forget what they had done the night before. I want you to remind them or remind me what each of them did last night.'

Step 2, Video III: First Viewing

The first time participants watched the video, I was narrating what was happening while each video clip appeared on the screen. I used Present Tense to describe each video clip. For example, while the *Video Clip* in 7 below was on the computer screen I would say:

FIGURE 4.7 – VIDEO CLIP 7: VIDEO III – EXAMPLE A

(4.4)	Mia	kopell-a	**krat-a(i)**	ena(n) ...
	one -FEM.SG.NOM	*girl-FEM.SG.NOM*	*hold.IMPF-PRES.3.SG*	*one.NEU.SG.NOM*
	... aγor-i	s-tus	om-us	tis.
	boy-FEM.SG.ACC	*on-DET.MASC-SG-ACC*	*street-MASC-SG-ACC*	*2.FEM.**GEN**.SG*

'A girl is holding a boy on her shoulders.'

When *Video Clip 8* below appeared on the screen I would say:

FIGURE 4.8 –VIDEO CLIP 8: VIDEO III – EXAMPLE B

(4.5)	Aft-os	o	andr-as	**krat-a(i)** ...
	3.DEM-MASC.SG.NOM	*DET.MASC.SG.NOM*	*man-MASC.SG.NOM*	*hold.IMPF-PRES.3.SG*
	... mia	ginek-ia	tsand-a(n)	ke ...
	one.FEM.SG.NOM	*feminine-FEM.SG.ACC*	*bag-FEM.SG.ACC*	*and*

... enan	potir-in	kras-i.
one.NEU.SG.ACC	*glass* NEU.SG.ACC	*wine*-NEU.SG.ACC

'This man is holding a woman's purse and a glass of wine.'

Step 3, Video III: Second Viewing

Participants needed to watch the video for a second time and narrate the story in Past Tense to either me, or the people in the story, reminding me and my friends what we had done the night before. When the first viewing of the video was completed I said:

> *Tora tha ksanadumen to video ke thelo na mu thimisis i na tus thimisis ti ekanan* ***xthes to vradi, i extes ti nixta, i epses****.*
> 'Now we'll watch the video for a second time and I want you to remind me, and remind them what they were doing **last night**.'[46]

Participants were required to begin each utterance with the adverbial phrase *xthes to vradi* SG or *extes ti nixta/epses* CG 'last night', whichever they felt most comfortable with. For example, for *Video Clip 8* participants were expected to say:

(4.6)

xθes	***to***	***vrað-i***	aft-os	o ...
last	DET.NEU.SG.ACC	*evening* NEU.SG.ACC	*3*.DEM-MASC.SG.NOM	DET.MASC.SG.NOM

... andr-as	***e-kratu-s-e***	mia	ginek-ia ...
man-MASC.SG.NOM	PAST-*hold*-IMPF-PAST.3.SG	*one*.FEM.SG.NOM	*feminine*-FEM.SG.ACC

... tsand-an	ke	enan	potir-in	kras-i.
bag-FEM.SG.ACC	*and*	*one*.NEU.SG.ACC	*glass*-NEU.SG.ACC	*wine*-NEU.SG.ACC

'Last night this man ***was holding*** a woman's purse and a glass of wine.'

The production in (6) was the ***targeted production*** for the experimental stimulus introduced via *Video Clip 8*. This video includes twenty-five video clips depicting several actions like the ones

[46] I made sure to stress the phrase *xthes to vrad-i/extes ti nixt-a/epses* 'last night' (three different ways id saying it).

shown in *Video Clips 7* and *8*. The last six video clips illustrate the fairy's arrival, her socializing with people and the casting of the forgetting powder onto the people at the party.

4.4.2 Experiment #2: Repetition

The second experiment consists of a *Production Imitation* task and a *Stimulus Production* task, hence controlled elicitation, involving stimuli targeting specific inflectional environments. Both tasks involve repetition of an experimental stimulus. Participants were either required to repeat an utterance exactly as they heard it (Task I) or listen to a set of utterances and produce a sentence following the instructions given (Task II).

4.4.2.1 Experiment #2: Task I

In *Task I* of *Experiment #2*, participants from the two groups were asked to repeat a number of structures exactly as they heard them being produced by the researcher.

Experiment # 2 – Task I: Goal

In this experiment, participants were required to repeat utterances with various combinations of Tense, *S/V* agreement (Person and Number), and Case features. The purpose of this imitation production task is to investigate whether participants from either group have particular difficulty with (i) one of the four features, (ii) a specific feature value or (iii) a specific combination of feature values (e.g. 1st Person, Plural, Past). Such combinations of features are included in both simple one-clause structures as well as complex main-subordinate structures. The purpose of the large number of experimental stimuli is to cover all possible combinations of features.

Experiment 2 – Task I: Procedure

Participants were asked to listen to each utterance and to repeat the utterance exactly as they heard it. With Group B (CG_{TDC} controls), I read the whole sentence once, paused and gave them time to repeat the sentence back. The same procedure was also attempted with Group A (CG_{DS} participants). However, many participants from Group A were unable to reproduce the whole utterance. Therefore, where sentences included multiple clauses and/or phrases, I often needed to break down the sentences into smaller phrases so that the participants could produce all the words in the sentence. The pause/breaks were after a clause (with main-subordinate or conjoined structures) or major phrase boundary. This was the only limitation met by this study; one that was anticipated, due to the evident problems with (i) verbal short-term memory, and (ii) with phonological short-term memory[47], as reported in a number of studies on *DS* (Caselli et al. 2008, Chapman 1995, and Laws and Bishop 2003), summarised in *Chapter 2*, *Section 2.2*.

Experiment 2 – Task I: Experimental Design

There are forty-seven stimuli, which include a variety of different clausal type combinations Indicative, Subjunctive (accompanied by both obligatory and optional control verbs), Interrogative and Imperative Moods, and all Tenses. Moreover, we find structures with single and conjoined clauses, as well as main-subordinate clause combinations. Furthermore, I ensured that all feature value combinations for Tense, Aspect, Person and Number on verbs, and for Case, Gender, Person and Number on nominal phrases are included. In what follows, I show the categories of structures targeted in this experiment and give examples for each targeted category.

[47] The storing of distinct phonological features for short periods of time to be "read off" in the process of applying the alphabetic principle to word identification.

(4.8) Targeting Verbal and Nominal Inflection: *S/V* Agreement, Tense, and Case

i	γiaγi-a	mu ...
DET.FEM.SG.NOM	*grandmother-FEM.SG.NOM*	*1.SG.NOM*

... ***e-***mairefk-***e***	psit-on	kaθe	kiriak-i.
PAST-cook.IMPF-PAST.3.SG	*roast-NEU.SG.ACC*	*every*	*Sunday-FEM.SG.ACC*

'My grandmother would cook roast every Sunday.'

With structures like the one given above, I test whether participants can re-produce utterances where verbs are inflected for Past Tense as well as Person and Number agreement. Nominal inflection on subject and object phrases is also targeted in these constructions. A number of similar simplex structures, including Present and the [*en* + Subj *na*+ verb] construction, instead of Past, used in (4.8), are also included in *Task I* of *Experiment #2*.

I. Verbal Inflection

As explained in *Chapter 3*, Subjunctive constructions in Greek are interesting because we have cases where the verb in a Subjunctive clause can be inflected with Tense and other cases where it cannot. On both occasions the verb always receives *S/V* agreement, hence it always licences a subject. Stimuli like the ones presented below test the participants' use of verbal and nominal inflection with Tensed and Tenseless constructions.

(4.9) Targeting Verbal Inflection: Tensed Subjunctives

stamat-a	na	mil-as	sinexia.
stop-PRF.IMP.2.SG	*SUBJ*	*talk.IMPF-PRES.2.SG*	*constantly*

'Stop talking all the time.'

(4.10) Targeting Verbal Inflection: Tenseless Subjunctives

e(n)	na	sas	ʃereti-s-o	pri	fi-o.
be.PRES.3.SG/PL	*SUBJ*	*2.PL.ACC*	*say.goodbye-PRF-DEP.1.SG*	*before*	*leave.PRF-DEP.1.SG*

'I am going to say goodbye before I leave.'

In (4.9), the verb *mil-as* 'you are talking' in the Subjunctive clause is inflected with Present Tense, 2nd Person Plural, while in (4.10) the verb *šereti-s-o* 'I say goodbye' in the Subjunctive clause is inflected as Dependent, 1st Person, Plural.

(4.11) Targeting Verbal Inflection: Imperatives

perimen-e	me	pende	lept-a.
wait.PRF-IMP.2.SG	*1. SG.ACC*	*five*	*minute-NEU.ACC.PL*

En	ime	etim-i	akoma.
NEG	*be.MPF.PRES.1.SG*	*ready-FEM.NOM.SG*	*yet*

'Wait for me for five minutes. I'm not ready yet.'

In structures such the one in (4.12), I test Gerunds and nominal inflection in conjoined DPs.

(4.12) Targeting Verbal Inflection: Gerunds

i	ðor-a	ki	o	Nikol-as ...
DET.FEM.SG.NOM	*Dora-FEM.SG.NOM*	*and*	*DET.MASC.SG.NOM*	*Nicolas-MASC.SG.NOM*

... e-fi-a	***vur-ondas***.
PAST-leave.PRF-PAST.3.PL	*run-GER*

'Dora and Nicolas left running.'

In general, Gerunds, the only verbal construction without both Tense and *S/V* agreement, are not commonly used in CG. However, experimental stimuli like the one illustrated in (4.12) were designed to test whether (i) participants are able to use such constructions and (ii) if they are not, whether they change the targeted Gerund suffix with a Tense and *S/V* agreement suffix (which both groups did consistently). If participants used a Tense and *S/V* agreement suffix we could safely argue that these two domains are intact and are favoured when participants are unable to use the infrequent Gerund suffix.

(4.13) Targeting Verbal Inflection: Cleft sentences

en	o	Savv-as	pu	ivr-en ...
be.PRES.3.SG	DET.MASC.SG.NOM	*Savvas*-MASC.SG.NOM	*that*	*find*.PRF-PAST.3.SG

... ti	ʃiokolat-an	pu	e-xo-s-es.
DET.FEM.SG.NOM	*chocolate*-FEM.SG.NOM	*which*	PAST-*hide*-PRF-PAST.2.SG

'It's Savvas who found the chocolate you hid.'

All cleft clauses used in this experiment are in Present Tense, whereas their subordinate clauses are in either Past Tense as in (4.13), or Present Tense as in (4.14) below.

II. Nominal Inflection

In all examples above I also target nominal inflection, especially Case, with subjects, objects, in determiner, nominal, adjectival, prepositional phrases as well as pronouns. In *Task I* of *Experiment #2*, I include sentences like (4.14) to examine the production of nominal features (Gender, Number, Case) and the agreement of the subject with the nominal features of nominal and adjectival predicates, as well as Tense inflection for copulas in cleft clauses.

(4.14) Targeting Nominal Inflection: Nominative Case on Subjects and Adjectival Predicates

en	***o***	Nik-***os***	pu ...
be.IMPF.PRES.3.SG/PL	DET.MASC.SG.NOM	*Nikos*-MASC.SG.NOM	*that*

... en	kal-***os***	ðaskal-***os***.
be.IMPF.PRES.3.SG/PL	*good*-MASC.SG.NOM	*teacher*-MASC.SG.NOM

'It's Nikos who is a good teacher.'

I further test the inflectional marking of conjoined DPs.

(4.15) Targeting Nominal Inflection: Nominative Case with Conjoined DPs

Ta	mil-a	ke	i	banan-es ...
DET.NEU.**PL.NOM**	*apple*-NEU.**PL.NOM**	*and*	DET.FEM.**PL.NOM**	*banana*-FEM.**PL.NOM**

... e	γlik-a	frut-a.
be.IMPF.PRES.3.SG/PL	*sweet*-NEU.**PL.NOM**	*fruit*-NEU.**PL.NOM**

'Apples and bananas are sweet fruit(s).'

In (4.15), the nominals in the conjoined DP subject are all inflected for Nominative Case.

Once again, the stimuli in this task are designed to include all Gender, Case, Number, Tense, Mood and Aspect features, and word types (word categories) with approximately equal frequency across the forty-seven stimuli. As is evident from the examples above, most structures combined more than one target. However, I also made sure that structures ranged from quite simple to complex in terms of the syntactic and morphological processes employed.

The use of function words (such as, conjunctions, adverbs, complementizers introducing embedded clauses, numerals, question particles) in all experimental stimuli are used to form full grammatical structures. However, they also serve another purpose; they help test several phonetic and phonological environments with non-inflectional value (i.e. omission or substitution did not cause ambiguity).

4.4.2.2 Experiment #2: Task II

Task II of Experiment #2 examines the use of a main clause in combination with a subordinate Gerund clause. This part also involves repetition.

Experiment # 2 – Task II: Goal

This task is testing whether participants inflect the verb of the main clause with a suffix marked for 3rd Person Plural. The second target of this task is to produce the Gerund as participants heard it. However, I also aimed to test whether participants would substitute the Gerund suffix in the

embedded clause with a *S/V* agreement suffix marked for Aspect, Tense, Person, and Number to avoid using the infrequent Gerund inflection, which was, in fact, observed.

Experimental Design

Participants were presented with four utterances where four different individuals perform the same two actions (e.g. drawing and smiling). After listening to the four sentences, participants were required to produce a single sentence describing what the four people are doing.

Instructions and Stimuli

Participants were asked to listen carefully and wait until after I had completed the four utterances. After I completed the production of the four utterances participants were asked to produce an utterance.[48] Participants were required to listen to the investigator producing a set of four sentences where the agents for each sentence were performing the exact same actions.

> *Tha akusete tesseris protasis opou tessera diaforetika atoma kamnun akrivos tis idies praksis. Thelo na akusete prosektika tis tesseris protasis ke meta na mu pite ti ine i dio praksis pu kamnun oli (mazi).*
> 'You will hear four sentences where four different people are doing the exact same actions. I want you to listen to the four sentences carefully and then tell me what the two actions are that they are all doing are (together).'

In (4.17), I give a set of stimuli used for *Task II* of *Experiment #2*.

(4.17) <u>Targeting *S/V* Agreement and Gerund Repetition</u>

(a)	o	Andre-as	perpat-a ...
	DET.MASC.SG.NOM	*Andreas-MASC.SG.NOM*	*walk.IMPF-PRES.3.SG*
	... s-to	ðrom-o	sfir-ondas.
	on-DET.MASC-SG-ACC	*street-MASC-SG-ACC*	*whistle-GER*

'Andreas is walking down the street whistling.'

[48] Some problems were recorded with Group A. Some participants shadowed my uttering of the stimuli. In such cases participants were asked to repeat the task.

(b) i Mar-ia perpat-a ...
DET.FEM.SG.NOM *Maria-FEM.SG.NOM* *walk.IMPF-PRES.3.SG*

... st-o ðrom-o sfir-ondas
on-DET.MASC.SG.ACC *street-MASC.SG.ACC* *whistle-GER*

'Maria is walking down the street whistling.'

(c) i Elen-i perpat-a ...
DET.FEM.SG.NOM *Eleni-FEM.SG.NOM* *walk.IMPF-PRES.3.SG*

... s-to ðrom-o sfir-ondas
on-DET.MASC.SG.ACC *street-MASC.SG.ACC* *whistle-GER*

'Eleni is walking down the street whistling.'

(d) o Alex-is perpat-a ...
DET.MASC.SG.NOM *Alex-MASC.SG.NOM* *walk.IMPF-PRES.3.SG*

... s-to ðrom-o sfir-ondas
on-DET.MASC.SG.ACC *street-MASC.SG.ACC* *whistle-GER*

'Alex is walking down the street whistling.'

After completing the production of the four utterances I would say:

Ti kamnun oli (mazi)?

'What are they all doing (together)?'

Participants were expected to produce only one utterance, which would describe the two actions performed by all four agents in the four sentences presented above. The target construction was a main-subordinate structure with the verb in the main clause inflected with Present and "subordinate clause" with a Gerund. The ***targeted production*** is given in (4.18):

(4.18) (ol-i) perpat-***u*** s-to ...
(all-MASC-PL-NOM) *walk.IMPF-PRES.3.PL* *on-DET.MASC.SG.ACC*

... ðrom-o sfir-***ondas***.

street-MASC.SG.ACC *whistle*-GER

'They are (all) walking down the street **whistling**.'

There were five sets of four sentences in this part.

4.4.3 Experiment #3: Story Telling (Spontaneous Data)

Unlike *Experiment #1* and *#2*, *Experiment #3* is a free elicitation task (collection of spontaneous data) where participants were simply asked to tell a story. This experiment is divided into two tasks (Task I and Task II). Task I required participants to narrate a story about how they spent their summer vacation, and Task II required participants to describe a typical weekday. The main goal, experimental design and procedure for both tasks are identical.

Experiment # 3 – Task I and Task II: Goal

The main goal for this task is to have participants use Tense, *S/V* agreement and Case in an uncontrolled setting. Specifically, Experiment #3, Task I targeted the 1st Person Singular and Plural. Nominal agreement and extensive use of tensed verbs inflected in the Past (both Imperfective and Perfective Aspect) for **Task I** and Present for **Task II**. The experimental design for this particular task targeted data where all four Cases, including Vocative,[49] would be used.

Experiment # 3 – Task I and Task II: Experimental Design

Participants were required to listen to an audio file where a Person was narrating a story about how they spent their past holiday, and the participant would in turn report their own account of their summer holiday.

[49] Vocative is a Case feature value not frequently used in non-direct speech contexts. Therefore, vocative is likely to be used in this task by the participant in an attempt to draw the listener's attention to a certain fact, or interacting with the listener, or in indirect speech as part of the story.

Experiment # 3 – Task I and Task II: Procedure

I started **Task I** of *Experiment #3* by providing participants with instructions on how to perform the task.

> *en na akousume mian istorian pu mia kopella mas lei pos eperasen tis kalokerines tis diakopes. Thelo na tin akusis prosextika ke meta na mu pis an exis (kapies) apories. Afu akusumen olin tin istoria, thelo meta na mu pis esi pos (e)perases persi to kalokeri.*
>
> We will hear a story where a girl is telling us how she spent her summer holiday. I want you to listen to her carefully and tell me if you have (any) questions. After we hear the whole story, then I want you to tell me what you did last summer.'

After confirming they understood the instructions, I played a sample story in an audio file to provide an example of exactly what they were required to do. They were free to get ideas from the story narrated.

When the audio file finished playing the story I asked the participant:

> *Lipon, ti ekames esi persi to kalokeri?*
> 'Well, what did you do last summer?'

Participants started narrating the story, and there were no interruptions or instructions during the story. However, when participants were not very articulate and needed encouragement, I supervised the story with short questions or played the audio again.

For **Task II** of *Experiment #3,* participants were asked to narrate a story about their everyday activities. After listening to the second audio file of an individual narrating how they pass a typical weekday, participants were asked to describe a typical weekday from the moment they wake up until they go to bed.

> *Tora thelo na mu perigrapsis mian tipiki su mera. Ti kamnis apo tin oran pu ksipnas mexri tin oran pu ppeftis gia ipnon to vradi?*
> 'Now I want you to describe to me one of your typical days. What do you do from the time you wake up till the time you go to bed at night?'

As with the first story, participants were not interrupted with further instructions while narrating the story. If participants seemed to have trouble producing or continuing a story, or if the story was extremely short (1-2 short sentences), I encouraged participants to elaborate on their weekday activities with short questions.

4.4.4 Experiment #4: Interview

The fourth experiment is also a free elicitation experiment consisting of two tasks. As with Experiment #3, a general description and instructions were given for the two elicitation tasks.

4.4.4.1 Experiment #4: Task I

In the first task of the forth experiment participants were asked to role-play with the researcher in the context of an "interview". That is, participants needed to play the role of an interviewer who wanted to learn some general information about the researcher.

Experiment #4 – Task I: Goal

This task aims to test the participants' use of 2nd Person agreement on verbs and of interrogative structures in a spontaneous/uncontrolled setting, i.e. without having to repeat utterances provided.

Experiment #4 – Task I: Experimental Design

Experiment #4 – Task I included a sample interview of two individuals, where the first was asking questions and the second (interviewee) was responding to the questions. Participants were required to play the role of the interviewer and ask the researcher a number of questions.

Experiment #4 – Task I: Procedure

A sample interview was played for the participants so they could become familiar with what they were being asked to do.

> *Tha akusumen prota enan pedaki ke mian kopella na milane/un. To pedaki perni sinentevksi, kani diladi erotisis stin kopellan ke afti apanta. Thelo na akusis prosektika pos milane/un ke meta na kanume ke emis to idio, na me rotisis ti thelis na mathis gia mena.*
>
> 'We will first hear a child and a girl/woman speaking. The child is interviewing, that is he is asking the girl/woman some questions and she answers. I want you to listen carefully how they speak and then we will do the same, you will ask me what you want to know about me.'

After ensuring the participant understood the instructions I played the audio file to him/her. When the audio was finished I asked if s/he had any questions. Participants were instructed to start asking questions addressing what they would like to know about the researcher.

> *Tora boris na me rotisis ti thelis na mathis gia mena.*
> 'Now you can ask what you would like to know about me.'

In case they were still having difficulty performing the task, I would spend a few moments initiating the role-play, such that I would play the role of an interviewer and the participant would be the interviewee. Once the participant assured me that they understood what the task was, we would then switch roles.

4.4.4.2 Experiment #4: Task II

In *Task II* of *Experiment #4* participants were asked to order the investigator to perform certain tasks around the room where the elicitation was conducted.

Experiment #4 – Task II: Goal

In this part of the experiment, I tested the use of Imperative and 2nd Person *S/V* agreement marking on the verb in addition to nominal inflection on the noun.

Experiment #4 – Task II: Experimental Design

Participants listened to a sample audio file where an individual was ordering another individual to perform some simplified tasks like: "Stand up" or "Open the window". Next, the participants were instructed to command the researcher to perform similar tasks. In the instructions given to the participant, it was important to use the word *diatak-s-e* 'order' rather than *ziti-s-e* 'ask' because with *ziti-s-e* it was more likely that participants would employ the "less than a forceful command" use of the Subjunctive, which in fact some of them did. The two verbs (*diatak-s-e* 'order' and *ziti-s-e* 'ask') differ in how forcefully a request is placed. Participants would be more inclined to use Subjunctive rather than Imperative had they been asked to use the verb *ziti-s-e*.

Experiment #4 – Task II: Procedure

Participants were asked to listen carefully to an audio file where a woman was "ordering" a boy to perform several acts.

> *Tha akusume mian kopellan na diatazi ena(n) agori. Thelo na akusis prosextika ke meta na kamumen kai emis to idio, na me* ***diataksis*** *na kamo diafora pragmata.*
>
> 'We will hear a girl/woman ordering a boy. I want you to listen carefully and then we will do the same, you will **order** me to do different things.'

Once the sample audio file ended I said:

> *Tora thelo na me diataksis esi na kamo kapia pragmata, opos akusamen tin kopella na diatazi to agori molis tora.*
> 'Now I want you to order me to do something, like we have heard the woman/girl order the boy just now.'

In case the participants were confused, as with *Task I* of *Experiment #4*, in order to help the participant understand the task, we exchanged roles for one or two minutes and I formed short orders directed towards the participant.

4.4.5 Summary

I constructed both free and controlled-elicitation experiments to combine the advantages and disadvantages of both types of elicitation as they have been laid out in *Chapter 2*, *Section 2.7.2*. The detailed overview of experimental design and methods employed for each experiment differs from previous studies researching on *DS*. In particular, it addresses all the morpho-syntactic issues arising from past research: portmanteau and separate morphemes for Tense and *S/V* agreement, environments where *S/V* agreement and Case surface with and without Tense, no irregular forms for Past Tense, a wide variety in combinations of all feature values, and environments where the inflectionally related sounds are tested in both inflectional morphemes and non-inflectional words. Additionally, I ensured that there was sufficient use of inflectional suffixes from all inflectional paradigms for nouns, adjectives, pronouns, etc. as well as all conjugation types for verbs. Moreover, the methodological design considers the combination of both free and controlled elicitation as well as the wide variety of inflectional environments and the large volume of experimental stimuli.

4.5 TRANSCRIPTION ANALYSIS

After the data collection process was completed the audio files were separated into two main folders: Group A (CG_{DS}) and Group B (CG_{TDC}). Within each folder there were sub-folders with separate files labelled with the name of each participant. The sub-folders contained six audio files: one for each of the *Experiments #2 - #4* and three separate ones for *Experiment #1*.

Due to the importance of transcription accuracy (especially at utterance-initial, word-final and utterance-final positions), I decided that transcription should not solely rely on audio input. For this reason, all utterances were transcribed while listening to the audio and observing both the spectrogram and the waveform in Praat. All sound changes were noted in narrow transcription. For this purpose the *CHAT* transcription conventions (MacWhinney 2000) and the International Phonetic Alphabet (IPA) were used. Depending on what sound changes were observed, the changes were notated with specific symbols preceding and/or following the phonemes in question. An example of the transcription Method is given below:

(4.18)	Target:	/ɔ.li. pɛr.nun. tin. ɔ.ɾɐn. tus. zɔ.ɣrɐ.fi.zɔ.ndɐs/	
	Translation:	They are all passing there time by drawing.	
	Production:	*s|(z)o(ɣ)(r)afi*s|(z)*u|(ondas)[50]	(CHAT Transcription)
	Transcription:	[[s]ɔ.ɐ.fi.[s]u][51]	(Phonetic Transcription)
	Translation:	'(They) are drawing.'	

Narrow transcription was necessary because one of the goals of this study was to test whether differences between CG_{DS}, CG_{TDC} and CG_{TD} Grammar are phonetically and phonologically conditioned, and whether these have an effect on morpho-syntactic inflection.

[50] A sound in ( ) represents an omitted sound(s). A sound between * and | is the sound(s) produced instead of the sound(s) in parentheses ( ).

[51] From here on, in order to avoid confusion, absence of a sound in presented data are represented by the symbol '∅', a substituted sound is represented by square brackets [ ] while an underlying sound/production is represented by //.

Transcription files for each participant's utterances for each task were saved separately into a Microsoft Word file, and labelled with the participant's name and task number. A record of the investigator's utterances was also kept, for reference. Audio files were transcribed per participant, per task. That is, productions of each participant for a particular task were transcribed. After completing the transcription of one task for all CG_{DS} participants I continued with the age-matched controls' audio files from the same Task. When that was completed, I moved on to transcribe another task.

4.6 DATA ANALYSIS AND DATABASE SETUP

Approximately 8,000 utterances (48,000 words) were recorded and transcribed. Utterances varied in size from one to thirty-eight words. The data was imported to a Relational DataBase Management System (RDBMS) using Microsoft Access and tagged for inflectional features, structural environment, and phonetic and/or phonological alternations. The Database consisted of approximately 48,480,000 data cells marking structural, phonetic and morpho-syntactic information for each word. These excluded information about participants name and group type, word and phrase identity, as well as experiment number and task number). That is, there are more than forty-eight million cells with structural, morpho-syntactic, phonetic, and phonological information concerning a given word. 4,000,000 additional cells record information that links utterances to a particular group, participant, experiment, task and utterance id.

4.6.1 General Information

When the data transcription was completed, I extracted just the participants' utterances from each word file and transferred them into a database file. My utterances during experiments along

with the instructions were excluded from the data analysis. Next to each participant's utterance, I included detailed information such as: (i) the name of the participant, (ii) whether a CG_{TDC} or CG_{DS} participant, (iii) the experiment number, (iv) the experimental task, (v) a word identity, and (vi) a sentence/phrase identity. Analysis was performed for each individual utterance and each individual word in an utterance, based on how it differed from the target, the context used and the inflected features. *Figure 9* below illustrates the layout in which the values were tagged.[52]

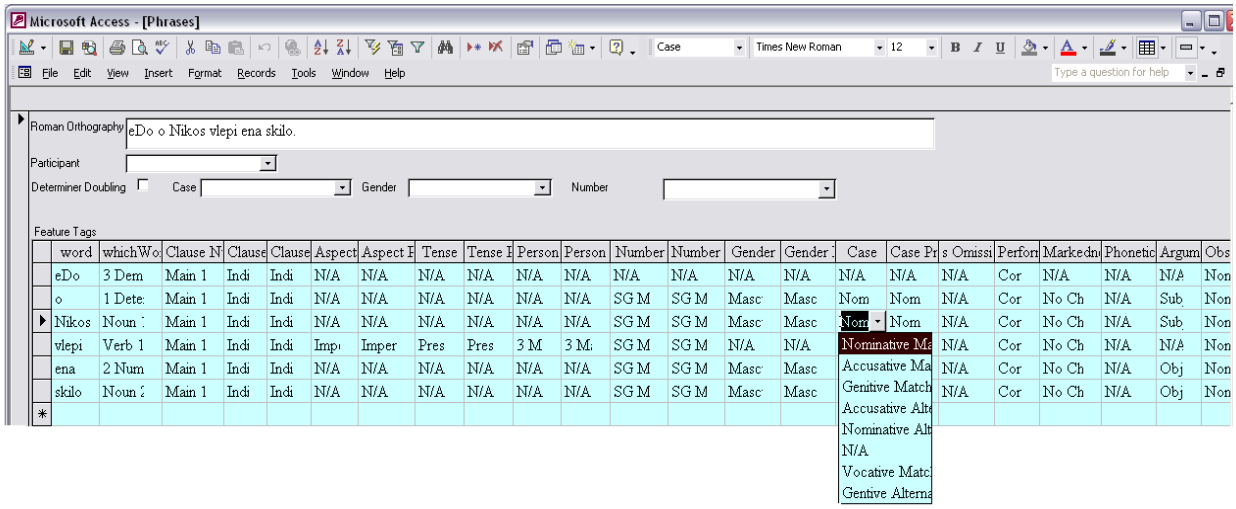


FIGURE 4.9: EXAMPLE OF WORD TAGGING IN THE DATABASE

Next to the first column labelled *word*, there are one hundred other columns.[53] Each column marks the feature value inflected on the target word (nominal or verbal), whether it was used as targeted, the evaluation of the feature use, etc. A number of columns note phonetic, structural, or other relevant information information concerning a produced form, in a specific structure. These come after the ones seen in the figure above. Note that each word can be traced back to each utterance, each utterance can be traced back to each participant, each experiment and experimental task. Each word can receive only one tag (e.g. feature value) per cell. When a word

[52] Only a small number of columns are shown due to limited space.
[53] This number excludes a column for token number and a column for phrase identity, connecting individual words to the structure/sentence they were produced in.

lacks any of the features listed below for each column, the label non-applicable (*N/A*) is selected. Next, I give a brief description of database setup and column contents.

4.6.2 Constructing the Database

The labels and consequently the columns are created based on my research question, i.e. on the participants' use of Tense, *S/V* agreement and Case. The way the database is organised helps address the *analytical issues* resulting from past research, as raised in *Chapter 2*. Specifically, the database was constructed to study the ways a surface form deviates from a target form. I take into consideration all features inflected on a word to evaluate the use of a grammatical word production and utterance production. Furthermore, I also keep records of any additional features inflected on a word, other than those targeted (Tense, *S/V* agreement and Case), to test potential effects on the domain I am investigating. Furthermore, I consider factors, which are not morpho-syntactic but rather relate to articulation and phonology. In evaluating words, I use a combination of *Performance* and *Type-of-Change*[54] system, where I note the appropriate or inappropriate use of a word and the way it resembles or deviates from what is expected or targeted in the specific context. In addition, each feature is evaluated separately based on (i) whether it was a match with what was targeted and (ii) the structural environment in which it was used. This is a helpful technique that allows for easier detection of the general source of a potential impairment.

In summary, the database was set-up in a way that any information about a specific word (morpho-syntactic, phonetic or phonological), feature, feature value or structural environment would be readily available. In addition, the format of the database allowed me to take into account effects from factors external to my research question (e.g. clause type, verb inflection,

[54] An explanation on how this label is used to evaluate entire word productions is given in *Appendix B*.

when considering Nominative Case on a subject, articulatory restrictions), or effects from a certain combination of features that could potentially affect an entire feature in general or a specific feature value.

4.6.3 Column Contents

Most columns in the database are comprised of three column sets. The first column labels the target/expected feature (e.g. *Nominative*), the second column tags the feature used in the production and whether (i) it matched the targeted feature or not (i.e. *Nominative Match*), or (ii) when the feature was altered from the targeted one (i.e. *Nominative Alternative*), discussed in detail at the beginning of *Chapter 6*. The third column evaluated the surface feature (production), based on what was targeted ***and*** how it was used in the specific structure or context it surfaced (*Correct*, *Incorrect*, or *Non Applicable*).

Sets of three columns were available for: *Clause Type* (Indicative, Subjunctive, Interrogative, etc.), *Aspect* (Perfective and Imperfective), *Tense* (Present, Past, Dependent and Imperative), *Person* (1st, 2nd and 3rd), *Number* (Singular and Plural), *Gender* (Masculine, Feminine and Neuter) and *Case* (Nominative, Accusative, Genitive and Vocative). The first column tags the word for the targeted features and information. The second column tags information on the productions, and specifies whether a feature was used as targeted or as an alternative to another feature value. The third column evaluates the production (*Correct, Incorrect, NA*) based on: (i) what was targeted and (ii) the structural environment the production was uttered. More details are given in *Appendix B*.

/s/ and */n/ Omission-Production* for each word position (in word-initial, word-medial and word-final positions) are analysed with information noted on three separate columns: Column 1 marks *Omission*, *Production* and *Substitution*, Column 2 marks the production of /s/ and /n/ in targeted forms and Column 3 marks the phonological environment (Consonant-Consonant-Vowel (CCV), Consonant-Vowel (CV), and Consonant-Vowel-Consonant (CVC)).

Additionally, there were a number of columns that were paired into a set of two columns. These columns contained data involving the evaluation of phonemes (/e/, /p/, /t/, /k/, /f/, /θ/, /ʃ/, /x/, /v/, /ð/, /z/. /γ/, /ɾ/, /l/ and /m/): production, omission, and substitution and the phonological environment they were produced in. Finally, there were a number of columns specifying general *Observations* on a specific word/utterance, *Argument Type* (Subject, Object, etc.), *Performance* (Correct, Incorrect, etc.), *Nature of Change* (no change, Phonetic or Phonological, Morpho-syntactic, etc.), *Lexical Category* (verb, noun, conjunction etc.) and *Word* (actual word production). There were also individual columns, marking whether the inflectionally related sounds /s/ and /n/ were targeted and/or produced in an inflectional or non-inflectional environment, which totalled to six columns, one for each phoneme, for each word position.

4.6.4 Tagging Conventions

In this section I explain the methodology of tagging and terminology used to evaluate the participants' productions. Values included in each column allow us to retrieve the contextual information for each word. Moreover, tagging enables us to label grammatical features inflected on the word (where applicable) as well as sound changes. Additional information concerning the structural and phonological environment the words might be involved also is noted. For example, I was able to keep a record of information such as failing to do subject to object raising

(structural), or omitting a vowel to prevent hiatus (phonological information). Next, I give a brief description of how labels for feature values were selected.

As discussed in *Chapter 3*, this study investigates performance relative to the following grammatical features: Aspect, Tense, Person and Number for verbs, and Person, Number, and Case for nouns. Each of these features has two, three, or four values. For example, the values for Case are Nominative, Accusative, Genitive and Vocative. I give a more extensive illustration of the assessment of productions, based on whether they matched or differed from what was targeted (by the experimental stimuli in controlled elicitation) or expected (in the free elicitation tasks) in *Chapter 6*, before I move on to discuss the results. Here, I simply mention that data evaluation for individual features is based on two factors: (i) what each task is targeting and (ii) the structural environment in which the actual production surfaces.

When the appropriate value for a feature is used in exactly the same manner as in the adult CG_{TD} Grammar, the value for this feature is considered a *Match* and is labelled as such (*Feature Value + Match*). In case the participant produced a form, which differed from either the one targeted by the experimental stimulus or else expected to be present in uncontrolled speech, then that feature is considered an *Alternative* (*Feature Value + Alternative)* to the targeted value. Alternative uses of a feature value can either be grammatical or ungrammatical.

4.7 STATISTICAL ANALYSIS

To statistically analyse the collected data I used the statistical program SPSS. The *Independent Samples t-test* and *Paired Samples t-test* were used to compare the means of production, omission and alternative use (morpho-syntactic analysis) or substitution (phonetic analysis) of

each participant of the CG_{DS} group to each participant of the CG_{TDC} group. I used a confidence level of 0.95 for both tests. Therefore, the cut-off point for a result to be considered significant is lower than 0.05.

The *Independent Samples t-test* was used to compare the means of a certain feature or feature value from the participants of the CG_{DS} group to the means of the same feature or feature value from the CG_{TDC} control group. Statistical comparison with inflectional features focused on (a) Global Production *(Overall Correct vs. Incorrect*, only Alternative use (*Correct vs. Incorrect*, given in *Appendix D*), and *Overall Target – Omission*, as represented in the results tables found in *Chapter 6*. The *Independent Samples t-test* was used based on the fact that that two different groups that included different individuals (i.e. the samples were independent of each other) were tested, and the participant number across groups, as well as the number of tokens produced by each participant differed within and across groups. The INDEPENDENT variable was the participant group/type (CG_{DS} or CG_{TDC}) and the DEPENDENT variable was the participants' means with regards to the inflectional feature tested in each case. The same test was also used to compare the participants' means of consonant omissions and substitutions across groups. The INDEPENDENT variable was the participant group/type (CG_{DS} or CG_{TDC}) and DEPENDENT variable tested was the participants' mean production, omission or substitution of a phoneme with two levels of comparison (e.g. *Production* vs. *Omission* and *Production* vs. *Substitution*).[55] The *Means* (*M*), *Standard Deviation* (*SD*), and *Standard Error* (*Std Error*) for each participant group

[55] Means are calculated based on a two-way comparison (*Omission* + *Production* or *Production* + *Substitution*) as a type of a "zoom-in" strategy, as opposed to the percentages given in tables, that are calculated based on the overall total for each phoneme in both *CCV* and *CV* environments, found on the left hand-side for each group (*Production* + *Omission* + *Substitution*). This may result to a slight variation in means. This was considered necessary because on some occasions omission (e.g. final /s/) is more characteristic of a sound than substitution and vice versa (e.g. /θ/). Therefore, the goal was to focus the statistical analysis to the particular phonetic process, given what was produced and what was either omitted, or substituted, eliminating external factors (a philosophy of analysis followed throughout this dissertation).

for each feature value (or consonant) is provided. Additionally, I provide the *t-value* (*t*), *degrees of freedom* (*df*) and *p-value* (*p*) resulting from the comparison between the two groups. Based on results from prior research, the following two hypotheses were tested:[56]

> ***Null Hypothesis I***: there is a non-significant difference between the mean correct productions or omissions of CG_{DS} and CG_{TDC} with a given feature or feature value,
>
> ***Alternate Hypothesis I***: there is a significant difference between the mean correct productions or omissions of CG_{DS} and CG_{TDC} with a given feature or feature value.

The *Paired Samples t-test* was used for within group comparisons, to compare each group's performance with a specific consonant in two different environments. The *Paired Samples t-test* compares the means of two variables that come from the same individuals (i.e. one group). Therefore, separate tests were conducted for the CG_{DS} and CG_{TDC} group. The two variables where: the participant' mean omissions or substitutions in (i) the given phonological environments *CCV* (VARIABLE I) or *CV* (VARIABLE II) or (ii) *Potential Morpho-Syntactic Effects* (VARIABLE I) or *Purely Phonetic/Phonological Effects* (VARIABLE II) caused by the omission or substitution of /s/ or /n/ in the three word positions. I provide the *Means* (*M*), *Standard Deviation* (*SD*), and *Standard Error* (*Std Error*) for each VARIABLE and the *t-value* (*t*), *degrees of freedom* (*df*) and *p-value* (*p*) resulting from the comparison. Two hypotheses were tested:

> ***Null Hypothesis II***: there is a significant difference between the mean /s/ or /n/ omissions or substitutions (of either CG_{DS} or CG_{TDC}), when they occur either (i) in a *CV* or *CCV* environment, or (ii) cause *Potential Morpho-Syntactic or Purely Phonetic/Phonological Effect*
>
> ***Alternate Hypothesis II***: there is a non-significant difference between the mean /s/ or /n/ omissions or substitutions (of either CG_{DS} or CG_{TDC}), when they occur either

[56] Based on the experimental and /theoretical assumptions resulting from *IIH* and the idea that *IIH* reduces to *EOI*, the reverse could also be true, namely the null hypothesis would be that there are significant differences,

(i) in a *CV* or *CCV* environment, or (ii) cause *Potential Morpho-Syntactic or Purely Phonetic/Phonological Effect*.

For comparison, statistical analysis for /s/ and /n/ based on the overall means (*Omission*, *Production* and *Substitution* in both *CCV* and *CV*), for within and across group comparisons, as presented in the results tables in *Chapter 5*, are given in *Appendix C*.

4.8 SUMMARY

In this chapter I presented information on the methodology used in this study. Specifically, I gave detailed information on participant groups, procedure and elicitation methods. I presented an overview of the experiments designed to test the CG_{DS} and CG_{TD} children's production of Tense, *S/V* agreement, and Case. I showed the large number of inflectional structures and diverse vocabulary employed to test the specific environments where we find Tense, *S/V* agreement and Case, as presented in *Chapter 3*. The methodology employed, controlling for factors related to and external to morpho-syntax, played an important role in determining whether the differences between the two participant groups are syntactically, morphologically, or phonetically and phonologically conditioned. Finally, I gave an overview of the database set-up and general information on the statistical method used to analyse the resulting data.

Chapter 5

Phonetics and Phonology: Results and Analysis

5.1 INTRODUCTION[57]

The *IIH* is based on languages like English, which have limited inflectional marking. Strikingly, many inflectional affixes contain sounds which have independently been reported problematic for Eng_{DS}, for instance, the consonant /s/ (especially in word-final positions). Specifically, it has been reported that Eng_{DS} have problems with specific sounds like /ɾ/[58], /l/, /θ/, /ð/, /f/, /v/, /z/, /s/. For such sounds, there are two strategies Eng_{DS} may use: omission or substitution, through a number of phonological processes. Finally, it has been observed by Stoel-Gammon (1980, 1981), among others, that Eng_{DS} tend to reduce consonant sequences (e.g. complex onsets or codas) and omit word-final consonants in general.

The goal of this study is to investigate whether these phonetic and phonological problems may be a contributing factor to the effect of *IIH*. In order to determine whether the differences between CG_{DS}, CG_{TDC}, and CG_{TD} Grammar are syntactically, morphologically or phonetically and phonologically conditioned, we first need to establish the articulatory difficulties CG_{DS} are facing and whether these have an effect on the produced features. *Phonetically* conditioned

[57] For transcription conventions and an example of how data were transcribed please see *Section 4.5* above, as well as the *Abbreviations and Conventions Section* in the list of features, abbreviations and conventions.
[58] CG has both trill and flap consonants. I treat these as a group throughout and represent them with the phoneme /ɾ/.

differences are due to the distinct physiology of the articulation apparatus, as reported in previous literature. In contrast, the nature of phonologically conditioned differences is either based on the syllable structure, the phonological environment (word position, or whether a consonant is an onset or a coda consonant), or other factors related to the phonological features carried by a phoneme. I will show that articulatory restrictions affect the production of inflectional affixes. In this chapter I identify and summarise all phonetic and phonological changes, observed in CG_{DS} and CG_{TDC}. Sound production, omission, and substitution are examined relevant to the phonological environment (*CCV*, *CV* or *(C)VC*[59] syllable type) in word-initial, word-medial, and word-final positions). Moreover, in addition to investigating sound omission and sound substitution in general, I separate sounds into two categories: (i) those included in inflectional suffixes (/s/ and /n/) and (ii) those that are not part of an inflectional suffix. I show that in both cases there is a consistent pattern of sound omission and substitution, independent of which category they belong to. This is important since some of these changes could be mistaken as being morpho-syntactically conditioned. However, I also show that articulatory and phonological restrictions alone do not suffice to explain all of the data. There are still problems that can only be explained as morpho-syntactically triggered.

The chapter is organised as follows. I first present the results on consonant omissions (*Section 5.2*). They are classified into two groups: (i) omissions that do not have an effect on the inflectional features carried by the surfacing form, and (ii) omissions, which appear to cause a change on the inflection of produced forms. In *Section 5.3*, I present an overview of the results on consonant substitutions, with a more detailed examination on substitutions divided into (i) substitutions which do not have an effect on the inflectional features surfacing on a nominal

[59] *(C)VC* usually occurred in word-final positions.

expression (*Section 5.3.1*) and (ii) substitutions involving the phoneme /s/ and /n/, that appear to have morph-syntactic effects on produced forms (*Section 5.3.2*). In *Section 5.4*, I discuss the participants' performance with the vowel /ɛ/. In *Section 5.6*, I discuss the significance of the phonetic and phonological results, presented in *Sections 5.2* through *5.4*, with regards to (i) the articulatory challenges CG_{DS} face and (ii) for the study of the participants' morpho-syntax.

5.2 CONSONANT OMISSION

A large number of consonant omissions were identified both in the CG_{DS} and in the CG_{TDC} productions. Overall, CG_{TDC} omitted consonants less frequently than CG_{DS}. In this section, I present results on the omission of consonants. In particular, I divide this section into two parts: in *Section 5.2.1*, I discuss all consonant omissions, with the exception of /s/ and /n/ and second, in *Section 5.2.2*, I examine the omission of /s/ and /n/ separately, since they are the only two consonants with inflectional value (i.e. found in inflectional suffixes).

Results from consonant omissions and substitutions can clarify whether problems with the participants' productions are due to morpho-syntactic, phonetic, and/or phonological restrictions. Furthermore, with the results from the participants' productions we can conclude whether or not morpho-syntactic differences between CG_{DS}, CG_{TDC} and CG_{TD} Grammar correlate with phonetic and/or phonological restrictions. A detailed discussion on the possible morpho-syntactic effects caused by sound omission and substitution is given in *Section 5.6*.

5.2.1 Overview of Consonant Omissions

As illustrated below, while some consonant omissions occur as a result of consonant cluster simplification/reduction (phonological), others seem to be a result of CG_{DS} articulatory

limitations, i.e. difficulty producing certain sounds due to the particularities of their articulators, tongue, lips etc. (phonetic).

Omissions are categorised in terms of manner of articulation. *Table 5.1* shows the distribution of consonant omissions, giving details on the overall number of tokens, the number of omissions and the proportions of omissions based on the overall use of each consonant. As stated above /s/ and /n/ are examined separately. Sounds from full-word omission and affix omission are not included in any of the tables throughout *Chapter 5*.

			CG$_{DS}$						CG$_{TDC}$			
			Production		Omission				Production		Omission	
	Tokens		N	%	∅	%	**Tokens**		N	%	∅	%
Voiceless Stops	**/p/ 3,948**	CCV	476	12.1%	68	1.7%	**/p/ 4,200**	CCV	586	14%	13	0.3%
		CV	3,163	80.1%	76	1.9%		CV	3,564	84.9%	6	0.1%
		CVC	11	0.3%	1	0.02%		CVC	7	0.2%	2	0%
	/t/ 5,927	CCV	2,304	38.9%	92	1.6%	**/t/ 6,614**	CCV	2,300	34.8%	16	0.2%
		CV	3,244	54.7%	239	4%		CV	4,196	63.4%	38	0.6%
		CVC	4	0.1%	3	0.1%		CVC	0	0%	0	0%
	/k/ 3,961	CCV	842	21.3%	92	2.3%	**/k/ 4,514**	CCV	1,168	25.9%	14	0.3%
		CV	2,638	66.6%	76	1.9%		CV	3,286	72.8%	13	0.3%
		CVC	1	0.03%	2	0.05%		CVC	5	0.1%	0	0%
Voiceless Fricatives	**/f/ 1,046**	CCV	344	32.9%	106	10.1%	**/f/ 1,544**	CCV	620	40.2%	5	0.3%
		CV	473	45.2%	12	1.2%		CV	901	58.4%	0	0%
		CVC	5	0.5%	0	0%		CVC	1	0.1%	0	0%
	/θ/ 850	CCV	119	14%	78	9.2%	**/θ/ 979**	CCV	457	46.7%	1	0.1%
		CV	303	35.6%	14	1.6%		CV	495	50.6%	2	0.2%
		CVC	35	4.1%	0	0%		CVC	1	0.1%	0	0%
	/x/ 1,483	CCV	415	28%	161	10.9%	**/x/ 1,355**	CCV	833	61.5%	17	1.3%
		CV	792	53.4%	14	0.9%		CV	487	35.9%	0	0%
		CVC	39	2.6%	0	0%		CVC	8	0.6%	0	0%
Voiced Fricatives	**/v/ 1,154**	CCV	349	30.2%	233	20.2%	**/v/ 1,650**	CCV	1,024	62.1%	48	2.9%
		CV	447	38.7%	22	1.9%		CV	565	34.2%	1	0.1%
		CVC	1	0.1%	0	0%		CVC	3	0.2%	0	0%
	/ð/ 860	CCV	35	4.1%	8	0.9%	**/ð/ 1,524**	CCV	88	5.8%	1	0.1%
		CV	548	63.7%	139	16.2%		CV	1,411	92.6%	13	0.9%
		CVC	9	1%	0	0%		CVC	3	0.2%	0	0%
	/z/ 691	CCV	322	46.6%	55	8%	**/z/ 624**	CCV	296	47.4%	3	0.5%
		CV	261	37.8%	4	0.6%		CV	315	50.5%	3	0.5%
		CVC	3	0.4%	0	0%		CVC	3	0.5%	0	0%
	/ɣ/ 740	CCV	90	12.2%	65	8.8%	**/ɣ/ 988**	CCV	197	19.9%	5	0.5%
		CV	502	67.8%	47	6.4%		CV	777	78.6%	3	0.3%
		CVC	1	0.1%	0	0%		CVC	0	0%	0	0%
Trill/ Flap	**/ɾ/ 3,294**	CCV	803	24.4%	519	15.8%	**/ɾ/ 3,713**	CCV	1,895	51.0%	46	1.2%
		CV	1,481	45%	361	11%		CV	1,737	46.8%	19	0.5%
		CVC	4	0.1%	3	0.1%		CVC	3	0.1%	0	0%
Lat. App	**/l/ 2,696**	CCV	626	23.2%	40	1.5%	**/l/ 3,069**	CCV	869	28.3%	4	0.1%
		CV	1,794	66.5%	178	6.6%		CV	2,176	70.9%	10	0.3%
		CVC	4	0.1%	5	0.2%		CVC	2	0.1%	0	0%

TABLE 5.1: DISTRIBUTION OF CONSONANT OMISSION BY CG$_{DS}$ AND CG$_{TDC}$

Table 5.1 shows that CG$_{DS}$ participants have a general problem with consonant production regardless of manner of articulation or syllable environment, though consonant omission involving *CCV* syllables is the most common of the three examined here. However, notice also that there is at least one consonant in all categories which usually has more omissions than all

remaining consonants in that category for both CG_{DS} and CG_{TDC}. A considerable number of omissions are found with the stop /t/: 334 for CG_{DS} and 54 for CG_{TDC}. Most omissions are observed in *CV* syllable environments. /t/ has been argued to be the most underspecified sound, lacking any phonological feature specification (Stoel-Gammon and Stemberger 1994). The omission of /t/ is crucial for our purpose because in some environments the result is accidentally of the same form as another form with different surfacing inflectional features. An analysis on the effects of /t/ omission is pursued in *Section 5.6*.

With regards to voiceless fricatives, in terms of percentages, all three voiceless fricatives examined are omitted equally frequently. In terms of numbers though, a large number of omissions with /x/ was observed for both CG_{DS} (175 omissions) and CG_{TDC} (17 omissions), especially in consonant cluster environments. Moreover, we see a large percentage of omissions with /v/, especially word-initially. CG_{DS} exhibit a higher percentage of /v/ omission, especially in a consonant cluster than CG_{TDC}: 20.2% (233) versus 2.9% (48), correspondingly. In fact, omission of /v/ exhibits the highest percentage of omission for both participant groups across this set of sounds, compared to the other consonant omissions. 95% of the time /v/ is omitted it results in a cluster reduction of word-initial /vl/ to [l].

CG_{DS} seem to also have difficulties with the trill/flap, especially word-medially. For both groups /ɾ/ is more frequently omitted within a cluster than in a *CV* syllable. Word-initial /ɾ/ is not as frequent as word-medial /ɾ/, while word-final /ɾ/ is very uncommon and only found in borrowings. It should be noted that /ɾ/ is cross-linguistically difficult and is one of the last sounds to be acquired by typically developing chldren, as reported in *Section 2.4*.

Independent Samples t-tests were conducted to compare the means of omissions across the 16 CG_{DS} and 17 CG_{TDC} participants. They test two variables; the INDEPENDENT variable tested is the group type, with two levels of comparison (CG_{DS} and CG_{TDC}) and the DEPENDENT variable tested is the participants' means of omission of /s/, /n/ or all other consonants tested in this research. Results are given in *Table 5.2*. The first section of the table summarises the *Means* (sums up the percentage of consonant omission recorded by each participant in each group), e.g. on average, CG_{DS} omitted /p/ 3.7% of the time they needed to produce it), *SD* and *Std Error* for each participant group and the second part gives the *t*-value, *degrees of freedom* and *p*-value resulting from the group comparison.

STATISTICAL COMPARISON ACROSS GROUPS - OMISSION									
	CG_{DS}			CG_{TDC}					
C	*M*	*SD*	*Std. Error*	*M*	*SD*	*Std. Error*	*t*	*df*	*p*
/p/	.046	.042	.010	.005	.005	.001	4.06	31	<.001
/t/	.068	.051	.013	.008	.007	.002	4.79	31	<.001
/k/	.049	.040	.010	.006	.005	.001	4.40	31	<.001
/f/	.157	.143	.036	.004	.009	.002	4.10	31	<.001
/θ/	.296	.237	.059	.004	.008	.002	5.09	31	<.001
/x/	.129	.115	.029	.013	.018	.004	4.09	31	<.001
/v/	.248	.204	.051	.029	.052	.013	4.30	31	<.001
/ð/	.255	.192	.048	.010	.011	.003	5.24	31	<.001
/z/	.118	.106	.027	.012	.024	.006	4.02	31	<.001
/γ/	.168	.101	.025	.009	.012	.003	6.42	31	<.001
/ɾ/	.318	.191	.048	.018	.033	.008	6.40	31	<.001
/l/	.091	.081	.020	.005	.005	.001	4.40	31	<.001

TABLE 5.2: STATISTICAL COMPARISON OF CONSONANT OMISSIONS ACROSS PARTICIPANT GROUPS

Statistical comparison reveals a highly significant difference between the CG_{DS} and CG_{TDC} overall performance with all phonemes: CG_{DS} are more likely to omit any of the consonants listed in *Table 5.2* than CG_{TDC}. It is evident from the means, however, that the percentage of omissions is low for almost all consonants apart from /ɾ/, /v/, /ð/, and /θ/.

Paired Samples t-tests were also performed to compare the participants' means of consonant omission and production in the given phonological environments (*CCV* and *CC*), separately for each group, as well as across groups. That is, I was testing whether participants are more likely to omit a consonant in a *CCV* rather than a *CV* environment. The INDEPENDENT variable tested is the phonological environment, with two levels of comparison (*CCV, CV*) and the DEPENDENT variable tested is the participants' production or omission of e.g., /p/ with two levels of comparison (*Production vs. Omission*). Results for CG_{DS} revealed a statistically significant difference with regards to the omission or production of a consonant in a specific environment. That is, based on the means comparison, CG_{DS} are more likely to omit a consonant in a *CCV* environment rather than a *CV* environment in all cases apart for /ð/ and /l/. I hypothesise that some of these results might potentially be due to a frequency effect of the specific environment.

STATISTICAL COMPARISON WITHIN GROUPS - OMISSION									
CG_{DS}	**CCV**			CV					
C	*M*	*SD*	*Std. Error*	*M*	*SD*	*Std. Error*	*t*	*df*	*p*
/p/	.196	.202	.051	.027	.032	.008	3.68	15	.002
/t/	.044	.037	.009	.096	.090	.023	-2.93	15	.010
/k/	.094	.097	.024	.030	.029	.007	2.76	15	015
/f/	.294	.271	.068	.025	.030	.008	3.99	15	.001
/θ/	.621	.351	.088	.044	.053	.013	6.89	15	<.001
/x/	.340	.291	.073	.021	.029	.007	4.37	15	.001
/v/	.417	.320	.080	.059	.071	.018	4.55	15	<.001
/ð/	.260	.404	.101	.256	.191	.048	0.05	15	**.963**
/z/	.220	.198	.050	.020	.069	.017	4.21	15	.001
/γ/	.433	.253	.063	.093	.074	.019	5.65	15	<.001
/ɾ/	.439	.216	.054	.238	.216	.054	3.68	15	.002
/l/	.083	.105	.026	.093	.078	.020	-0.60	15	**.555**

TABLE 5.3: STATISTICAL COMPARISON OF CONSONANT OMISSIONS WITHIN GROUPS: CG_{DS}

The phonological environment does not always play a significant role in the omission of consonants by CG_{TDC}. Environment did play a significant role for /p/, /k/, /x/ and /γ/ and marginally for /v/.

STATISTICAL COMPARISON WITHIN GROUPS - OMISSION									
CG_{TDC}	CCV			CV					
C	*M*	*SD*	*Std. Error*	*M*	*SD*	*Std. Error*	*t*	*df*	*p*
/p/	.023	.027	.007	.002	.003	.001	3.34	16	.004
/t/	.007	.007	.002	.010	.011	.003	-0.81	16	.430
/k/	.013	.016	.004	.004	.004	.001	2.63	16	.018
/f/	.009	.019	.005	.000	.000	.000	1.89	16	.077
/θ/	.004	.016	.004	.005	.013	.003	-0.39	16	.891
/x/	.021	.028	.007	.000	.000	.000	3.09	16	.007
/v/	.042	.078	.019	.003	.010	.002	2.09	16	.053
/ð/	.007	.030	.007	.010	.012	.003	-0.38	16	.711
/z/	.022	.051	.012	.009	.021	.005	1.26	16	.252
/γ/	.026	.042	.010	.003	.007	.002	2.21	16	.042
/ɾ/	.029	.057	.014	.010	.019	.005	1.90	16	.076
/l/	.004	.009	.002	.005	.006	.001	0.02	16	.982

TABLE 5.4: STATISTICAL COMPARISON OF CONSONANT OMISSIONS WITHIN GROUPS: CG_{TDC}

Below, I give examples of omission from each manner of articulation included in *Table 5.1*. The periods between sounds in the word mark syllable breaks. The participant identity is marked by the abbreviation in italic-bold following each production.

(5.1)	Suggested CG_{TD} Utterance		Participant Production		Consonant Omitted
(a)	***p***ca.(-u-).men[60] *take.PRF-DEP.1.PL*	➡	∅ca.-me *take.PRF-DEP.1.PL*	***AI***	*Stop*
(b)	***v***le.p-i/ *see.IMPF-PRES.3.SG*	➡	∅le.p-i *see.IMPF-PRES.3.SG*	***AI***	*Fricative*
(c)	γ***l***i.k-a *sweet-NEU.NOM.PL*	➡	γ∅i.k-a *sweet-NEU.NOM.PL*	***EA***	*Lateral Approximate*
(d)	***ɾ***u.x-a *cloth-NEU.ACC.PL*	➡	∅u.x-a *cloth-NEU.ACC.PL*	***EA***	*Tap/Flap*

In the CG_{DS} production *∅ca-me*, when compared with the CG_{TDC} production ***pca-(u)men***, we see that *AI* omits the word-initial /p/. This omission results in cluster reduction from /pc/ to [c]. The same is also true for (5.1b) and (5.1c), while (5.1d) is a case of a singleton omission. In general,

[60] Productions are represented in the IPA. For ease of exposition, I chose to use broad representation for the vowels. Note that the IPA equivalent for /a/ is /ɐ/, for /o/ is /ɔ/, for /e/ is /ɛ/, for /u/ is /u/ and for /i/ is /i/.

the greatest percentage of consonant omissions reported is a result of complex onset simplification, i.e. omission of the first consonant in an onset consonant cluster. We do, on occasion, find omission of the second consonant in a complex onset (5.1c) or consonant omission in *CV* syllables. Further analysis on the nature of the clusters and stress pattern where we find consonant omission might also offer valuable information on the nature of consonant omissions.

5.2.2 Consonant Omissions Affecting Inflectional Features

In this section I discuss /s/ and /n/ omission, the only consonants found in inflectional marking. The omission of /s/ and /n/ is sub-divided into two categories: (i) sound omissions with no ambiguity in the inflectional features marked on a verb or a nominal phrase and (ii) /s/ and /n/ omissions which cause a form to have different phonetic realisation, than the word targeted, and coincidentally resemble forms with different morpho-syntactic features. /s/ omission is examined in three separate word positions because different inflectional features are affected by its omission: (i) an aspectual affix in word-medial position, and (ii) Person features on verbs and Case and Gender features on nominal expressions in word-final position. These are discussed in more detail throughout this chapter.

I start with a presentation of results on the participants' use of /s/, which is the most affected sound, independent of its word position. *Table 5.5* summarises the participants' omissions of /s/, giving details on the overall number of tokens, the number of omissions and the proportions of omissions based on the overall use of /s/ in word-initial, word-medial and word-final position in *CCV*, *CV* and *CVC* environments.

CG$_{DS}$						CG$_{TDC}$					
/s/		Production		Omission		/s/		Production		Omission	
Tokens		N	%	N	%	Tokens		N	%	N	%
Initial 1,128	CCV	449	39.8%	226	20%	**Initial 1,691**	CCV	998	59%	5	0.3%
	CV	359	31.83%	26	2.3%		CV	685	40%	3	0.18%
	CVC	0	0%	0	0%		CVC	0	0%	0	0%
Medial 2,228	CCV	1,010	45.33%	274	12.3%	**Medial 2,252**	CCV	1,108	49.20%	22	0.98%
	CV	819	36.76%	32	1.44%		CV	1,091	48.40%	17	0.75%
	CVC	0	0%	0	0%		CVC	0	0%	0	0%
Final 2,766	CCV	0	0%	0	0%	**Final 4,060**	CCV	0	0%	0	0%
	CV	0	0%	0	0%		CV	0	0%	0	0%
	CVC	1,103	39.88%	1,499	54.2%		CVC	3,894	95.90%	152	3.74%
6,122		3,740	61.09%	2,057	33.6%	**8,003**		7,776	97.16%	199	2.49%

TABLE 5.5: DISTRIBUTION OF /S/ OMISSION BY CG$_{DS}$ AND CG$_{TDC}$

Table 5.5 shows that there is an uneven distribution of /s/ omission across the two groups. While the overall /s/ omission rate for CG$_{DS}$ is 33.6%, for CG$_{TDC}$ it is only 2.49%. Furthermore, most of the omitted sounds for both groups occur in *word-final* position; 54.2% of the CG$_{DS}$ overall expected final /s/ occurrences and 3.74% of the CG$_{TDC}$ overall /s/ occurrences are omitted. This is in accordance with previous literature on the phonetic and phonological performance of Eng$_{DS}$. Specifically, in previous work researchers report a general problem with word-final consonants (Stoel-Gammon 1980, Stoel-Gammon 1981, *inter alia*) (regardless of whether the sound is problematic in general) but also a specific problem with the consonant /s/.

Concerning /s/ in *word-initial* positions, we see that CG$_{DS}$ participants still exhibit a high percentage of /s/ omission, though much lower compared to final /s/ omissions. A closer examination of the data revealed that 20% of the overall initial /s/ in targeted words was omitted in a consonant cluster with almost always a stop, usually /t/ (19% out of 20%), or rarely the fricative /x/ (1% out of 20%). Past literature on the phonetic and phonological abilities of CG$_{DS}$ found a tendency to simplify complex consonant sequences. A small percentage of /s/ omissions in *CV* environments were also observed in both groups. Therefore, in this case, syllable structure facilitates the omission of /s/ further to the already existing articulatory difficulties.

The percentage of omission for *word-medial* /s/ is the lowest of all word positions: 12.3% for CG_{DS} and 1% for CG_{TDC}. Thorough phonological analysis of word medial /s/ shows that in this case omission is mostly observed in /st/ clusters (90%) for both groups. It was further observed that medial /s/ is also omitted in /sp/ and /sm/ clusters. On rare occasions, word medial omission is also observed in *CV* syllables. Next, I provide results on the statistical comparisons performed.

STATISTICAL COMPARISON ACROSS GROUPS - OMISSION									
	CG_{DS}			CG_{TDC}					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /s/	.265	.173	.043	.004	.007	.002	6.19	31	<.001
Medial /s/	.146	.101	.025	.017	.015	.004	5.24	31	<.001
Final /s/	.612	.310	.078	.038	.024	.006	7.61	31	<.001

TABLE 5.6: STATISTICAL COMPARISON OF /S/ OMISSION ACROSS PARTICIPANT GROUPS

Statistical comparison reveals a highly significant difference on the CG_{DS} and CG_{TDC} overall performance with /s/ in all three word positions, such that CG_{DS} omit /s/ in all word positions more frequently than CG_{TDC}. Results in *Table 5.7* verify that the omission of /s/ for CG_{DS} was affected by phonological environment, such that /s/ was more frequently omitted in a *CCV* than in a *CV* environment for word-initial and word-medial /s/. Statistical comparison was not applicable for word-final /s/, since it is only found in *(C)VC* environments.

STATISTICAL COMPARISON WITHIN GROUPS – OMISSION									
CG_{DS}	**CCV**			**CV**					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /s/	.356	.210	.052	.112	.185	.046	4.59	15	<.001
Medial /s/	.215	.150	.038	.054	.092	.023	4.06	15	.001
Final /s/	------	------	------	------	------	------	------	-----	------

TABLE 5.7: STATISTICAL COMPARISON OF /S/ OMISSION WITHIN GROUPS: CG_{DS}

This is, however, not the case for CG_{TDC}; the *Paired Samples t-tests* comparing the means of CG_{TDC} productions and omissions in *CCV* and *CV* syllables showed that the phonological environment did not play a role on the omission of word-initial and word-medial /s/.

STATISTICAL COMPARISON WITHIN GROUPS – OMISSION									
CG_{TDC}	CCV			CV					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /s/	.005	.008	.002	.005	.012	.003	-0.14	16	.888
Medial /s/	.018	.022	.006	.015	.018	.005	0.52	16	.609
Final /s/	------	------	------	------	------	------	------	----	------

TABLE 5.8: STATISTICAL COMPARISON OF /S/ OMISSION WITHIN GROUPS: CG_{TDC}

An example of /s/ omission in each word position is given in (5.2):

(5.2)	Suggested CG_{TD} Utterance		Participant Production	Word Position
(a)	***sp***í.t-i *house-NEU.SG.ACC*	➡	∅pí.t-i *house-NEU.SG.ACC*	*Initial*
(b)	ku.ra.***sm***é.n-i *tired-FEM.SG.NOM*	➡	ku.ra.∅mé.n-i *tired-FEM.SG.NOM*	*Medial*
(c)	γa.la.n-***ós*** blue-*MASC.**NOM**.SG*	➡	γa.la.n-ó∅ blue-*MASC.**ACC**.SG*	*Final*

The examples in (5.2) show /s/ omission in word-initial, word-medial and word-final positions. While in (5.2a) and (5.2b) the /s/ omission results in cluster simplification of the onset, in (5.2c) the omission of final /s/ in a coda position results in a Vowel-only syllable (hereinafter, *V*), instead of a *VC* syllable.[61] The stress pattern does not seem to have an effect on /s/ omission.

In sum, /s/ appears to be problematic for CG_{DS} in all word positions. Consonant cluster simplification with *CCV* syllables is the most common effect of /s/ omission in word-initial and word-medial positions, though we find /s/ to be omitted in *CV* syllables as well. Word-final /s/

[61] In general, word-final codas in unstressed syllables are commonly subject to deletion in English, for young typically developing children, and also for older children with protracted phonological development (Bernhardt and Stemberger 1998). Such a tendency was also observed with CG_{DS}, especially with the name *Nik-os*, though not evident above (see later examples). Such a categorization (stressed vs. unstressed) is not available at this point.

omission is more straight-forward in the sense that we only find /s/ as a singleton coda.[62] A detailed analysis on the effects of /s/ omission is presented in the *Discussion Section 5.5.2.2*.

Another frequently omitted consonant, in both participant groups' productions is /n/. I traced the omission of /n/ also in word-initial, word-medial and word-final positions. /n/ omission is the only other consonant found in inflectional affixes for nominal expressions, though only in word-final position. /n/ omission word-medially affects aspectual features. I nevertheless examined /n/ omission, in all word positions to observe whether there is a consistent pattern of omission, like the one seen for /s/. *Table 5.9* presents the overall number of /n/ tokens, the number of /n/ productions and omissions with each phonological environment (*CCV*, *CV*, *(C)VC*) and their proportions based on the overall number of /n/ tokens in each position.

CG$_{DS}$						CG$_{TDC}$					
/n/		Production		Omission		/n/		Production		Omission	
Tokens		N	%	N	%	Tokens		N	%	N	%
Initial 2,173	CCV	41	1.9%	9	0.41%	**Initial 1,826**	CCV	10	0.5%	0	0%
	CV	1,904	87.6%	110	5%		CV	1,789	98.1%	24	1.31%
	CVC	0	0%	0	0%		CVC	0	0%	0	0%
Medial 2,438	CCV	530	21.7%	104	4.3%	**Medial 3,248**	CCV	666	20.4%	33	1.02%
	CV	1,642	67.2%	135	5.54%		CV	2,520	77.2%	23	
	CVC	0	0%	0	0%		CVC	0	0%	0	0%
Final 1,181	CCV	0	0%	0	0%	**Final 2,468**	CCV	0	0%	0	0%
	CV	0	0%	0	0%		CV	0	0%	0	0%
	CVC	694	58.8%	477	40.39%		CVC	2,287	92.7%	176	7.13%
5,792		4,811	83.1%	835	14.4%	**7,542**		7,272	96.42%	256	3.39%

TABLE 5.9: DISTRIBUTION OF /N/ OMISSION BY CG$_{DS}$ AND CG$_{TDC}$

Table 5.9 shows that /n/ is omitted more frequently by CG$_{DS}$ than by CG$_{TDC}$. We observe that, similarly to /s/ omission, /n/ is most commonly omitted in word-final position in both CG$_{DS}$ and CG$_{TDC}$. Unlike /s/ omission however, most word-initial and word-medial /n/ omissions are observed in *CV* environments. Finally, compared to /s/ omission, CG$_{TDC}$ omit /n/ more frequently than /s/, while the reverse is true for CG$_{DS}$.

[62] In Classical Greek there were nouns ending in the /ks/ sequence and could be declined: /oniks/ /onixos/ 'claw'.

Next, I provide results on the statistical comparisons performed. *Table 5.10* shows that a comparison of the two groups in all three tested word positions revealed statistically highly significant differences on the CG_{DS} and CG_{TDC} overall performance with /n/.

STATISTICAL COMPARISON ACROSS GROUPS - OMISSION									
	CG_{DS}			CG_{TDC}					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /n/	.056	.039	.010	.013	.016	.004	0.29	31	.001
Medial /n/	.120	.080	.020	.017	.017	.004	5.15	31	<.001
Final /n/	.405	.157	.039	.076	.056	.014	8.13	31	<.001

TABLE 5.10: STATISTICAL COMPARISON OF /N/ OMISSION ACROSS PARTICIPANT GROUPS

Contrary to /s/ omission, non-statistical significance with regards to phonological environment is reported: /n/ was not omitted by CG_{DS} more frequently in a *CCV* than in a *CV* syllable structure in either word position. Once again, it was not possible to analyse /s/ word-finally.

STATISTICAL COMPARISON WITHIN GROUPS – OMISSION									
CG_{DS}	CCV			CV					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /n/	.224	.343	.087	.054	.039	.010	1.97	15	.067
Medial /n/	.181	.143	.036	.099	.100	.025	1.80	15	.092
Final /n/	------	------	------	------	------	------	------	----	------

TABLE 5.11: STATISTICAL COMPARISON OF /N/ OMISSION WITHIN GROUPS: CG_{DS}

Table 5.12 below shows that there was a statistically significant result for /n/ omission in a word-medial position for CG_{TDC}, such that CG_{TDC} are more likely to omit word-medial /s/ in *CCV* than *CV* syllables. Note that for word-initial positions there were no /n/ omissions in a *CCV* environment and the statistical comparision revealed only a marginal significance.

STATISTICAL COMPARISON WITHIN GROUPS – OMISSION									
CG_{TDC}	CCV			CV					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /n/	.000	.000	.000	.014	.017	.004	-3.47	15	.003
Medial /n/	.049	.070	.017	.008	.012	.003	2.34	15	.033
Final /n/	------	------	------	------	------	------	------	----	------

TABLE 5.12: STATISTICAL COMPARISON OF /N/ OMISSION WITHIN GROUPS: CG_{TDC}

An example for /n/ omission for each word position is given in (5.3).

(5.3)	Suggested CG_{TD} Utterance		Participant Production	Word Position
(a)	***n***a *SUBJ*	➡	∅a *SUBJ*	*Initial*
(b)	ka.m***n***-i (*CG*) *do-**IMPF**-PRES-3SG*	➡	ka.m∅-i *do-**PRF**-PRES-3SG*	*Medial*
(c)	ma.m-a***n*** *mother-FEM.SG.ACC*	➡	ma.m-a∅ *mother-FEM.SG.ACC*	*Final*

In (5.3a) and (5.3c), we have syllable simplification from *CV* and *CVC* to V. (5.3b) exhibits cluster simplification of a *CCV* syllable, to a *CV* syllable. Moreover, in (5.3b) the /n/ omission appears to reflect a change in the inflectional features marked on the verb, such that the Aspect value appears to be affected. In particular, the expected feature is Imperfective, while with /n/ omission the production is of the same form as that used for the Perfective Aspect. As with /s/ omission, the effects of /n/ omission on morpho-syntactic features are discussed in *Section 5.5.3*.

In this section, I have presented results on consonant omission. I first showed that mainly CG_{DS} and to a much lesser degree 7- to 8-year old CG_{TDC} have a general problem with consonant production, such that they tend to omit consonants, in any word position. Problems mainly exist with /ɾ/, /v/, /ð/, /x/ and /t/, while numerous other consonants also present a considerable rate of omissions. Many of these omissions have the effect of simplifying consonant clusters. Moreover, we observe that in each group of consonants (based on their manner of articulation) one of the consonants presents higher rate of omissions than the others. By far the majority of omissions were observed with /s/ and /n/ in all word positions. Word-final positions are more prone to omission than other positions. A more detailed analysis on the effects of /s/ and /n/ omission and

the probable cause of their omissions is given in *Section 5.5*. Next, I examine consonant substitutions involving all aforementioned sounds.

5.3 CONSONANT SUBSTITUTION

In this section, I examine sound substitutions involving consonants. While a small percentage of changes result from the phonological processes of feature assimilation, feature spreading or consonant harmony, others seem to be a result of the articulatory restrictions associated with *DS*.

5.3.1 Overview of Consonant Substitutions

The term substitution here is used to refer to any occurrence where one sound is used instead of another, independent of the phonological processes involved. I first present results on the substitution of consonants that typically do not appear to cause a change on the inflectional marking of verbs and nominals. *Table 5.13* charts the distribution of substitutions, giving details on the overall number of tokens of targeted consonants, including the omitted and substituted tokens (Tokens), the number of productions and substitutions occurring with each consonant, and the proportion of productions and substitutions, based on the overall number of tokens. Results are broken down based on their phonological environment.

			CGDS						CGTDC			
			Production		Substitution				Production		Substitution	
	Tokens		N	%	N	%	Tokens		N	%	N	%
Voiceless Stops	/p/ 3,948	CCV	476	12.1%	147	3.7%	/p/ 4,200	CCV	586	14%	20	0.5%
		CV	3,163	80.1%	4	0.1%		CV	3,564	84.9%	1	0%
		CVC	11	0.3%	0	0%		CVC	7	0.2%	0	0%
	/t/ 5,927	CCV	2,304	38.9%	43	0.7%	/t/ 6,614	CCV	2,300	34.8%	64	1%
		CV	3,244	54.7%	0	0%		CV	4,196	63.4%	0	0%
		CVC	4	0.1%	0	0%		CVC	0	0%	0	0%
	/k/ 3,961	CCV	842	21.3%	264	6.7%	/k/ 4,514	CCV	1,168	25.9%	27	0.6%
		CV	2,638	66.6%	46	1.2%		CV	3,286	72.8%	1	0%
		CVC	1	0%	0	0%		CVC	5	0.1%	0	0 %
Voiceless Fricatives	/f/ 1,046	CCV	344	32.9%	64	6.1%	/f/ 1,544	CCV	620	40.2%	11	0.7%
		CV	473	45.2%	42	4%		CV	901	58.4%	6	0.4%
		CVC	5	0.5%	0	0%		CVC	1	0.1%	0	0%
	/θ/ 850	CCV	119	14%	4	0.5%	/θ/ 979	CCV	457	46.7%	7	0.7%
		CV	303	35.6%	297	34.9%		CV	495	50.6%	16	1.6%
		CVC	35	4.1%	0	0%		CVC	1	0.1%	0	0%
	/x/ 1,483	CCV	415	28%	48	3.2%	/x/ 1,355	CCV	833	61.5%	9	0.7%
		CV	792	53.4%	14	0.9%		CV	487	35.9%	1	0.1%
		CVC	39	2.6%	0	0%		CVC	8	0.6%	0	0%
Voiced Fricatives	/v/ 1,154	CCV	349	30.2%	74	6.4%	/v/ 1,650	CCV	1,024	62.1%	8	0.5%
		CV	447	38.7%	28	2.4%		CV	565	34.2%	1	0.1%
		CVC	1	0.1%	0	0%		CVC	3	0.2%	0	0%
	/ð/ 860	CCV	35	4.1%	9	1%	/ɾ/ 1524	CCV	88	5.8%	3	0.2%
		CV	548	63.7%	112	13%		CV	1,411	92.6%	5	0.3%
		CVC	9	1%	0	0%		CVC	3	0.2%	0	0%
	/z/ 691	CCV	322	46.6%	8	1.2%	/z/ 624	CCV	296	47.4%	0	0%
		CV	261	37.8%	37	5.4%		CV	315	50.5%	4	0.6%
		CVC	3	0.4%	1	0.1%		CVC	3	0.5%	0	0%
	/ɣ/ 740	CCV	90	12.2%	12	1.6%	/ɣ/ 988	CCV	197	19.9%	2	0.2%
		CV	502	67.8%	23	3.1%		CV	777	78.6%	4	0.4%
		CVC	1	0.1%	0	0%		CVC	0	0%	0	0%
Trill/ Flap	/ɾ/ 3,294	CCV	803	24.4%	59	1.8%	/ɾ/ 3,713	CCV	1,895	51%	7	0.2%
		CV	1,481	45%	64	1.9%		CV	1,737	46.8%	6	0.2%
		CVC	4	0.1%	0	0%		CVC	3	0.1%	0	0%
Lat. App	/l/ 2696	CCV	626	23.2%	2	0.1%	/l/ 3,069	CCV	869	28.3%	5	0.2%
		CV	1,794	66.5%	47	1.7%		CV	2,176	70.9%	3	0.1%
		CVC	4	0.1%	0	0%		CVC	2	0.1%	0	0%

TABLE 5.13: DISTRIBUTION OF CONSONANT SUBSTITUTIONS BY CG_{DS} AND CG_{TDC}

Table 5.13 shows which sounds are more likely to be substituted by each participant group. Once again, we do not find a specific problem with sounds from one place or manner of articulation over another. That is, we see that consonant substitutions are spread relatively evenly across most consonants, with slight preference towards at least one consonant from each manner of

articulation. The only noteworthy exception is the consonant /θ/, where we find the highest percentage of substitutions from both groups (especially in the CV environment). *Table 5.14* summarises which sound was substituted, and which sound it was substituted by.[63]

		CG_{DS}			CG_{TDC}		
	Substitution	Tokens	*Sub*	%	Tokens	*Sub*	%
Voiceless Stops	/p/ → [t]	3,948	99	2.51%	4,200	3	0.07%
	/t/ → [k]	5,927	51	0.86%	6,614	65[64]	0.98%
	/t/ → [n]		11	0.19%		0	0%
	/t/ → [C]		22	0.37%		4	0.06%
	/k/ → [t]	3,961	317	8%	4,514	27	0.6%
	/k/ → [x]		23	0.58%		3	0.07%
Voiceless Fricatives	/f/ → [x]	1,047	33	3.15%	1,544	6	0.39%
	/θ/ → [x]	850	232	27.3%	979	28	2.86%
	/θ/ → [s]		23	2.71%		2	0.2%
	/θ/ → [C]		31	3.65%		1	0.1%
	/s/ → [x]	6,008	115	1.91%	7,565	3	0.04%
	/s/ → [θ]		77	1.45%		3	0.04%
	/ʃ/ → [s]	229	38	16.6%	161	2	1.24%
	/s/ → [ʃ]	167	15	9%	159	0	0%
	/x/ → [C]	1483	55	3.7%	1,355	6	0.44%
	/C/→ [x]	---	126		---	18	
Voiced Fricatives	/v/ → [x]	1,154	0	0%	1,650	1	0.06%
	/ð/ → [x]	860	4	0.47%	1524	4	0.26%
	/z/ → [x]	699	8	1.14%	624	0	0%
	/ɣ/ → [x]	740	9	1.2%	988	2	0.2%
Trill/ Flap	/ɾ/ → [l]	3,294	60	1.82%	3,713	9	0.24%
	/ɾ/ → [C]		50	1.52%		6	0.16%
Lateral	/l/ → [C][65]	2696	41	1.52%	3,069	5	0.16%

TABLE 5.14: PHONEME SUBSTITUTIONS WITH CONSONANTS BY CG_{DS} AND CG_{TDC}

Table 5.14 also provides information on the most common consonant substitutions. Results for consonant substitution are categorised by manner of articulation. I highlight the most noteworthy changes. *Table 5.14* shows that the most frequent consonant substitutions are /θ/→[x], /ʃ/ →[s] and /k/→[t]. The latter is a case of velar fronting, also common in CG_{TDC} and English child

[63] Confusion matrices representing consonant production, substitution, and omission for each group are found in *Chapter 7*, *Section 7.4.3*.

[64] 62 out of 65 /t/ → [k] substitutions for CG_{TDC} were performed by a single participant with a cleft palate problem. The participant had already undergone two surgeries but he was still facing some articulation problems involving dental and (bi)labial sounds.

[65] Capital [C] stands for any substituting consonant.

phonology (Stoel-Gammon and Stemberger 1994). At least 88% of this substitution for both CG_{DS} and CG_{TDC} involve the *CCV* cluster /ks/ surfacing as [ts]. The remaining 12% of /k/ →[t] substitutions mainly involve *CV* syllables where /k/ is word initial. We also see a notable number of substitutions with the other stops: /t/→[k], /p/→[t]. The former substitution surfaces when /t/ is part of the following consonant clusters: /tr/, /ft/ (more frequently) and /st/. Concerning the latter, 75% of the /p/→[t] substitutions for both groups concern the /ps/ → [ts] clusters. [t] is frequently produced in the place of /p/ by CG_{DS}, but very rarely the other way round (i.e., [p] is hardly ever produced where /t/ is expected).[66]

Assuming that /θ/ occurs less frequently than other fricatives,[67] *Table 5.13* also shows that of all the fricatives, /θ/ is the least favoured for both CG_{DS}, and CG_{TDC}. More explicitly, on several occasions, we find other sounds (usually fricatives) used in the place of /θ/. Concerning the flap or trill, it seems that it is a particularly difficult sound for CG_{DS} to produce since they either frequently omit it (as shown in *Section 5.2*) or less frequently substitute it with [l]. This is considered a common error in phonological development across languages (Bernhardt and Stemberger (1998) for English, Goldstein and Cintrón (2001) for Spanish). The flap/ trill can, but is very rarely, substituted by another consonant. Data shows, however, that while for some consonants participants tend to omit a sound rather than substitute it, for other consonants (i.e. voiceless stops) overall percentages of substitution are higher than overall percentages of omission. Statistical comparisons within and across groups were performed.

[66] Throughout the 48,000 words there were only 10 instances of /t/ to [p] substitutions, involving the clusters /ft/ and /tɾ/ (5 instances) and the remaining 5 instances we see this substitution in *CV* syllables. Moreover, 5 out of the 10 reported instances involve consonant harmony of /p/ with a preceding or following syllable.

[67] This assumption is based on the following: (i) the lower number of uses (see *Tables 5.13* and *5.14*) compared to other fricatives, (ii) /θ/ is acquired later than the fricatives /s/ and /f/ in Eng_{TDC} acquisition of phonology and iii) Edwards and Beckman (2008) argue that language-specific frequency effects show that /s/ is more common than /θ/, (see also *Chapter 2*, *Section 2.4*).

STATISTICAL COMPARISON ACROSS GROUPS – SUBSTITUTION									
	CG_{DS}			CG_{TDC}					
C	*M*	*SD*	*Std. Error*	*M*	*SD*	*Std. Error*	*t*	*df*	*p*
/p/	.041	.049	.012	.005	.009	.002	2.95	31	.006
/t/	.10	.018	.004	.008	.017	.004	-0.17	31	**.986**
/k/	.085	.054	.013	.006	.024	.006	5.54	31	<.001
/f/	.134	.104	.026	.013	.030	.007	4.60	31	<.001
/θ/	.424	.327	.082	.036	.072	.018	4.79	31	<.001
/x/	.053	.080	.020	.007	.012	.003	2.32	31	.027
/v/	.122	.176	.044	.006	.013	.003	2.73	31	.010
/ð/	.164	.082	.021	.008	.015	.021	4.74	31	<.001
/z/	.107	.124	.031	.008	.020	.005	3.25	31	.003
/γ/	.056	.052	.013	.008	.011	.003	3.75	31	.001
/ɾ/	.058	.047	.012	.004	.004	.001	4.80	31	<.001
/l/	.020	.014	.004	.003	.007	.002	4.52	31	<.001

TABLE 5.15: STATISTICAL COMPARISON OF CONSONANT SUBSTITUTIONS ACROSS GROUPS

Apart from /t/, the two groups differ significantly with regards to the *Substitution* of all consonants listed in *Table 5.15*. That is, CG_{DS} are more likely to substitute a consonant than CG_{TDC}. *Table 5.16* gives the results for the statistical comparison on the *Substitution* means by CG_{DS} participants in *CCV* and *CV* syllables. Results revealed that CG_{DS} are more likely to substitute a consonant in a *CCV* than a *CV* environment for most consonants apart from /f/, /ð/, /x/, /γ/and /ɾ/, and only marginally for /v/.

STATISTICAL COMPARISON WITHIN GROUPS - SUBSTITUTION									
CG_{DS}	**CCV**			**CV**					
C	*M*	*SD*	*Std. Error*	*M*	*SD*	*Std. Error*	*t*	*df*	*p*
/p/	.258	.268	.068	.001	003	.001	3.84	15	.002
/t/	.020	.231	.008	.000	.000	.000	2.66	15	.018
/k/	.233	.139	.035	.017	.019	.005	6.16	15	<.001
/f/	.178	.167	.042	.102	.105	.026	1.93	15	.072
/θ/	.102	.259	.065	.465	.316	.079	99.21	15	<.001
/x/	.144	.172	.043	0.21	.037	.009	2.83	15	.013
/v/	.198	.279	.070	.060	.060	.015	2.17	15	.046
/ð/	.271	.426	.106	.200	.160	.040	0.73	15	**.478**
/z/	.043	.087	.022	.154	.188	.047	-4.55	15	.043
/γ/	.122	.166	.042	.042	.041	.010	2.00	15	**.064**
/ɾ/	.071	.075	.019	.053	.052	.013	0.81	15	**.431**
/l/	.003	.009	.002	.025	.016	.004	-5.18	15	<.001

TABLE 5.16: STATISTICAL COMPARISON OF CONSONANT SUBSTITUTIONS WITHIN GROUPS: CG_{DS}

CG_{TDC}'s performance is rarely affected by the phonological environment. *Table 5.17* below shows that CG_{TDC} are more likely to substitute a consonant in a *CCV* syllable than a *CV* syllable, only with /p/, /k/, /θ/, and /z/ (highlighted below).

STATISTICAL COMPARISON WITHIN GROUPS - SUBSTITUTION									
CG_{TDC}	**CCV**			**CV**					
C	*M*	*SD*	*Std. Error*	*M*	*SD*	*Std. Error*	*t*	*df*	*p*
/p/	.038	.065	.016	.001	.001	.001	2.36	16	**.031**
/t/	.020	.077	.019	.000	.000	.000	1.04	16	.312
/k/	.021	.086	.021	.001	.002	.001	0.99	16	**.339**
/f/	.019	.046	.011	.008	.018	.004	1.29	16	.214
/θ/	.042	.151	.037	.040	.070	.017	0.68	16	**.947**
/x/	.010	.019	.005	.003	.010	.003	1.36	16	.194
/v/	.019	.046	.011	.008	.018	.005	2.22	16	.041
/ð/	.025	.104	.025	.006	.022	.006	0.96	16	.350
/z/	.000	.000	.000	.011	.026	.006	-1.69	16	**.110**
/ɣ/	.010	.028	.007	.007	.014	.003	020	16	.760
/ɾ/	.005	.010	.002	.003	.005	.001	0.51	16	.616
/l/	.004	.019	.005	.002	.005	.001	0.64	16	.533

TABLE 5.17: STATISTICAL COMPARISON OF CONSONANT SUBSTITUTIONS WITHIN GROUPS: CG_{TDC}

Below, I give examples of the most common substitutions presented in *Table 5.14*. Examples are presented in terms of the substituted phoneme's manner of articulation.

(5.4)	Suggested CG_{TD} Utterance		Participant Production	Substitution Type	
(a)	***t***ra.pe.z-i *table-NEU.ACC.SG*	➡	[k]∅a.pe.z-i *table-NEU.ACC.SG*	/t/ → [k]	*Stop*
(b)	***k***se.ɾ-o *know.IMPF-PRES.1.SG*	➡	[t]se.ɾ-o *know.IMPF-PRES.1.SG*	/k/ → [t]	*Stop*
(c)	***θ***o.ɾ-i *see.IMPF-PRES.3.SG*	➡	[x]o.ɾ-i *see.IMPF-PRES.3.SG*	/θ/ → [x]	*Fricative*
(d)	ðen.d***ɾ***-a *tree-NEU.NOM.PL*	➡	ðen.d[l]-a *tree-NEU.NOM.PL*	/r/ → [l]	*Tap/Flap*

Examples (5.4a), (5.4b) and (5.4c) involve clusters: /ks/ turns to [ts] for (5.4a), /tr/ turns to [k∅] for (5.4b) and /dr/ turns to [dl] for (5.4d). We also see that CG_{DS} and CG_{TDC} sometimes use [k] where the target is /t/ and [t] where the target is /k/, even though the latter is a much more frequent substitution. Moreover, substitutions may accidentally be of the same form as another form with a different meaning:

(5.5)	Suggested CG_{TD} Utterance		Participant Production	Substitution Type
	ni.*x*t-a	➡	ni.[s]t-a	/x/ → [C] *Fricative*
	night-*FEM-ACC-SG*		*sleepiness*-*FEM-ACC-SG*	

For the remainder of this section, I examine the sound substitutions involving /s/ and /n/. Each sound is examined separately to determine whether the substitution is really phonologically/phonetically conditioned or whether it could be reduced to morphologically or syntactically conditioned differences between CG_{DS}, CG_{TDC} and CG_{TD} Grammar.

First, I present results on /s/ substitution for word-initial, word-medial and word-final positions. *Table 5.18* shows that /s/ substitution is less common than /s/ omission.

CG_{DS}						**CG_{TDC}**					
/s/		Production		Substitution		/s/		Production		Substitution	
Tokens		N	%	N	%	Tokens		N	%	N	%
Initial 1,128	CCV	449	39.80%	21	1.86%	Initial 1,691	CCV	998	59.02%	0	0%
	CV	359	31.83%	47	4.17%		CV	685	40.51%	0	0%
	CVC	0	0%	0	0%		CVC	0	0%	0	0%
Medial 2,228	CCV	1,010	45.33%	38	3.76%	Medial 2,252	CCV	1,108	49.20%	13	0.58%
	CV	819	36.76%	55	2.47%		CV	1091	48.45%	1	0.04%
	CVC	0	0%	0	0%		CVC	0	0%	0	0%
Final 2,766	CCV	0	0%	0	0%	Final 4,060	CCV	0	0%	0	0%
	CV	0	0%	0	0%		CV	0	0%	0	0%
	CVC	1,103	39.88%	164	5.93%		CVC	3,894	95.91%	14	0.34%
6,122		3,740	61.09%	325	5.31%	8,003		7,776	97.16%	28	0.35%

TABLE 5.18: DISTRIBUTION OF /S/ SUBSTITUTIONS BY CG_{DS} AND CG_{TDC}

/s/ substitution is more frequent word-finally. Moreover, we observe that /s/ is more likely to be substituted in *CV*, rather than *CCV* syllables in word-initial but not word-medial positions. All word positions where we find /s/ reveal a highly significant difference between the two groups such that, CG_{DS} are more likely to fully substitute /s/ in any word position than CG_{TDC}.

STATISTICAL COMPARISON ACROSS GROUPS - SUBSTITUTION									
	CG_{DS}			CG_{TDC}					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /s/	.088	.079	.020	.000	.000	.000	4.60	31	<.001
Medial /s/	.050	.047	.012	.006	.005	.001	3.81	31	.001
Final /s/	.131	.160	.040	.004	.003	.001	3.29	31	.003

TABLE 5.19: STATISTICAL COMPARISON OF /S/ SUBSTITUTIONS ACROSS PARTICIPANT GROUPS

Results presented in *Table 5.19* confirm that the phonological environment played a somewhat significant role in some of the participants' substitutions; *CV* in word-medially was more challenging for CG_{DS} with a marginally significant result, while statistical comparison revealed a non-significant difference between *CCV* and *CV* syllables in /s/ word-initial substitutions.

STATISTICAL COMPARISON WITHIN GROUPS – SUBSTITUTION									
CG_{DS}	CCV			CV					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /s/	.104	.249	.062	.180	.215	.054	-0.91	15	.377
Medial /s/	.040	.044	.011	.071	.071	.018	-2.12	15	.051
Final /s/	------	------	------	------	------	------	------	----	-----

TABLE 5.20: STATISTICAL COMPARISON OF /S/ SUBSTITUTIONS WITHIN GROUPS: CG_{DS}

Similarly, /s/ was significantly more frequently substituted in a *CCV* rather than in *CV* environment in word-medial positions by CG_{TDC}. CG_{TDC}, did not produce any /s/ substitutions in word-initial positions.

STATISTICAL COMPARISON WITHIN GROUPS – SUBSTITUTION									
CG_{TDC}	CCV			CV					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /s/	.000	.000	.000	.000	.000	.000	------	-----	------
Medial /s/	.000	.000	.000	.012	.011	.003	-4.63	16	<.001
Final /s/	------	------	------	------	------	------	------	-----	------

TABLE 5.21: STATISTICAL COMPARISON OF /S/ SUBSTITUTIONS WITHIN GROUPS: CG_{TDC}

Next, I consider /s/ substitution in occurrences where the substitution does not have an effect on the morpho-syntactic features of the produced form. Studying the consistency and surfacing result of consonants substituting for /s/ and examining the outcome of the substitution help decide whether the substitutions are phonologically or morpho-syntactically conditioned. *Table 5.21* above shows that in comparison to /s/ omissions, /s/ substitutions are considerably less frequent for both groups. *Table 5.21* below charts the distribution of /s/ substitutions based on the surfacing consonant and phonological environment they surface in (i.e. in word-initial, word-medial and word-final positions), giving details on the number of instances /s/ was substituted in each case and the proportion of each substitution, based on the overall number of /s/ tokens.

	CG_{DS}					**CG_{TDC}**				
	Initial	Medial	Final	Total		Initial	Medial	Final	Total	
Tokens	1,128	2,227	2,767	6,122	%	1,691	2,253	4,060	8,004	%
/s/ → [ɬ]	2	0	49	51	0.8%	0	0	0	0	0%
/s/ → [θ]	11	23	43	77	1.3%	0	1	2	3	0.04%
/s/ → [x]	**32**	**40**	**43**	**115**	**1.9%**	0	1	2	3	0.04%
/s/ → [ʃ]	1	13	1	15	0.2%	0	0	0	0	0%
/s/ → [C]	1	3	3	7	0.1%	0	0	3	3	0.04%
Total	48	78	139	265	4.3%	0	2	7	9	0.1%

TABLE 5.22: NON-INFLECTIONAL PHONETIC SUBSTITUTIONS WITH /S/ ACROSS WORD POSITIONS

At first glance, we observe that the most frequent /s/ substitution results in the production of the fricative [x]. While both CG_{TDC} and CG_{DS} are more likely to substitute /s/ in word-medial and word-final positions, we see that when [x] is the substituting sound, the number of substitutions is approximately the same across all word positions. Moreover, /s/ substitutions are more likely to occur in a *CV* or *CVC* syllable than a *CCV* syllable: 208 vs. 57 overall for CG_{DS} and 6 versus 3 overall for CG_{TDC}. Based on these numbers, it appears that the phonological environment does not appear to play a role on whether /s/ is prone to these substitutions. Below, I give examples for each of the /s/ substitutions.

(5.6)	Suggested CG_{TD} Utterance		Participant Production	Substitution Type
(a)	to.k***s***-o *bow-NEU.SG.NOM*	➡	to.∅[θ]-o *bow-NEU.SG.NOM*	/s/ → [θ]
(b)	***s***a.la.t-a *salad-FEM.SG.ACC*	➡	[ʃ][i].a.la.t-a *picture-FEM.SG.ACC*	/s/ → [ʃ]
(c)	i.ko.n-e***s*** *picture-FEM.PL.ACC*	➡	i.ko.n-e[ɬ] *picture-FEM.PL.ACC*	/s/ → [ɬ]
(d)	a.***s***ti.no.mi.-a *police-FEM.SG.NOM*	➡	a.[x]ti.∅o.mi-a *police-FEM.SG.NOM*	/s/ → [x]

Examples (5.6a) through (5.6d) are all phonologically and phonetically triggered substitutions, as opposed to morpho-syntactically triggered. More explicitly, differences between the targeted and produced formed are conditioned by the articulatory limitations CG_{DS} are facing and the phonological environment a consonant is targeted. There is no change in the inflectional features marked on the verb or the nominal, despite the fact that /s/ substitution sometimes occurs with inflectional suffixes like (5.6c). Moreover, there are no cases of minimal pairs, where a change of a sound from /s/ to any of the consonants listed in *Table 5.22* results in ambiguity.

/s/ → [C] substitutions involve the change of /s/ into a consonant other than the ones mentioned thus far. There is only a small number for each of the surface consonants, i.e. changes are not consistent across participants with one or two occurrences per substitution. Therefore, these could very well be speech errors or assimilations that involve a low frequency phonetic environment. For these cases I do not specify the surface consonant and treat them as a group. Below, I give examples of such cases:

(5.7)	Suggested CG_{TD} Utterance		Participant Production	Substitution Type
(a)	e-nixto-***s***-e PAST-*get.dark*-***PRF***-*PAST.3.SG*	➡	eni∅to-[t]-e PAST-*get.dark*-***PRF***-*PAST.3.SG*	/s/ → [t]
(b)	fu.***s***t-a *skirt*-*FEM.SG.ACC*	➡	fu.[f]t-a *skirt*-*FEM.SG.ACC*	/s/ → [f]

The data in (5.7) show /s/ → [t] and /s/ → [f] substitution. Both can be analyzed as an instance of (left-to-right) consonant harmony with the onset of the preceding syllable. These substitutions do not affect the inflectional features marked on the verb (5.7a) and the noun (5.7b).

Next, I present results on /n/ substitution in word-initial, word-medial, and word-final positions. This breakdown will help us decide whether /n/ substitutions are phonologically or morpho-syntactically conditioned. In particular, the syllable environment and consistency of changes in a specific word position, will help us decide what /n/ substitution is conditioned by. *Table 23* charts the distribution of /n/ substitution and production across the three tested word positions.

CG_{DS}						**CG_{TDC}**					
/n/		Production		Substitution		/n/		Production		Substitution	
Tokens		N	%	N	%	Tokens		N	%	N	%
Initial 2,174	CCV	41	1.89%	0		Initial 1,826	CCV	10	0.55%	0	0%
	CV	1,904	87.58%	109	5%		CV	1,789	97.97%	3	0%
	CVC	0	0%	0	0%		CVC	0	0%	0	0%
Medial 2,438	CCV	530	21.74%	5	0.21%	Medial 3,248	CCV	666	20.50%	2	0.06%
	CV	1,642	67.35%	22	0.90%		CV	2,520	77.59%	4	0.12%
	CVC	0	0%	0	0%		CVC	0	0%	0	0%
Final 1,181	CCV	0	0%	0	0%	Final 2,468	CCV	0	0%	0	0%
	CV	0	0%	0	0%		CV	0	0%	0	0%
	CVC	694	58.76%	10	0.85%		CVC	2,287	92.67%	5	0.20%
5,792		4811	83.06%	146	2.52%	7,542		7,272	96.42%	14	0.19%

TABLE 5.23: DISTRIBUTION OF /N/ SUBSTITUTION BY CG_{DS} AND CG_{TDC}

While CG_{TDC} are prone to substituting /n/ with another consonant in word-medial positions, CG_{DS} exhibit most /n/ substitutions in word-initial positions. Percentages of /n/ substitution are even lower than percentages of /s/ substitution. Further phonological analysis showed that most

/n/ substitutions occur with *CVC* or *CV* syllables than *CCV* syllables as shown in *Table 5.23*. Results from the statistical comparison summarised in *Table 5.23* reveal that CG_{DS} are more likely to substitute /n/ than CG_{TDC} in all three positions where we find /n/.

STATISTICAL COMPARISON ACROSS GROUPS - SUBSTITUTION									
	CG_{DS}			CG_{TDC}					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /n/	.056	.109	.027	.001	.003	.001	2.09	31	.045
Medial /n/	.015	.012	.003	.002	.004	.001	4.20	31	<.001
Final /n/	.015	.023	.006	.002	.006	.004	2.17	31	.038

TABLE 5.24: STATISTICAL COMPARISON OF /N/ SUBSTITUTIONS ACROSS PARTICIPANT GROUPS

The phonological environment did play a significant role in the substitution of /n/, both word-initially and word-medially, for both CG_{DS} and CG_{TDC}. Note that, once again, word-initial /n/ omission in a *CCV* environment was not recorded for either group.

STATISTICAL COMPARISON WITHIN GROUPS – SUBSTITUTION									
CG_{DS}	CCV			CV					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /n/	.000	.000	.000	.083	.199	.050	-1.66	15	.117
Medial /n/	.014	.030	.008	.018	.017	.004	0.46	15	653
Final /n/	------	------	------	------	------	------	------	----	------

TABLE 5.25: STATISTICAL COMPARISON OF /N/ SUBSTITUTIONS WITHIN GROUPS: CG_{DS}

STATISTICAL COMPARISON WITHIN GROUPS – SUBSTITUTION									
CG_{TDC}	CCV			CV					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /n/	.000	.000	.000	.001	.003	.001	-1.84	16	.085
Medial /n/	.005	.021	.005	.002	.003	.001	0.67	16	.511
Final /n/	------	------	------	------	------	------	------	-----	------

TABLE 5.26: STATISTICAL COMPARISON OF /N/ SUBSTITUTIONS WITHIN GROUPS: CG_{TDC}

Next, I give the distribution of /n/ substitutions based on the surface consonant in word-initial, word-medial and word-final positions. *Table 5.27* charts the most frequent /n/ substitutions, based on word position, giving details on the number of instances /n/ is substituted by another sound, and the proportion of /n/ substitution to the overall number of /n/ occurrences (Omissions,

Substitutions, and Productions). For the cases where /n/ substitution does not fall under any of the major categories listed in *Table 5.27* I use the generic label /n/ → [C].

	CG_{DS}					CG_{TDC}				
	Initial	Medial	Final	Total		Initial	Medial	Final	Total	
Tokens	2,174	2,444	1,181	5,799	%	1,823	3,264	2,468	7,555	%
/n/ → [l]	73	0	0	73	1.26%	1	1	0	2	0.03%
/n/ → [m]	4	9	4	17	0.29%	0	0	3	3	0.04%
/n/ → [t]	7	9	0	16	0.28%	0	0	0	0	0%
/n/ → [C]	22	13	0	35	0.6%	2	5	0	7	0.09%
Total	106	31	4	141	2.43%	3	6	3	12	0.16%

TABLE 5.27: NON-INFLECTIONAL PHONETIC SUBSTITUTIONS WITH /N/ ACROSS WORD POSITIONS

Table 5.27 shows that while CG_{DS} are more likely to substitute /n/ word-initially, CG_{TDC} are more likely to substitute /n/ in word-medial positions. Moreover, while CG_{DS} are more likely to use [l] to substitute for /n/, CG_{TDC} are more likely to use [m]. There were also 16 instances of /m/ gemination by CG_{TDC} and 6 by CG_{DS}, where the target was a word-medial /mn/ cluster.

In the following example /n/ is substituted by [l]. In both *Nikos* and *na* the initial /n/ is substituted by /l/. In *Nikos* the word meaning is ambiguous with another form, while in *na* it is not, unless you take it to be the musical node 'la'.

(5.8)	Suggested CG_{TD} Utterance		Participant Production	Substitution Type
(a)	***N***ik-os *Nikos-MASC.SG.NOM*	➡	***L***ik-o∅ *wolf-MASC.SG.ACC*	/n/ → [l]
(b)	***n***a *SUBJ*	➡	***l***a[68]	

The result of /n/ to [l] substitution in (5.8a) is accidentally of the same form as the word *lik-o* 'wolf-ACC'. This is most likely the result of a phonological substitution since it is highly unlikely that the participant would see a character named *Nikos* (a human nonetheless) in the videos in

[68] The word following this lexical item *tze* 'and' does not include a /l/.

Experiment #1 and decide to give him an animal name.[69] As *Table 5.27* shows, /n/ substitution also occurs with [m], a consonant close in place of articulation with /n/, sharing the same manner of articulation features. However, we also see the reverse substitution from /m/ to [n]: 11 (7 word-initially and 4 word-medially) for CG_{DS} and 5 (4 word-initially and 1 word-medially) for CG_{TDC}. Example (5.9a) shows that /n/ to [m] substitution is a case of consonant assimilation.

(5.9)	Suggested CG_{TD} Utterance		Participant Production	Substitution Type
(a)	ip-e***n***	➡	ip-e[m]	/n/ → [m]
	say.PRF-PAST.3.SG		*say.PRF-PAST.3.SG*	
(b)	kam***n***-i	➡	kam[m]-i	
	do-IMPF-PRES-3SG		*do-IMPF-PRES-3SG*	

In example (5.9a) we see that the preceding syllable starts with a bilabial stop. It is possible that the change of /n/ to [m] is affected by the presence of the bilabial stop /p/ which triggers the substitution, or rather spreads the bilabial feature, to match the bilabial's place of articulation. This process is called partial assimilation and it is also quite common in adult CG_{TD}, but not in the specific environment used here. The assimilation only affects the place feature of /p/, which is assimilated to /n/ and generates the surfacing phoneme [m]. As mentioned earlier, there were also some instances of /m/ gemination (5.10). /m/ gemination and simultaneous /n/ omission is a common phonological process in adult CG_{TD}, though not always the most prominent form of the standard CG dialect. In such cases, neither the meaning of the word, nor the surfacing of the morpho-syntactic feature values inflected on the word are affected.[70]

[69] All occurrences are produced by the same two participants. Moreover, the participants did not change the names of other characters or proper names in the remaining experimental stimuli.

[70] The striking majority of /m/ gemination recorded involved the verb *kan-o* 'I do/make': 24/39 overall for both groups: 16 inflected with 3rd Person Singular agreement. All instances with CG_{TDC} concerned the verb ka*mn*-o → ka*mm*-o 'I do'. CG_{DS} also produced most /m/ geminations (8/15) with the same verb, surfacing the same result, as shown in (5.9b).

Below, I give an example of root internal /m/ to [n] substitution. The substitution occurs root internally and causes the production of a non-existing word; the morpho-syntactic properties of the inflectional marking of the surfacing form are not affected. That is, produced forms do not resemble another form with different inflectional features.

(5.10)	Suggested CG_{TD} Utterance		Participant Production	Substitution Type
(a)	o***m***oɾf-i	➡	o[n]o∅f-i	/m/ → [n]
	beautiful-MASC.PL.NOM		*beautiful-MASC.PL.NOM*	

(b)	en	***m***e	me	➡	e	[n]e	[n]e
	NEG	*1.SG.ACC*	*1.SG.ACC*		*NEG*	*1.SG.ACC/yes*	*1.SG.ACC/yes*

This substitution is rarely observed with CG_{TDC}. The CG_{DS} participant substituted /m/ to [n] with the clitic *me* → *[n]e* 'me'. The surfacing form is accidentally the same as the one used for 'yes'. The preceding word was the negation marker *en*, produced as [e]. There is also a possibility that this could be /m/ omission with re-syllabification of a preceding /n/ for the first occurrence and a second [n]e is a repetition of the first occurrence. Notice that in both examples the substitution is with the onset of a syllable. In (5.10a), the change to anterior Coronal [n] might be related to the deletion of the anterior Coronal /ɾ/, through feature spreading.

Concerning the substitution of /n/ by any phoneme, a CG_{DS} participant used [k] instead of the expected word-initial /n/, as shown in (5.11a). This is a case of consonant assimilation of the onset /k/ of the second syllable of the word. Moreover, the word initial /n/ in *na* is changed to /γ/ in (5.11b). These substitutions have neither a morpho-syntactic effect on the inflectional features of the words, nor do they result in homophony with another word.

(5.11)	Suggested CG_{TD} Utterance		Participant Production	Substitution Type
(a)	***N***ikol-as *Nicolas-MASC-SG-NOM*	➡	[k]ikol-a∅ *Nicolas-MASC-SG-ACC*	/n/ → [k]
(b)	***n***a *SUBJ*	➡	[γ]a *SUBJ*	/n/ → [γ]

In *Section 5.3.1*, I presented results on the most common phonological substitutions seen with consonants. Through the examples, we see that in all occasions presented, we did not find cases where /n/ substitution surfaces different inflectional features for nominals and verbs than those targeted/expected. That is, no discrepancy is observed between the features of the targeted form and their phonetic realisation on the surface form. Moreover, in each group of consonants divided into manner of articulation, both CG_{DS} and CG_{TDC} participants have a "preferred consonant" to substitute other consonants with. On some occasions these consonant substitutions consist of phonologically triggered processes, common also in adult CG_{TD}, like phonological feature assimilation/spreading, consonant reduction with gemination, consonant harmony and other processes. However, in some instances these processes are not used in the same environments as the ones seen in this section. I propose that these processes mainly occur as a mechanism employed by participants, as part of their Grammar, to overcome their difficulties with the consonants listed in this section, as opposed to other substitutions that are not part of their Grammar. Finally, as with omissions, CG_{DS} perform more consonant substitutions than CG_{TDC}. However, CG_{TDC} are like CG_{DS} in that they use the same consonants for substitution of other consonants based on the manner of articulation. In the following section, I show that /s/ is also substituted by consonants other than the ones discussed above. Contrary to the ones discussed above, when /s/ is substituted in an inflectional environment it appears to have an effect on the inflectional features carried by the produced word.

5.3.2 Substitutions Affecting Inflectional Features

A considerable number of /s/ substitutions are the result of phonetic or phonological problems affecting the voiceless fricative /s/, as shown in *Section 5.3.1*. Above, I discussed cases where the surface forms are not affected in terms of inflectional features and/or meaning. In this section, I show that /s/ substitutions may either (i) affect the inflectional features or (ii) /s/ substitution with the same consonant may have no effects on the inflectional features of produced forms. That is, it may occur in either a non-inflectional environment or in an inflectional environment but the effect does not cause ambiguity between the targeted form and another form.

Table 5.28 below gives a classification of sound substitutions involving /s/ in all word positions. Specifically, it shows the distribution of a number of consonants which substitute /s/ or are substituted by [s], giving details on the number of instances /s/ is substituted by or substitutes for another sound, and the proportion of the substitution of /s/ to the overall number of tokens of /s/ production, substitution or omission. There were also 7 instances of /n/ to [s] substitution: 5 for CG_{DS} and 2 for CG_{TDC}, which are not examined here. The substituting sounds listed in *Table 5.28* (apart from /z/) do not share phonological features with /s/. *Table 5.28* shows that the probability of CG_{DS} and CG_{TDC} using one of the sounds in the table to substitute /s/ is quite low.

	CG_{DS}					**CG_{TDC}**				
	Initial	Medial	Final	Total		Initial	Medial	Final	Total	
Tokens	1,128	2,227	2,767	6,122	%	1,691	2,253	4,060	8,004	%
/z/ → [s]	7	9	4	20	0.33%	0	0	0	0	0%
/s/ → [z]	0	12	4	16	0.26%	0	11	3	14	0.17%
/s/ → [n]	0	0	11	11	0.18%	0	0	5	5	0.06%
/n/ → [s]	0	0	5	5	0.08%	0	0	2	2	0.02%
/s/ → [m]	12	3	1	16	0.26%	0	0	0	0	0%
/m/ → [s]	19	2	0	21	0.34%	4	0	0	4	0.05%
[s] Insertion	5	2	27	34	0.56%	2	0	7	9	0.11%
Total	43	28	52	123	2.01%	6	11	17	34	0.42%

TABLE 5.28: SUB-CATEGORIZATION OF PHONETIC SUBSTITUTIONS WITH /S/ AFFECTING INFLECTION

CG_{DS} and CG_{TDC} equally use [z] to substitute for /s/. Moreover, CG_{DS} insert /s/ (usually in a noun) more frequently than CG_{TDC}. Concerning the phonological environment for both participant groups, the overwhelming majority of substitutions occur in *CVC* or *CV* syllables, rather than *CCV* syllables: 115 vs. 8 for CG_{DS} and 23 vs. 11 for CG_{TDC}. We observe that there does not appear to be a consistency in terms of the word positions /s/ substitutions occur. Below, I discuss each substitution and give examples to illustrate the resulting surface form. I show that the position a sound is substituted in, on this occasion, relates to the inflectional features it carries. Examples (5.12) through (5.14) illustrate /z/ → [s] and /s/ → [z] substitutions respectively. Productions in (5.12) and (5.13) are instances of devoicing. (5.14) presents an instance of voicing in addition to consonant deletion.

(5.12)	Suggested CG_{TD} Utterance		Participant Production	Substitution Type
(a)	ʑoɣrafi***ʑ***-u *draw.**IMPF**-PRES.3.PL*	➡	[s]oafi-[s]-u *draw-**PRF**-DEP.3.PL*	/z/ → [s]
(b)	tʑin-a *those-NEU.PL.ACC*	➡	t[s]in-a *those-NEU.PL.ACC*	

(5.13)	Suggested CG_{TD} Utterance		Participant Production	Substitution Type
(a)	θimi***ʑ***-i *remind.**IMPF**-PRES.3.SG*	➡	θimi-[s]-i *remind-**PRF**-DEP.3.SG*	/z/ → [s]
(b)	kuʑin-a *kitchen-FEM.SG.ACC*	➡	ku[s]in-a *kitchen-FEM.SG.ACC*	

(5.14)	Suggested CG_{TD} Utterance		Participant Production	Substitution Type
	pek-***s***-u *play-**PRF**-PRES.3.PL*	➡	pe∅[z]-u *play.**IMPF**-PRES.3.PL*	/s/ → [z]

In examples (5.12a) and (5.13a), the surfacing form is affected in terms of the features inflected on the word, namely Aspect. In addition, in (5.12a) the initial /z/, in addition to the medial one,

also surfaces as a [s]. This latter substitution does not have an effect on the meaning of the word or on the inflectional features marked on the verb. Moreover, the same is also true with /z/ → [s] substitution in examples (5.12b) and (5.13b). Concerning the /s/ → [z] substitution given in (5.14), we find two phonetic/phonological processes in the surface form: (i) omission of /k/ and (ii) change of /s/ to [z]. The combination of the two processes results in a form that appears to be the same as the Present, Imperfective. Thirteen (2 for CG_{DS} and 11 for CG_{TDC}) instances of /s/ → [z] substitutions involve the same verb in the exact same experimental stimulus from *Experiment #2 Task I.* The change of Aspect in the specific environment results in a grammatical form. In fact, regarding the specific experimental stimulus, where 90% of this substitution occurred, the Imperfective Aspect is more widely used than the Perfective Aspect. Though grammatical (and evaluated as correct), the produced form was nevertheless, not what the stimulus required.

Next, I discuss /s/ → [n] and /s/ → [m] and /m/ → [s] substitutions. Only a small number of each type is recorded. Below, I offer a set of examples for each substitution and discuss its effects.

(5.15)	Suggested CG_{TD} Utterance		Participant Production	Substitution Type
(a)	e.na***s*** *one.MASC.**NOM**.SG*	➡	e.na[n] *one.MASC.**ACC**.SG*	/s/ → [n]
(b)	ti***s*** *DET.FEM.**GEN**.SG*	➡	ti[n] *DET.FEM.**ACC**.SG*	

In (5.15a) and (5.15b), the substitution appears to result in a change in the inflectional features marked on the numeral (5.15a), and determiner (5.15b). While in (5.15a) the /s/ → [n] substitution could be a case of consonant harmony, from the consonant in the onset to the consonant in the coda position of the same syllable, (5.15b) is a more uncommon case of /s/ → [n] substitution. In both cases, however, the surfacing result is the same, such that the inflectional

feature Case appears to be affected by this substitution and surfaces a different Case, Accusative. Next, I discuss an example of /s/ → [m] and /m/ → [s] Substitution.

(5.16)	Suggested CG_{TD} Utterance		Participant Production	Substitution Type
(a)	***s***as ***2****PL-GEN*	➡	[m]as ***1****PL-GEN*	/s/ → [m]
(b)	e***s***is ***2****PL-NOM*	➡	e[m]is ***1****PL-NOM*	/s/ → [m]
(c)	***s***u ***2****.SG.GEN*	➡	[m]u ***1****.SG.GEN*	/s/ → [m]
(d)	***m***u ***1****.SG.GEN*	➡	[s]u ***2****.SG.GEN*	/m/ → [s]

/s/ → [m] substitution is quite infrequent as a phonological change during phonological acquisition because the two share no phonological features. The above examples show that, in both cases the word initial and word medial /s/ → [m] substitution appears to be causing a change of the feature Person inflected on the Personal pronoun from 2nd to 1st Person. Finally, the two comparable examples presented in (5.16c) and (5.16d) show that /s/ → [m], and the reverse /m/ → [s] substitution result in opposite surface forms in terms of the Person feature value with the clitic: 2nd to 1st Person Singular for (5.16c) and vice versa for (5.16d).

The last process involving /s/ has to do with the insertion of /s/ in different positions in the word. /s/ insertion are not consistent across the words they occur in, and has different surface effects. We find them in any position of the word, as codas or onsets. The three examples in (5.17) show insertion of [s] when it was not part of the expected phonetic representation of the targeted form.

(5.17)	Suggested CG_{TD} Utterance		Participant Production
(a)	kosm-o *people-MASC.SG.**ACC***	➡	kosm-o**[s]** *people-MASC.SG.**NOM***
(b)	kopel-as *girl-FEM.SG.GEN*	➡	**[s]**∅∅pel-as *girl-FEM.SG.GEN*
(c)	aresk-i *like.IMPF-PRES.**3**.SG*	➡	∅∅e∅k-i**[s]** *??.IMPF-PRES.**2**.SG*

In (5.17a), the insertion of [s] in word-final position appears to be causing a change in the inflectional features marked on the noun: the Case value appearing on the surfacing form is now Nominative. In fact, the majority of cases are recorded with nominal expressions, where the produced Case marking appears to deviate from the targeted Case in the same was as (5.17a). Inflectional effects are also observed with (5.17c); the Person value inflected on the verb appears to have changed from the targeted 3rd to the surfacing 2nd Person. In contrast, the insertion of [s] word-initially in (5.17b) has no effect on the inflectional features, or the meaning of the surfacing form. The insertion of [s] is rather uncommon and unexpected, especially considering the fact that in general /s/ is a difficult sound for CG_{DS} to pronounce. Therefore, we would not expect to see participants inserting the sound for phonetic reasons, since they tend to either omit /s/ or substitute it with a phoneme close in articulation, approximately 39% of the time they need to use it. In sum, it seems that [s] insertion is more likely morpho-syntactically conditioned, since (i) the majority of cases [s] insertion is found it is part of inflectional suffixes affecting the features marked on verbs or nouns, (ii) it is unlikely that a sound is added due to phonetic or phonological reasons, when in the majority of the data its production is otherwise avoided due to articulatory restrictions. This could potentially be a product of cluster simplification, by shifting a /C/ to final position. For English-learning children, this is a frequent error for /snoʊ/ → [noʊs].

With respect to /s/ substitutions, I have shown that a small percentage of /s/ substitutions appear to be causing an effect in the surfacing forms produced by participants: approximately 2% for CG_{DS} and 0.5% for CG_{TDC}. Substitutions involving /s/ are quite diverse, with the involvement of various consonants, but rather consistent, in most cases, considering each individual consonant and inflectional feature affected. Next, I present results on vowel omission.

5.4 VOWEL OMISSION

As discussed in *Chapter 3*, the vowel /ε/ is used as a verbal prefix marking Past Tense. The verb is marked for Tense with an additional affix, either one fusing Tense, Person and Number features together, or one marking only Tense, with a separate suffix for Person and Number. It was also noted that verbs in Past Tense can be affixed with the Past prefix (augment) *e-* only with consonant-initial stems (with some minor exceptions).

There are many instances where this initial /ε/ can grammatically be omitted in both SG_{TD} and CG_{TD}. First, in non-utterance initial position when the preceding word ends in a vowel, /ε/ is optionally omitted to prevent hiatus, i.e. avoid two vowels with no consonant between them. /ε/ is optionally, though frequently, omitted when the preceding word ends in /ε/ or, on many occasions even when the preceding word ends in a different vowel. Hiatus resolution is a very common phonological process in CG. Christodoulou (2007a), Christodoulou (2007b), Kaisse (1992), Kaisse (1993), Malikouti-Drachman (2001), Müller (2002a), Müller (2002b) have noted that a series of phonological processes take place to prevent hiatus surfacing in CG_{TD}. Each is applied in different environments, based on the onset of the syllable that contains one of the two vowels. Furthermore, according to Baltazani (2006), hiatus resolution in SG_{TD} occurs in only 25% of tokens in her study. In many other occasions (30%), we find no assimilation between adjacent vowels. In the remaining 45% of her data, assimilation of various sorts occurs.

Specifically, hiatus resolution seems to be more resistant in environments, which receive focus and, strong prosodic boundaries (i.e. across Intonational Phrases). Moreover, vowel duration and prosodic position appear to play an additional role in assimilation. As a final note, Baltazani stresses that hiatus resolution in SG_{TD} is ***not*** categorical; that is, the same speaker, for the same target word in the same prosodic position, variably produces different surface forms, with varying degrees of assimilation between the two adjacent vowels. Second, while in CG_{TD} the inflectional prefix *e-* is *obligatory* in utterance-initial positions with certain verbs (5.19a), it is *optional* with other verbs (5.19b):

(5.19) CG_{TD} Past Prefix Inflection

	Present	Past	Past Prefix Omission
(a)	fefk-o	e-fi-a	*fi-a
	*leave.**IMPF**-PRES.1.SG*	*PAST-leave.PRF-PAST.1.SG*	*leave.PRF-PAST.1.SG*
	'I am leaving.'	'I left.'	'I left.'
(b)	tro-is	e-fa-es	fa-es to fa-i su?
	*eat.**IMPF**-PRES.2.SG*	*PAST-eat.PRF-PAST.2.SG*	*eat.PRF-PAST.1.SG DET food 2SG.GEN*
	'You are eating.'	'You ate.'	'Have you eaten your food?'

For a discussion on the realisation of the Past prefix *e-* see *Chapter 3*. Moreover, when CG_{TD} speakers use the suffixes *-e-te* (also used for Present Tense 2nd Person Plural) in place of the SG_{TD} Past-Tense 2nd Person Plural suffixes *–a-te*, the Past prefix is necessary in order to disambiguate the temporal interpretation, and therefore, in such cases, it is rarely dropped.[71] (See *Chapter 3*, *Section 3.2.1.* for more details).

Past augment *e-* deletions, to resolve hiatus, are not obligatory with either optional or obligatory instances of the Past prefix. In cases where a hiatus is created between a word ending in a vowel

[71] This is a Personal observation in analysing results from my research. This has never been reported in previous literature on CG_{TD}.

and a verb inflected with the Past prefix, the production of the hiatus is not ungrammatical, but the result sounds formal and rather odd in casual speech. CG_{DS} almost always resolve hiatus with the omission of a word-initial /ε/, including cases where it functions as a Past prefix. Therefore, neither productions where hiatus resolution is possible but does not apply, nor when hiatus resolution occurs with verbs requiring obligatory surfacing of the Past prefix are considered incorrect, because hiatus resolution facilitates the omission of the Past prefix.

Omissions and substitutions with vowels other than /ε/ are quite limited; hence, results mainly concern the vowel /ε/. The distribution of /ε/ in word-initial and word-final positions is important for our purposes, because in the former position it functions as an inflectional prefix and in the latter as an inflectional suffix. *Table 5.29* shows the distribution of /ε/, giving details on the number of tokens, overall number of /ε/ omission in all word positions, regardless of lexical category, and the proportion of /ε/ omission, based on the overall number of tokens.

/ε/ Omission	CG_{DS}			CG_{TDC}		
	Tokens	*Omission*		*Tokens*	*Omission*	
Initial /ε/	2,169	514	23.7%	2,026	438	21.6%
Medial /ε/	3,512	127	3.6%	4,449	22	0.5%
Final /ε/	2,154	160	7.4%	2,758	138	5%
Total	7,835	801	10.2%	9,233	598	6.5%

TABLE 5.29: DISTRIBUTION OF /ε/ OMISSION BY CG_{DS} AND CG_{TDC}

Table 5.29 shows that overall CG_{DS} tend to omit the vowel /ε/ in all word positions more frequently than CG_{TDC}: 10.2% for CG_{DS} vs. 6.5% for CG_{TDC}. Both groups tend to omit the initial /ε/ more frequently than /ε/ in any other word position. Evidence from young children in other languages suggests that initial onsetless unstressed syllables are especially at risk for omission (Kehoe and Stoel-Gammon 1997, for discussion on medial onsetless syllables. However, it should be noted that in CG when a Past prefix is inflected on the verb, it usually (but not necessarily always) carries the word stress. Furthermore, the percentages of word-initial /ε/

omissions are similar: 23.7% for CG_{DS} vs. 21.6% for CG_{TDC}. All fillers (i.e. eh, ehm, uh, ahm), are excluded from the final calculation of percentage for the initial /ɛ/ omission as well as the overall omission. Below, I give examples of word initial, medial and final /ɛ/ omission and use.

(5.20) Suggested CG_{TD} Production — Participant Production

(a) *Initial /ɛ/ Omission*

..vlé.p-***i***	(e).sé.na..	➡	… vlé.p-***i***	∅.sé.na...
see-IMPF-PRES-3SG	*you-2SG-ACC*		*see-IMPF-PRES-3SG*	*you-2SG-ACC*
'…is seeing you…'			*'…is seeing you…'*	***LA* (CG$_{TDC}$)**

(b) *Medial /ɛ/ Omission*

ti.l***e.***ó.ra.s-i	➡	ti.∅∅.ó.ra.s-i
television-FEM-SG-ACC		*television-FEM-SG-ACC*
'television'		'television' ***ES* (CG$_{DS}$)**

(c) *Final /ɛ/ Omission*

tz(e)	é.ʃ-i	ðén.dra	➡	tz∅.	é.ʃ-i	ðén.dr-a
and	*have-IMPF-DEP-1SG*	*tree-NEU-ACC-PL*		*and*	*have-IMPF-DEP-1SG*	*tree-NEU-ACC-PL*
'… and there are trees .'				'and there are trees.'		***AS* (CG$_{TDC}$)**

(5.20a) shows an initial /ɛ/ omission, where a CG_{TDC} participant omits the initial /ɛ/ vowel in the pronoun *esena* 'you.ACC' to avoid hiatus with a preceding vowel, the Tense and *S/V* agreement inflection on the verb *vlep-i* 's/he is seeing'. In (5.20b), the CG_{DS} participant omits the word-medial /ɛ/ in *tileoras-i* 'television', in addition to omitting the onset /l/ of the syllable. (5.20c) shows the omission of a word-final /ɛ/ in *tze* 'and', when the following word begins with /ɛ/. The environments in which these omissions occurred are discussed in detail in *Section 5.5.5* below.

5.5 DISCUSSION

Thus far, I have presented the results of consonant omission, consonant substitution and vowel omission performed by CG_{TDC} and CG_{DS}. A general problem with a wide number of consonant sounds is observed. Specifically, both participant groups exhibit a bigger problem with /s/, /n/, /v/, /ɾ/, /x/, /θ/, /k/, /l/, /ð/, and other stops and fricatives to a lesser extent. The aforementioned sounds are either omitted or substituted. The most problematic phonotactic position for CG_{DS} and CG_{TDC} (though to a lesser extent), triggering *CCV* cluster reduction, are complex onsets, especially word-initially, though this environment seems to not be a contributing factor with consonant substitution. In general, I observed a parallel behaviour between the two groups, such that the consonants that exhibit the highest and lowest number of omissions or substitutions are the same, though CG_{DS} make considerably more omissions and substitutions than CG_{TDC}. Moreover, concerning the participants' performance with the vowel /ɛ/, I observed comparable behaviour between the two groups: the percentages of omission from the two participant groups are comparable for word-initial, and word-final positions, while in word-medial positions, CG_{DS} tend to omit /ɛ/ more frequently than CG_{TDC}.

Furthermore, I have observed that a number of omissions and substitutions involving /s/ and /n/ appear to be causing a change of inflectional features on the surfacing forms produced by participants from both groups. In what follows, I investigate whether the ambiguity caused by a substitution or an omission of a sound is phonetically, phonologically or moprho-syntactically conditioned. More explicitly, I examine whether a sound omission or substitution affecting the surfacing features coincidentally appears to be of the same form as another form with different inflectional features, or whether there is a *consistent* change across an inflectional feature for the majority of participants. This could suggest that the nature of a very small residue of omissions

and substitutions is not purely either phonetically or phonologically conditioned, but rather morpho-syntactically conditioned. The conclusions resulting from the discussion below will offer valuable information of the analysis of the participants' use of Tense, *S/V* agreement and Case presented in *Chapter 6* as well as the evaluation of the role of articulatory and phonological restrictions as a contributing factor to the hypothesised inflectional impairment.

In *Sections 5.2 through 5.4*, it was established that in general, CG_{DS} have phonetic and phonological problems. Specifically, it was shown that a number of consonants are either omitted or other consonants sharing the same manner of articulation are produced instead of the targeted ones. Furthermore, we observed another category of consonants where participants either omit or produce other sounds which they share neither place, nor manner of articulation. These consonants consistently appear to have the same phonetic realisation as another form that carries different inflectional features than the ones targeted or expected. Also, it is worth noting that there is a consistent pattern across the two participant groups, such that all participants in both groups find same sounds problematic: the problems, however, are minimal for CG_{TDC} in comparison to CG_{DS}. Moreover, these sounds are commonly problematic for young children acquiring the phonological system. In this section, I discuss the significance of these omissions and substitutions for the study of morpho-syntax in CG_{DS} and CG_{TDC}. I start with an analysis of consonant omissions with /t/, /s/ and /n/, and move on to discuss the significance of numerous consonant substitutions, which appear to affect the inflectional marking of the targeted/expected form. Finally, I discuss the participants' performance with the vowel /ε/.

To decide whether phoneme omissions and substitutions must be treated as a crucial factor affecting the results of the morpho-syntactic productions I examine two hypotheses:

Hypothesis I: Sound omission and/or substitution is phonetically and/or phonologically conditioned,

Hypothesis II: Sound omission and/or substitution is morpho-syntactically conditioned.

The second hypothesis includes both the morphologically and syntactically conditioned explanation, to evaluate omissions and substitutions, because at this point we cannot determine which of the two it might be. Here, we can only exclude what is phonetically and phonologically conditioned. As a next step, in *Chapters 6* and *7* we will be able to distinguish, which of the two explanations merged in Hypothesis II above can best account for the data.

5.5.1 The Significance of Consonant Omissions with no Morpho-syntactic Effect

The results involving consonant omissions are in accordance with past literature on the Eng_{DS} articulation problems. Specifically, problems with /ɾ/, /l/ and fricatives have been reported. With CG_{DS} we saw that /ɾ/ presents one of the highest rates of omission (27%, collectively), while most fricatives also have a significant percentage of omission, reaching up to 22% with /v/. /l/ appears problematic as well. Some minor problems with stops are also recorded. While some of these are a direct result of cluster reduction, for others I was unable to determine the cause of omission. Interestingly, CG_{TDC} presented problems with the same sounds, but their percentages of omission are much lower. Hence, overall results suggest a general phonetic problem with a number of sounds, regardless of the phonetic, phonological or inflectional environment. A much lower percentage of omissions and substitutions appear to be phonologically conditioned.

Previous work on Eng_{DS} describes similar problems and reports that the phonological patterns characterizing Eng_{DS} productions are inconsistent (Dodd 1976, Kumin 2006). However, this is

not what we observe with the current data. On the contrary, all omissions are quite consistent, in terms of what is altered and what the produced outcome is, as shown in *Sections 5.2* through *5.4*. I later argue that a very small number of instances which appear to not fit this pattern (presented in *Section 5.3.2*) are morpho-syntactically triggered.

5.5.2 The Significance of Consonant Omissions with Morpho-syntactic Effects

In this section I discuss the effects of consonant omission where the produced form is not a result of a morpho-syntactically conditioned process. I attempt to determine whether the resemblance to another form with different inflectional features than the ones targeted, is phonetically or phonologically conditioned or whether it is morpho-syntactically conditioned. I discuss results in the order they were presented throughout *Sections 5.2* to *5.4*. I start with a discussion on /t/ omission, and move on to discuss the morpho-syntactic effects of /s/ and /n/ omission.

5.5.2.1 Disambiguating /t/ Omission

It was observed that the majority of /t/ omissions (42% of overall /t/ omissions) occurred word-initially with clitics and the definite determiner for either Masculine, Feminine or Neuter. In many instances, /t/ omission results in a form identical to the Nominative Masculine or Feminine determiner. Since the resulting form is identical to an existing form, we could conclude that /t/ omissions are not really phonologically conditioned, but rather we are dealing with morpho-syntactically conditioned changes to the inflectional features of Case and Gender. In particular, we could potentially be dealing with a change from Accusative to Nominative as in /tin/ → [i], or

from Neuter to Masculine Gender /tɔ/ → [ɔ].[72] Hence, two possible accounts are examined below: /t/ omission is either (i) phonologically or (ii) morpho-syntactically conditioned.

There are reasons to think that these omissions are in fact phonetically/phonologically conditioned. In particular, out of the 42% of overall /t/ omissions mentioned above, 12% of /t/ omissions detected with definite determiners do not result in a change of Case. That is, the produced form does not correspond to an existing form, as with cases like /tɐ/ → [ɐ] or /tu/ → [u]. This establishes that we must at least recognise the existence of phonologically/phonetically conditioned /t/ omissions. A possible explanation for this could be stress. More explicitly, monosyllabic words in Greek do not receive stress and therefore, sounds are more prone to omission, especially word-initially or word-finally. Hence, overall, in 70% of tokens (58% of /t/ omission in non-inflectional environments and 12% of the cases described above) /t/ omission has no effect on the inflectional features of the produced forms. In contrast, 30% of the produced forms where /t/ is omitted appear to have an effect on the inflectional features marked on the production. This however, still leaves the option that, at least in some cases, /t/ omission is morpho-syntactically conditioned. In particular, /t/ omissions with determiners involved simultaneous Gender and Case change on some occasions and consistently involved the same feature values: Neuter to Masculine and Accusative to Nominative, accordingly. Thus, we are still left with two possible explanations for this 30% of /t/ omissions; they could be phonologically/phonetically or morpho-syntactically conditioned.

Four facts can disambiguate this issue: (i) additional information on the phonological features of /t/, (ii) the *DS* use of the phoneme /t/ in other languages and (iii) the CG_{TDC} and CG_{DS} overall use of the features affected by /t/ omission (Case and Gender). The first fact supports the view that /t/

[72] This might be similar to the change from Past to Infinitive reported in the literature.

omission is phonologically conditioned. /t/ has been described as the most underspecified sound in the Eng_{TDC} acquisition of phonology, carrying no underlying phonological features (Kiparsky 1982, Stoel-Gammon and Stemberger 1994). Therefore, omission is common with this underspecified phoneme. The second fact points towards a morpho-syntactically conditioned process: /t/ omission is not very common outside of consonant clusters. Therefore, while /t/ omission can be accounted for as phonological in the cluster cases, when in *CV* syllables we cannot explain why /t/ is omitted. The third fact supports the conclusion that /t/ omission is due to phonetic reasons, i.e. the *DS* articulation restrictions. In particular, reports on the *DS* articulation difficulties report that tongue size affects the production of lingual consonants (Stoel-Gammon 2001) - /t/ being a lingual consonant. The fourth fact provides evidence for a phonologically conditioned process: omission of /t/ in unstressed syllables, regardless of syllable environment, can explain the omission of initial /t/, especially if those are also utterance-initial. To determine the nature of the fifth fact, we need to look at the participants' overall performance with Case. As we will see in *Chapter 6* participants do show a clear preference to Nominative Case. This shows that /t/ omission for these specific environments could very well be morpho-syntactically conditioned. To this point, however, the nature of /t/ omission in these environments is inconclusive.

5.5.2.2 Disambiguating /s/ Omission

There are the only two consonants with inflectional value (i.e. found in inflectional suffixes). One of the sounds, where omission causes the produced form to accidentally have the same surface form as a form with different inflectional features, is /s/. Again, we need to determine whether /s/ omission is phonetically, phonologically conditioned or morpho-syntactically conditioned. There are a number of factors that help to decide.

Below, I categorise /s/ omissions based on whether or not inflectional features are affected. *Tables 5.30* (for CG_{DS}) and *5.33* (for CG_{TDC}) show the distribution of /s/ omissions in all word positions, giving details on the overall number of /s/ targeted in each word position, /s/ production, omission (∅), and substitution (/s/ → [C]) for each evaluation category based on the change the omission caused. It also gives the proportion (i.e. percentages) of production, omission and substitution for each category: causing *Phonetic and/or Phonological Effects* or *Potential Morpho-syntactic Effects*.

CG_{DS}	Potential Morpho-Syntactic Effects				Phonetic/Phonological Effects			
/s/	Tokens	Production	∅	/s/ → [C]	Tokens	Production	∅	/s/ → [C]
Initial	83	77	0	6	1,045	731	252	62
		92.77%	0%	7.23%		69.95%	24.11%	5.93%
Medial	568	488	50	30	1,661	1,342	256	63
		85.92%	8.8%	5.28%		80.79%	15.41%	3.79%
Final	1,727	731	989	7	1,040	372	372	158
		42.33%	57.27%	0.41%		35.77%	35.77%	15.19%
TOTAL	2,378	1,296	1,039	43	3,746	2,445	880	283
		54.50%	43.69%	1.81%		65.27%	23.49%	7.55%

TABLE 5.30: DISTRIBUTION OF /S/ OMISSION IN TERMS OF ITS NATURE AND EFFECTS FOR CG_{DS}

As discussed above, CG_{DS} are more likely to omit /s/ word-finally, but also have a considerable number of /s/ omissions in both word-medial and word-initial positions. The results in *Table 5.30* show that /s/ omissions appear to be equally distributed between cases where the omission is clearly phonetically (articulatory restrictions) and phonologically conditioned (i.e., environment accommodates omission) and occurrences where the omission appears to have a morpho-syntactic effect, especially in word-final positions. In word-initial positions there were only a handful of cases where features are affected due to the substitution of /s/. Word-medial /s/ omission is, on most occasions, clearly phonetically/phonologically conditioned. Word-final /s/ omissions are almost equally distributed between instances that may or may not be morpho-syntactically conditioned. And are clearly phonetically or phonologically conditioned.

Paired Samples t-tests comparing the participants mean /s/ *Production* and *Omission,* and /s/ *Production* and *Substitution* (VARIABLE I) in *Phonetic and/or Phonological Effects* and *Potential Morpho-syntactic Effects* (VARIABLE II), for all three word-positions, were conducted to determine whether /s/ omission is phonetic/phonologically or morpho-syntactically conditioned. The statistical comparision for both /s/ *Production – Omission* and /s/ *Production – Substitution* revealed non-significant differences between the two potential effects. That is, /s/ omission in all positions is purely phonetically and phonologically conditioned.

STATISTICAL COMPARISON WITHIN GROUPS – OMISSION									
CG_{DS}	Potential Morpho-Syntactic			Phonetic/Phonological					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /s/	.000	.000	.000	.281	.174	.044	-6.46	15	<.001
Medial /s/	.114	.110	.027	.158	.110	.027	-1.88	15	.080
Final /s/	.611	.325	.081	.603	.303	.076	-0.22	15	.833

TABLE 5.31: STATISTICAL COMPARISON OF /S/ OMISSION WITHIN GROUPS

Results revealed a non-significant difference between the two environments for word word-final and word-medial positions, such that, /s/ omission occurs irrespective of an inflectional or non-inflectional environment. There were a few instances of omission in word-initial environments where omissions surfaced a morpho-syntactic difference between the produced and targeted form, and those were statisticallysignificant. With regards to substitutions, CG_{DS} are more likely to substitute word-final /s/ in non-inflectional environments than in inflectional environments, where the change could cause a change in the morpho-syntactic features inflected on the word. Comparisons for word-initial and word-medial positions revealed non-significant differences.

STATISTICAL COMPARISON WITHIN GROUPS – SUBSTITUTION									
CG_{DS}	Potential Morpho-Syntactic			Phonetic/Phonological					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /s/	.094	.188	.047	.090	.090	.022	0.76	15	.941
Medial /s/	.059	.069	.017	.046	.046	.012	0.97	15	.346
Final /s/	.007	.016	.004	.225	.234	.059	-3.78	15	.002

TABLE 5.32: STATISTICAL COMPARISON OF /S/ SUBSTITUTIONS WITHIN GROUPS

In sum, these results clearly show that /s/ omissions in all word positions are phonetically and phonologically conditioned. The same is also true for /s/ substitutions in word-medial positions. *Table 5.33* below, provides a categorisation of the /s/ omission results for CG_{TDC}. It shows that /s/ omission and substitution is evenly distributed between the two categories for CG_{TDC}.

CG_{TDC}	Potential Morpho-Syntactic Effects				Phonetic/Phonological Effects			
/s/	Tokens	Production	∅	/s/ → [C]	Tokens	Production	∅	/s/ → [C]
Initial	337	328	0	0	1,355	1,329	24	2
		97.33%	0%	0%		98.08%	1.77%	0.15%
Medial	898	871	15	12	1,386	1,327	49	10
		96.99%	1.67%	1.34%		95.74%	3.54%	0.72%
Final	2,697	2,586	106	5	1,363	1,308	46	9
		95.88%	3.93%	0.19%		95.96%	3.37%	0.66%
TOTAL	3,932	3,785	121	17	4,104	3,964	119	21
		96.26%	3.08%	0.43%		96.59%	2.90%	0.51%

TABLE 5.33: DISTRIBUTION OF /S/ OMISSION IN TERMS OF ITS NATURE AND EFFECTS CG_{TDC}

Statistical comparison given in *Tables 5.34* and *5.35* on /s/ *Production – Omission* and *Production – Substitution* between *Phonetic and/or Phonological Effects* and *Potential Morpho-syntactic Effects* surfaced somewhat parallel results as for CG_{DS}: CG_{TDC} will equally omit /s/ regardless of whether the omission occurs in a morpho-syntactic or purely phonological environment. The same was not true for /s/ substitution in either word position.

STATISTICAL COMPARISON WITHIN GROUPS – OMISSION									
CG_{TDC}	Potential Morpho-Syntactic			Phonetic/Phonological					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /s/	.000	.000	.000	.006	.008	.002	-3.06	16	.007
Medial /s/	.017	.028	.007	.017	.016	.004	0.49	16	.962
Final /s/	.040	.029	.007	.034	.024	.008	0.86	16	.401

TABLE 5.34: STATISTICAL COMPARISON OF /S/ SUBSTITUTIONS WITHIN PARTICIPANT GROUPS

CG_{TDC} appear to substitute /s/ more frequently in environments where substitution results in ambiguity between the targeted inflectional features and the inflectional features surfacing on the produced form, but the reverse is true for word-final /s/ substitution. Namely, as with CG_{DS}, CG_{TDC} substitute word-final /s/ in environments with no change in the morpho-syntactic features.

STATISTICAL COMPARISON WITHIN GROUPS – SUBSTITUTION									
CG_{TDC}	Potential Morpho-Syntactic			Phonetic/Phonological					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /s/	.000	.000	.000	.003	.007	.002	-1.73	16	.104
Medial /s/	.014	.015	.004	.008	.014	.003	0.96	16	.350
Final /s/	.002	.003	.001	.021	.025	.006	-3.20	16	.006

TABLE 5.35: STATISTICAL COMPARISON OF /S/ SUBSTITUTIONS WITHIN PARTICIPANT GROUPS

I present a number of facts supporting that /s/ omission is a phonetically and phonologically conditioned process. First, *Tables 5.30* and *5.33* (as well as *Tables 5.31*, *5.32*, *5.34* and *5.35*) show that where /s/ is not so frequently used as an inflectional affix (word-medially) the omission is phonetically conditioned; 9.09% for CG_{DS} and 1.64% for CG_{TDC} appear to be morpho-syntactically conditioned. The same is true for /s/ substitution, apart from isolated cases.

Second, we already know that /s/ omission is phonetically conditioned (i.e. caused by articulatory difficulties). Recall that (Kumin 2001) and (Stoel-Gammon 2003) observe that Eng_{DS}, tend to omit word-final consonants. Note that word-final /s/ omission does appear more frequently with inflectional suffixes exactly because there is a much higher number of lexical categories (verbs, nominals, determiners, adjectives, pronouns, etc.) which receive inflection, and their inflection includes the sound /s/, than non-inflectional categories (adverbs, prepositions etc.) which end in /s/. This is evident by the classification given in *Tables 5.30* and *5.33*.

Third, a substantial number of /s/ omissions are clearly triggered by articulatory restrictions, and thus are phonetically conditioned. In particular, such are /s/ omissions which occur either in words which do not receive inflection or root internally, for verbs and nominal expressions which can be inflected (see *Tables 5.30* and *5.33 Phonetic/ Phonological Effects*) Therefore, we observe an equal distribution of omissions and substitutions across the two environments.

Fourth, previous research on the articulatory restrictions associated with *DS* has shown that /s/ omission in any word position is phonetically conditioned. Specifically, /s/ is a lingual sound, and has been extensively reported to be problematic in the Eng_{DS} speech, based on articulation difficulties resulting due to tongue size (Stoel-Gammon 2001). Furthermore, (Bacsfalvi 2008 and Gibbon and Hardcastle 1987) show that Eng_{DS} exhibit a general problem with /s/, which can be dealt with through speech therapy.

Fifth, the changes caused by /s/ omission are not found to be consistent for the same feature value across different Gender, Number or Case values (nominals), or different Number and Person marking (verbs). For example, /s/ omission with nouns, marked with Masculine, Singular, Nominative, has an effect where the output is homophonous with Masculine, Singular, Accusative. However, we do not observe the same effect across Feminine, Neuter, or even Masculine values of a different inflectional class. Overall, 640 final /s/ omissions by CG_{DS} result in a form accidentally resembling the same form including Accusative, instead of Nominative Case and 89 appear to be Accusative instead of Genitive. Note that a similar phenomenon is observed with CG_{TDC}, but to a lesser degree: there are 45 instances where /s/ omission results in a form accidentally resembling Accusative instead of Nominative, and 14 where the production accidentally appears to have the same form as Accusative, instead of Genitive. These results initially point towards problematic use of Case. However, /s/ omission causing changes to the inflectional features is also observed with verbal inflection; the produced form for the targeted 2nd Person Singular resembles that of the 3rd Person Singular. Consider the examples below:

(5.21) Examples of /s/ Omission with Diverse Inflectional Effects

	Suggested CG_{TD} Utterance		Participant Production
(a)	Nik-***os***	➡	Nik-***o***
	Nikos-*MASC.SG.**NOM***		*Nikos*-*MASC.SG.**ACC?***

(b) papp-***us*** ➡ papp-***u***
grandfather-MASC.SG.**NOM** *grandfather*-MASC.SG.**GEN/ACC/VOC**

(c) anθrop-***us*** ➡ anθrop-***u***
human-MASC.**PL.ACC** *human*-MASC.**SG.GEN?**

(d) vel-***os*** ➡ vel-***o***
arrow-NEU.SG.**NOM/ACC** *arrow*-NEU.SG.NOM/*(non-existing affix for **this** infl paradigm)*

(e) kukl-***es*** ➡ kukl-***e***
doll-FEM.PL.**NOM/ACC** *doll*-MASC.SG.VOC *(non-existing suffix for **this** infl paradigm)*

The examples in (5.21) show that /s/ omission does not occur in specific environments, and presents major inconsistencies with regards to the effects caused by its omission. Hence, we observe that final /s/ omission occurs in a diversity of environments unrelated to each other and with no consistent pattern across features, such that, if Nominative or Genitive Case do not end in /s/ then we rarely find them changing to Accusative: 26 (0.66%) instances of Nominative changing to Accusative and 12 (0.25%) of Genitive changing to Accusative for CG_{DS}, 4 (0.08%) instances of Nominative changing to Accusative and 5 (0.02%) of Genitive changing to Accusative for CG_{TDC}.

If /s/ omission was syntactically conditioned, as it was perceived by *IIH* studies (e.g. for the omission of the 3rd Person Singular *–s* and noun Plural inflection *–s*), caused by a problem with Case assignment, first, we would expect to see consistent problems with Case assignment across all three Genders. That is, we would observe the same Case values to be problematic, causing the same effects across Masculine, Feminine and Neuter Gender, irrespective of the consonants and vowels used for its phonological representation. Second, we would expect to see a pattern with the Case assignment problems. That is, we would expect (i) that other features associated with the head of the affected phrase will also present problems, or (ii) the use of an (random) affix to

serve phonological purposes (triggered by a ban against word-final consonants other than /n/ and /s/), or (iii) a consistent change from one Case value to another. Third, we would expect to see sounds other than /s/ being dropped or altered in order to accommodate change from Nominative to Accusative. However, the most consistent characteristic of Case inconsistencies in the data presented in this dissertation is the omission of /s/. In sum, based on the aforementioned evidence, /s/ omission is not syntactically conditioned and does not result in random use of Case values by CG_{DS}. More information and statistical comparisons as to how consistent Case changes are across the two groups are given in *Section 6.5*, *Chapter 6*. In sum, /s/ omission is consistent across changes from and to the same feature value. Thus, we can conclude that /s/ omission is phonetically and phonologically conditioned.

Sixth, there are no /s/ omissions (in any word position) that unambiguously change the feature values inflected on a word. More explicitly, the surrounding environment shows that /s/ omission resulting in a change from Nominative or Genitive to Accusative is in fact accidental. There is no record of cases where in addition to /s/ omission, we have independent evidence, from other sounds changing or being omitted to support that the feature change is not accidental. In particular, we do not find other nominals in a DP, specifically nominal modifiers and the determiner, to also exhibit Case change from Nominative or Genitive to Accusative. 389 occurrences of final /s/ omission for CG_{DS} concern the same word, *Nik-os* which is inflected with Masculine, Singular, ***Nominative***. The omission of /s/ results in the surfacing form *Nik-o∅*, seemingly carrying the feature values Masculine, Singular and ***Accusative***. On the 389 occurrences the form *Nik-o∅* is produced, approximately 95% of the productions are accompanied by the corresponding determiner *o* marked with Masculine, Singular ***Nominative***.

Therefore, we can conclude that the nominal is also marked with Nominative, despite the lack of the final /s/. If the inflectional marking on a nominal as well as a determiner (the head D, which hosts the Case features marked on the entire DP) are problematic, we can conclude that the problem is syntactically conditioned, since what controls the assignment of the Case features (i.e. T/INFL) creates the problem with the inaccurate use of Case on the nominal. On the other hand, if inaccurate use of the Case only appears on the noun, without any effects on the determiner, we can conclude that what syntactically controls the assignment of Case is intact, and therefore, the inaccurate use of Case is not syntactically conditioned. Finally, if the head of the phrase is affected, then we expect to see all features controlled by the head to present a bundling effect, such that other features controlled by the head of the affected phrase also present problems.

(5.22)	Suggested CG_{TD} Utterance			Participant Production	
(a)	o	Nik-os	➡	o	Nik-o∅
	DET-MASC.SG.NOM	*Nikos-MASC.SG.NOM*		*DET-MASC.SG.NOM*	*Nikos-MASC.SG.NOM*
(b)	o	Nik-os	➡	[73]×ton	Nik-o∅
	DET-MASC.SG.NOM	*Nikos-MASC.SG.NOM*		*DET-MASC.SG.ACC*	*Nikos-MASC.SG.ACC?*
(c)	tis	ikoγeni-as	➡	ti∅	ik[u]∅eni-a∅
	DET.FEM.SG.GEN	*family-FEM.SG.GEN*		*DET.FEM.SG.ACC*	*family-FEM.SG.**ACC?***
(d)	tis	ikoγeni-as	➡	×tin	ik[u]∅eni-a
	DET.FEM.SG.GEN	*family-FEM.SG.GEN*		*DET.FEM.SG.ACC*	*family-FEM.SG.**ACC?***
(e)	tu	all-u	➡	tu	all-u
	DET.MASC.SG.GEN	*other-MASC.SG.GEN*		*DET.MASC.SG.GEN*	*other-MASC.SG.GEN*
(f)	tus	anθrop-us	➡	tu∅	anθrop-u∅
	DET.MASC.PL.ACC	*Person-MASC.**PL.ACC***		*DET.MASC.SG.GEN*	*Person-MASC.**SG.GEN?***

[73] × indicates that the relevant example was not evidenced. It is presented merely for illustration purposes.

Notice that the effects caused by /s/ omission are neither consistent across Gender (e.g. Genitive Case across all three Gender values) nor across Case features. If the change was indeed morpho-syntactically triggered, then we would expect to see a final /n/ at least on the determiner: *to**n** Nik-o(n)* for (5.22a) and *ti**n** ikoγeni-a(n)* for (5.22d), and an initial /t/ for the determiner in (5.22a). In the case of a morpho-syntactic problem, we would expect to see *to**n** allo(n)* for (5.22e).

Seventh, I provide evidence on Nominative Case inflection in relation to Tense, showing that /s/ omission is phonetically conditioned. Determining whether the omission of /s/ is phonetically, phonologically, morphologically or syntactically conditioned is important because its omission with the noun *Nik-os* could suggest that participants have difficulties with the inflection of Nominative, treating *Accusative* as a favoured alternative value. Tense and Nominative Case have been argued to be closely related in Indo-European languages. However, problems with Case inflection, which may reflect problems with Tense inflection, are generally not observed. A thorough examination of the structural environment, where Case was found problematic, revealed ***only 8*** instances for CG_{DS} and ***only 4*** for CG_{TDC} of incorrect Case and incorrect Tense assignment, in the same or across main and subordinate clause, in approximately 28,800 clauses. Hence, this fact also supports that /s/ omission is primarily a result of articulatory restrictions.

Eighth, /s/ omission is reinforced as an articulatory restriction, rather than an inflectional impairment, by the variety of effects observed with Plural forms, regardless of Case infection. Data in (5.23) below confirm that when final /s/ omission occurs with Plural we have the production of the remaining part of the suffix, just a vowel. In such cases there is no ambiguity in terms of the targeted and produced Case value expressed by the suffix. Thus, the produced form does not appear to accidentally correspond to a particular set of morpho-syntactic features as with the Masculine, Singular, Nominative to Masculine, Singular, Accusative, found in (5.24).

(5.23) Final /s/ omission in Inflectional Suffix with Accidental Morpho-syntactic Effect

	Suggested CG_{TD} Utterance		Participant Production
(a)	aɣon-as	➡	aɣona∅
	match-*MASC.SG.**NOM***		*match*-*MASC.SG.**ACC?***

(5.24) Final /s/ omission in Inflectional Suffix with NO Morpho-syntactic Effect

	Suggested CG_{TD} Utterance		Participant Production
(a)	aɣon-es	➡	aɣon-e∅
	match-*MASC.PL.ACC*		*match*-*MASC.PL.ACC*
(b)	kopell-es	➡	kopell-e∅
	girl-*FEM.PL.NOM*		*girl*-*FEM.PL.NOM*

Ninth, /s/ omission is considered phonetically and phonologically conditioned based on evidence from CG_{TD} phonetics/phonology. In general, CG_{TD} only allows /s/ and /n/ in word-final positions. It was extensively shown in this chapter that /s/ and /n/ omissions by CG_{DS} are more prominent in word-final positions. Though there is no ban on codas, CG_{TD} speakers do not favour any word-final codas on loan words CG_{TD}; they almost always omit final consonants and simplify syllables from *(C)CVC* to *CV*. For example, many CG_{TD} will say [pɐɾ.kɪ] instead of /pɐɾ.kɪŋ/, or [pɔ.lɐɪ] instead of /pɔp.lɐɪn/.

In sum, results from the current phonetic analysis in combination with the basic facts on feature change consistency in morpho-syntactic features summarised above indicate that /s/ omission at its most part is primarily phonetically conditioned. Overall, phonetic results show a general problem with specific sounds in the *CG* phonetic inventory. The highest omissions come from /n/ and /s/ which are frequently part of an inflectional affix, as well as medial /ɾ/, initial /v/ (sounds carrying no inflectional features). In addition, we find an inconsistency with the morpho-syntactic effects where omission of /s/ causes the surfacing form to accidentally resemble a form inflected with inflectional features other than those targeted. Moreover, there is a considerable

percentage of cases where only non-inflected forms (adverbs, prepositions, etc.) are affected and result to a different phonetic realisation of targeted forms.

At this point, we have ample evidence to conclude that /s/ omission in any word position, seemingly surfacing different inflectional features than the ones targeted/expected, is indeed phonetically and phonologically conditioned. It results from the articulatory restrictions (i.e. due to different physiology) associated with *DS*, which makes it hard to pronounce /s/, as well as the phonological environment (syllable structure and word position, word-final consonants and clusters are not favoured) and phonological features (Coronal versus Dorsal and Labial).

5.5.2.3 Disambiguating /n/ Omission

In this section, I discuss /n/ omission to determine whether the result of the production accidentally appears to be bearing features other than those targeted, or whether the surfacing form is a product of an impairment of a specific inflectional domain. In *Table 5.35*, I present the categorization of /n/ omission under *Phonetic/Phonological Effects*, i.e. instances where /n/ omission does not affect the inflectional features. The categorization of /n/ omission under *Potential Morpho-syntactic Effects* lists those cases where /n/ omission results in forms which appear to have different inflectional features than those targeted. *Table 5.35* shows the distribution of /n/ omissions in all word positions, giving details on the overall number and percentage of /n/ productions, omissions and substitutions for each word position, based on the type of change caused by the omission.

CG_{DS}	Potentially Morpho-Syntactic Effects				Phonetic/Phonological Effects			
/n/	Tokens	Production	∅	/n/ → [C]	Tokens	Production	∅	/n/ → [C]
Initial	0	0	0	0	2,174	1,946	119	109
		0%	0%	0%		89.51%	5.47%	5%
Medial	290	262	25	3	2,148	1,910	214	24
		90.34%	8.62%	1.03%		88.92%	9.96%	1%
Final	99	28	66	5	1,082	666	411	5
		28.28%	66.67%	5.05%		61.55%	37.99%	0%
TOTAL	389	290	91	8	5,404	4522	744	138
		74.55%	23.39%	2.06%		83.68%	13.77%	3%

TABLE 5.36: DISTRIBUTION OF /N/ OMISSION IN TERMS OF ITS NATURE AND EFFECTS CG_{DS}

Table 5.36 shows that the overwhelming majority of /n/ omissions do not affect inflectional features. Word-initially, there are no cases where either /n/ omission or substitution can be perceived as morpho-syntactic. Word medially, /n/ omission rarely causes the surface form to resemble another form with different inflectional features with an 8.07% omission rate for CG_{DS}. However, the same is not true for word-final omissions, which may potentially have morpho-syntactic effects. In proportion, /n/ omission with such cases is quite high (60.4%). However, given (i) the low numbers and the fact that word-final /n/ omission in such environments occurred with the determiner *ton* and (ii) surfacing of /n/ in CG is pending on the phonological rule of /n/ surfacing only when preceding /p/, /t/, /k/ or a vowel, these cases could also very well be phonetically/phonologically conditioned. The three aforementioned facts already point towards the conclusion that /n/ omission is also phonetically (i.e. being a lingual sound) and/or phonologically (syllable structure and phonological environment) conditioned. Some word-final and word-medial omissions appear to be an exception. These are discussed in more detail below. Statistical comparison of /n/ omission and substitution by CG_{DS}, between phonetic/phonological and morpho-syntactic environments, evidenced non-significant results for both environments for substitutions, but only word-medially for omissions. However, I maintain that, based on the unusual substitution of /n/ to /s/ discussed in *Section 5.3.2*, some of the /n/ substitutions for both groups are indeed morpho-syntactically conditioned and are be analysed as such in *Chapter 6*.

STATISTICAL COMPARISON WITHIN GROUPS – OMISSION									
CG_{DS}	Potential Morpho-Syntactic			Phonetic/Phonological					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /n/	-----	-----	------	-----	-----	------	----	-----	------
Medial /n/	.119	.128	.032	.118	.081	.020	-0.01	15	.993
Final /n/	.738	.343	.086	.376	.142	.036	5.29	15	<.001

TABLE 5.37: STATISTICAL COMPARISON OF /S/ SUBSTITUTIONS WITHIN PARTICIPANT GROUPS

STATISTICAL COMPARISON WITHIN GROUPS – SUBSTITUTION									
CG_{DS}	Potential Morpho-Syntactic			Phonetic/Phonological					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /n/	-----	-----	------	-----	-----	------	----	-----	------
Medial /n/	.019	.044	.011	.015	.011	.003	0.42	15	.678
Final /n/	.135	.280	.070	.009	.016	.004	1.82	15	.088

TABLE 5.38: STATISTICAL COMPARISON OF /S/ SUBSTITUTIONS WITHIN PARTICIPANT GROUPS

Table 5.39 summarises the results on /n/ omission for CG_{TDC} with the same categorisation. We observe that in comparison with CG_{DS}, CG_{TDC} omit /n/ in any word position at much lower rates. /n/ omissions with potential morpho-syntactic effects are also observed with CG_{TDC}.

CG_{TDC}	Potential Morpho-Syntactic Effects				Phonetic/Phonological Effects			
/n/	Tokens	Production	∅	/n/ → [C]	Tokens	Production	∅	/n/ → [C]
Initial	0	0	0	0	1,826	1799	24	3
		0%	0%	0%		98.52%	1.31%	0.16%
Medial	486	476	10	0	2,762	2762	46	6
		97.94%	2.06%	0%		100.00%	1.67%	0.22%
Final	175	160	13	2	2,293	2127	193	3
		91.43%	7.43%	1.14%		92.76%	8.42%	0.13%
TOTAL	661	636	23	2	6,881	6688	263	12
		96.22%	3.48%	0.30%		97.20%	3.82%	0.17%

TABLE 5.39: DISTRIBUTION OF /N/ OMISSION IN TERMS OF ITS NATURE AND EFFECTS CG_{TDC}

Paired Samples t-tests revealed non-significant results for /n/ omission in both word-medial and word-final position; that is, the omission of /n/ in word-medial and word-final positions by CG_{TDC} is independent on the environment it occurs. Based on these results as well as the detailed discussion below, /n/ omission is all word positions appears to be phonetically/phonologically conditioned.

STATISTICAL COMPARISON WITHIN GROUPS – OMISSION									
CG_{TDC}	Potential Morpho-Syntactic			Phonetic/Phonological					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /n/	-----	-----	------	-----	-----	------	----	----	------
Medial /n/	.023	.043	.010	.017	.016	.004	0.66	16	.520
Final /n/	.065	.079	.019	.077	.060	.015	0.55	16	.587

TABLE 5.40: STATISTICAL COMPARISON OF /s/ SUBSTITUTIONS WITHIN PARTICIPANT GROUPS

Concerning /n/ substitutions produced by CG_{TDC} /n/, we observe that word-final /n/ substitutions surfaced a non-significant result, and word-medial /n/ substitutions revealed a significant result. Therefore, it appears that in general CG_{TDC} omit or substitute /n/ without targeting the change of inflectional features, and therefore, /n/ omission and substitution for CG_{TDC} is also phonetically/phonologically conditioned. As discussed above, the word-final /n/ substitutions listed under potential morpho-syntactic effects are, however, treated as morpho-syntactic, given (i) the consistency of the environments it occurs, (ii) the effects the substitution has on inflectional features, and (iii) the unusual phonological substitution of /n/ to /s/ where we find their single word-final /n/ substitution.

STATISTICAL COMPARISON WITHIN GROUPS – SUBSTITUTION									
CG_{TDC}	Potential Morpho-Syntactic			Phonetic/Phonological					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /n/	-----	-----	------	-----	-----	------	-----	-----	------
Medial /n/	.000	.000	.000	.002	.004	.001	-2.49	16	.024
Final /n/	.009	.025	.006	.002	.004	.001	1.11	16	.283

TABLE 5.41: STATISTICAL COMPARISON OF /s/ SUBSTITUTIONS WITHIN PARTICIPANT GROUPS

Below, I give an example for word-medial /n/ omission, where the surface form appears to carry different inflection than the one targeted, but also a parallel example where it is not.

(5.245 <u>Suggested CG_{TD} Utterance</u> <u>Participant Production</u>

(a) a***n***θrop-on ➡ a∅θrop-on

Person-MASC.SG.ACC *Person-MASC.SG.ACC*

(b) e-kam***n***-e ➡ e-kam∅-e

*PAST-do.**IMPF**-PAST.3.SG* *PAST-do.**PRF**-PAST.3.SG*

In (5.25a), the omission of /n/ deviates from the targeted form only phonetically, as the produced form does not resemble a parallel form inflected with different inflectional features. This type of omission is quite common for CG_{TD} as well. In contrast, in (5.25b) the produced form deviates from the phonetic representation of the targeted form in terms of the morpho-syntactic features (i.e. Aspect), associated with the inflectional marking. In fact, in all cases where word-medial /n/ omission points towards a morphologically or syntactically conditioned difference between CG_{DS} and CG_{TD} the feature Aspect is affected.

One possibility is that /n/ omission in the examples above can be perceived as the phonological process of cluster reduction: 74% (N=17/23) of the CG_{DS} overall medial /n/ omissions under the *Potential Morpho-syntactic Effects*, and 75% (N=9/12) of the CG_{TDC} medial /n/ omissions resulted to cluster reduction. Moreover, of all the cluster reduction cases, only 2 from CG_{DS} ***did not*** concern the sequence /mn/, namely involved the verb *kan-o* SG_{TD} or *kamn-o* CG_{TD} 'I do/make'. As explained above, the specific cluster reduction involving medial /n/ results in a change of Aspect form Imperfective to Perfective. This is not only observed for verbs inflected with Present but it is a process observed with Past verbs as well. Despite the consistency of cluster reduction involved in the omission of medial /n/, we also observe a consistent pattern across participants within and across groups with the exact same verb, and the exact same feature. This uniformity seems to be pointing towards a morphologically or syntactically driven process, for this specific environment, where Aspect change is the outcome/target.

Word-final /n/ omission was found in inflectional suffixes, or with either the Masculine or Feminine clitic or determiner. However, it was determined that in such cases, what caused the

ambiguity of inflectional features between the targeted and produced form was not the final /n/ omission. Examples under (5.26) show that /n/ omission in word-final position is purely phonetically or phonologically conditioned.

(5.26)	Suggested CG_{TD} Utterance			Participant Production	
(a)	itan		➡	ita∅	
	be.IMPF-PAST.3.SG/PL			*be.IMPF-PAST.3.SG/PL*	
(b)	s-ti***n***	aðerf-in	➡	i	a[l]e∅f-in
	to-DET-FEM.SG.ACC	*sister-FEM.SG.ACC*		*DET-FEM.SG.NOM*	*sister-FEM.SG.ACC*

Even though in (5.26a) the omission of final /n/ is observed with a copula, it has no effect on the inflectional features marked on the copula. In (5.26b), the omission of word-final /n/ appears to have an effect on the inflectional marking of the determiner. However, the /n/ omission is not what is causing the produced form to resemble another form with different inflectional features. The omission of final /n/, in combination with the omission of the initial /t/ and the omission of the prepositional affix *s-*, preceding the /t/, cause the determiner to surface as Nominative instead of Accusative. For discussion on the acquisition of the /st/ cluster see Sanoudaki (2010).

In summary, there is a small percentage of occurrences where /n/ omission appears to be the outcome of a morphological or syntactic problem, i.e. the change of Aspect from Imperfective to Perfective. However, even these can be perceived as instances of cluster reduction, especially if we consider numerous other cases, where medial /mn/ cluster exhibits /n/ omission and the produced inflectional features do not accidentally resemble another form with different surfacing features than those targeted. Nonetheless, in these environments /n/ omission is more likely to be targeting a feature value change. Except for these specific cases, which are considered separately in *Chapter 6*, /n/ omission in all positions is phonetically or phonologically conditioned.

5.5.3 The Significance of Consonant Substitutions with no Morpho-syntactic Effect

Results on consonant substitutions show that the same consonants as the ones involving omission are affected: most substitutions involve fricatives and stops as well as the sonorants /n/, /ɾ/ and /l/. Among other consonants, /θ/ → [x] and /k/ → [t] substitutions presented the highest percentage of substitution for both groups. While some substitutions can be explained in terms of feature spreading from adjacent sounds, voicing/devoicing, consonant harmony within and across syllables or sharing place of articulation, there are nevertheless some substitutions that do not fall under any of these categories. The one characteristic that most of these uncategorised substitutions have in common is the fact that they are usually substituted by a consonant with which they share the manner of articulation. In particular, stops are commonly substituted by another stop, usually [t], while fricatives are frequently substituted by another fricative, usually /x/: /θ/ → [x], /s/ → [x], /C/ → [x]. In particular, participants tend to produce [t] instead of /p/ and /k/, or [x] instead of other fricatives like /s/, /f/ and /θ. It should be noted that these substitutions were observed in many diverse environments: inter-vocalically, in a consonant cluster as first or second consonant, word-initially or word-medially.

/n/ and /s/ substitutions display parallel results in terms of consistency: CG_{DS} use another sound instead of /s/ at a 5.3% rate, while CG_{TDC} use another sound instead of /s/ at a 0.3% rate (based on the overall /s/ productions). Most /s/ substitutions result to the production of [x] or [θ]. Though /s/ is substituted more in word-final and word-initial positions, /s/ substitution is also found word-medially. Concerning /n/ substitutions, the rate of /n/ substitutions is quite low: 2.5% for CG_{DS} and 0.2% for CG_{TDC}. Participants almost always produce other sonorants, in the place of /n/, frequently in word-initial positions for CG_{DS} and word-medial for CG_{TDC}.

Both CG_{DS} and CG_{TDC} present similar problems with the same sounds, but nonetheless the percentages of substitution for the latter are much lower. In general, results point towards a broad phonetic or phonological problem with a number of sounds, regardless of the phonetic, phonological or inflectional environment they are expected to surface. The general problems of consonant substitutions discussed in this section provide independent evidence to the argument of general phonetic and phonologically conditioned difficulties. In particular, we find substitutions with various sounds, which when substituted, create no ambiguity concerning the inflectional features of the produced form.

5.5.4 The Significance of Consonant Substitutions with Morpho-syntactic Effect

Due to the difficulty participants have pronouncing the sound /s/ they (i) omit the sound or (ii) have a tendency to use another sound instead of /s/, usually one sharing manner of articulation with /s/, as shown above. In this section, I present further analysis on the phonological substitutions of the sound /s/ which appear to result in the production of a verb or a nominal with different inflectional features than those targeted. Results are summarised in *Table 5.28* (p.165).

Apart from the /z/ → [s] and /s/ → [z] substitutions which are common in CG_{TD} speech and only involve change in the [±VOICE] feature, other substitutions listed here, which involve other than a voice feature change, are rarely observed throughout the database. This is clearly illustrated in the confusion matrices for each group provided in *Chapter 7*, *Section 7.4.3.1*. Examples (5.12) – (5.17) above show that the substitutions involving /s/ in *Table 5.28* are more likely morpho-syntactically conditioned, rather than phonetically or phonologically conditioned. Example (5.12) presented results on /z/ → [s] and /s/ → [z] substitutions. The data shows that based on the environment in which these substitutions occur, (i) they can sometimes be perceived as an effect caused by a morphological or syntactic factor or (ii) despite the different phonetic realisation of

the word targeted, the substitution does not cause an ambiguity with another form carrying different inflectional features. The same is true for all other substitutions included in *Table 5.27* appearing to cause morpho-syntactic effects.

/m/ → [s] and /s/ → [m] do not cause an accidental ambiguity between the target form and a produced form with a different phonetic realisation *and* different inflectional features than those targeted. When these two substitutions occur with clitics, full pronouns and the copula, the production in a /m/ → [s] substitution has the same phonetic realisation as the form used for 2nd Person, instead of the targeted 1st Person. Accordingly, /s/ → [m] substitution has the reverse effect. Namely, it causes the produced form to have the same phonetic realisation as that of the 1st Person, instead of the targeted 2nd Person. Participants sometimes repeat an experimental stimulus including the 1st Person inflection, instead of maintaining this inflection by analysing it as referring to the speaker, (i.e. the researcher). Hence, when repeating it they use 2nd Person to maintain the reference to the researcher. Similarly, when the experimental stimulus includes a 2nd Person reference they perceive it as actually referring to them and when repeating the stimulus, they change the Person inflection to 1st Person to maintain the reference. The example in (5.27) below provides additional data where we see an overall change of the Person inflection from 2nd to 1st with both verbs and the clitic across the main and subordinate clause.

(5.27) <u>Targeting 2nd Person – Singular *S/V* agreement</u>

(a) *Targeted Utterance*

etelio-s-es	na	ðin-***is***	ta	ram-ata ...
PAST-finish-PRF-PAST-2SG	*SUBJ*	*tie-IMPF-PRES-2SG*	*DET.NEU-ACC-SG*	*shoelace-NEU-ACC-SG*

... ton	paputs-io	***s***u?
DET.MASC-GEN-SG	*shoe-MASC-GEN-SG*	*2-GEN-SG*

'Have you finished tying the shoelaces of your shoes?'

(b) CG_{DS} *Production (FA)*

∅-telio-s-a	∅a	ðin-***o***	paputsio	***m***u?
*PAST-**finish**-PRF-PAST-1.SG*	*SUBJ*	*tie-IMPF-PRES-**1SG***	*shoe-MASC-GEN-SG*	*1.GEN-SG*

'Have you finished tying the shoelaces of your shoes?'

In (5.27b), the participant uses the 1st Person clitic form instead of the targeted 2nd Person in (5.27a). However, she also uses the 1st Person inflected on the two verbs in the target stimulus, instead of the 1st Person. The consistency of the alternative use for the Person value, and the rarity of such a phonological substitution in *TD* speech cross-linguistically, suggests that /s/ → [m] substitution is not phonetically or phonologically conditioned but rather a consequence of misinterpretation of reference or non-repetition response with a repetition task. CG_{TDC} are less likely to produce this kind of a substitution but a small number of such changes was recorded.

The last type of phonetic process I discuss in this section is [s] insertion. This is examined more closely to determine if the insertion of [s] is either morpho-syntactically or phonologically conditioned. [s] insertion is mainly perceived as a process where the altered phonetic realisation of the target form does not always accidentally resemble another form with different inflectional marking. Above, it was established that [s] is a difficult sound for CG_{DS}. It is therefore doubtful, that CG_{DS} would insert [s] for the same reasons they omit it. Some cases appeared to be caused by problems with an inflectional feature, and more specifically change of the Accusative Case to Nominative, or for verbs, change of the Person feature from 3rd to 2nd. Such cases are determined as morpho-syntactically conditioned, where participants add [s] as a process of targeting the use of inflectional features other than those targeted on a verb or a nominal expression. However, on some occasions [s] insertion found in a produced form is ***not*** of the same form as another form carrying different inflectional features. Such cases are perceived as an exchange or coping error.

5.5.5 The Significance of Vowel Omission

The final type of phonetic or phonological issue discussed in this chapter is /ɛ/ omission. *Table 5.42* charts the distribution of /ɛ/ based on the type of environments it was produced or omitted, giving details on the number of instances it was omitted and the proportion of omission, based on the total number of tokens.

	CG_{DS}					CG_{TDC}				
		initial	final	Total			initial	final	Total	
	Tokens	2,835	2,154	8,501	%	Tokens	2,832	2,758	10,039	%
Hiatus	213	65	72	137	64.3%	320	139	92	231	72.2%
Aug (obg)	104	11	0	11	10.6%	222	16	0	16	7.2%
Aug (opt)[74]	319	155	0	155	48.6%	621	305	0	305	49%
Aux/Cop	462	94	0	94	20.4%	571	23	0	23	4%
Conj	656	0	65	65	9.9%	1,004	0	87	87	8.7%
Total	1,754	325	137	462	26.3%	2,738	344	0	344	12.6%

TABLE 5.42: DISTRIBUTION OF THE PARTICIPANTS' USE OF THE VOWEL /ɛ/

We observe that a number of word-initial and word-final omissions are triggered to prevent hiatus. Of the 213 instances for CG_{DS} and 320 for CG_{TDC} vowel omissions involving hiatus resolution 64.3% CG_{DS} and 72.2% for CG_{TDC} concerned the vowel /ɛ/. Moreover, the percentage of obligatory Past prefix omission is relatively low for both groups and mostly involves hiatus resolution: 10.6% for CG_{DS} and 7.2% for CG_{TDC}. Finally, CG_{DS} omit /ɛ/ in copula or auxiliary environments 20.4% of the time they need to use it, while CG_{TDC}'s omission rate is 4%. Despite the fact that the omission of /ɛ/ causes a different phonetic realisation of the targeted form, the inflectional features of the produced form are the same as the features targeted. The only instance where the omission of (initial) /ɛ/ could possibly affect the inflectional features marked on a surface form is the case of verbs inflected with Past Tense, where the production of /ɛ/ is not optional. Though there are only a small number of such cases, the omission mostly occurred due to hiatus resolution and therefore the different phonetic realisation of surfacing forms is due to a

[74]Note that the table includes only verbs where the past prefix *e-* (optional and obligatory) is used in adult CG_{TD}.

phonological process, typically occurring in CG_{TD} as well. Furthermore, omission of /ε/ does not accidentally result in an existing form with different inflectional features,[75] nor does the /ε/ omission cause the production of an ungrammatical (morpho-syntactically) result.

5.6 SUMMARY

The phonetic and phonological results and analysis presented in this chapter creates a different foundation on which the morpho-syntactic analysis can be based. All ambiguous cases – the greater majority of /s/ and /n/ omissions – investigated in this chapter are now categorised as either phonetically and phonologically or morpho-syntactically conditioned, based on the type of change they undergo and what conditions the different phonetic realisation of produced forms. Moreover, having eliminated one of the most critical factors affecting the data analysis (especially omission of final /s/), we can move on to a morpho-syntactic analysis with a clear classification of affected surface forms as undergoing a phonetic, phonological, or mopho-syntactic process. Therefore, productions are placed into corresponding categories, based on the nature of their change, as determined in this chapter.

In this chapter, I established that certain sound omissions, previously analysed as inflectional, are in fact not morpho-syntactically conditioned. Further, I show that these results look quite different from past research on *DS* and other atypical populations, where extensive phonetic and phonological analysis is not pursued alongside with a morpho-syntactic analysis. As a final note, while Dodd (1976) and Kumin (2006) suggest that the phonological patterns characterizing *DS*

[75] Such a case would be the surfacing of a targeted past Tense form inflected with 2nd Person plural:

(5.26)	pez-***a***-te	➡	e-pez-***e***-te	➡	pez-***e***-te *(ambiguous)*
	play.impf-past-2.pl		past.play.impf-pres-2.pl		play.impf-pres-2.pl
	'You were playing.'		'You were playing.'		'You are playing.'

Such cases were not recorded, however.

productions are inconsistent; results in this chapter show otherwise. Omissions and substitutions are evidenced as either phonetically and phonologically or morpho-syntactically conditioned. What was possibly missing from Dodd's (1976) and Kumin's (2006) analysis is the latter.

In the following chapter, I present the morpho-syntactic results of this study for Tense, *S/V* agreement and Case. I discuss the performance of participants, with regards to their ability to correctly inflect forms with the appropriate features, and their ability to correctly use the forms in an appropriate syntactic environment. Hence, results and Discussion in this chapter set the foundation for the morpho-syntactic analysis pursued in *Chapter 6* below, by eliminating one of the most important factors external to morpho-syntax, namely, phonetically and phonologically conditioned differences between the CG_{DS}, CG_{TDC} and CG_{TD} Grammar, which only appear to be morpho-syntactically conditioned due to the fact that they occur in an inflectional affix.

Chapter 6

Results on Morpho-Syntactic Features

6.1 INTRODUCTION

The main goal of this chapter is to investigate the inflectional marking of Tense, *S/V* agreement, and Case in CG_{DS} and CG_{TDC}. In particular, I aim to evaluate the inflectional impairment hypothesis (*IIH*) relative to data from Cypriot Greek and determine whether the differences between the CG_{DS} and the CG_{TD} (and CG_{TDC}) Grammar are morphologically, syntactically or phonetically and phonologically conditioned. The three particular domains are chosen due to the close syntactic and morphological relations that exist between them. In *Chapter 5* I have shown that the hypothesised impairment is in fact mainly phonetically and phonologically conditioned. However, there is a small residue of differences between target and produced forms that cannot be attributed to a different realisation of the phonetic and phonological system of CG_{DS}.

In this chapter, I discuss results of the inflectional marking based on the features of Tense, Person, and Number for verbs and Case for nominal expressions and examine whether differences between the targeted and produced utterances are morphologically or syntactically conditioned. Though the two participant groups present a parallel system, such that they use the same three options in dealing with utterances that do not match the target, nevertheless, statistical comparison confirms that the two groups differ in their use of certain feature valuesas well as

their overall performance. I present the results from the four experiments that bear on the morpho-syntax of CG_{DS} and CG_{TDC} in comparison to adult CG_{TD}. It is particularly notable that accuracy is near ceiling for both groups, ranging between 95% to 99%, depending on the feature. I show that once we control for the articulatory and phonological restrictions we observe only minimal differences between CG_{DS} and CG_{TDC} with respect to verbal and nominal inflection. Minimal problems observed with both groups manifest themselves in three ways: (i) the use of alternative values to those targeted or expected, which are however not necessarily ungrammatical, (ii) omission of inflectional affixes, and (iii) omission of entire words. Crucially, results show that omission of full words is not restricted to inflected words (nominal expressions and verbs). For nominal expressions, non-inflected words are omitted as frequently as inflected ones. For verbs, non-inflected word omission is observed at a much higher rate than verb omission. Moreover, we see that the differences CG_{DS} exhibit are *systematic*.

The chapter is organised as follows. In *Section 6.2*, I give an overview of the participants' overall performance of all produced words, regardless of whether they receive inflectional marking or not. This serves to establish that (i) overall the two groups, are to a great extent, accurate in their productions and (ii) it is important to control for the phonetically/phonologically conditioned changes. Results show differences up to 10%, such that the CG_{DS} percentage of correct use may drop up to 10% when not considering phonetic and phonological effects. In following sections, I present results on each of the inflected features. More explicitly, in *Section 6.3*, I establish that Tense marking of adult CG_{DS} slightly differs from that of CG_{TDC}. I show that, while the two groups use the same strategies when they do not use a form as targeted, we do find a number of (statistical) differences between CG_{DS} and CG_{TDC} performance. In *Section 6.4*, I consider *S/V* agreement. I show that the participants' performance is almost 100% accurate, apart from slight

problems with 2nd Person agreement. In *Section 6.5*, I examine the production of Case marking, again comparing CG_{DS} and CG_{TDC}. Once more, I show that both CG_{DS} and CG_{TDC} use Case correctly on more than 97%. Only some minor problems with Nominative Case are observed. Finally, in *Section 6.6*, I conclude with a summary of the results.

6.2 OVERVIEW

In this section, I present results of the overall performance of the two participant groups. In later sections, I discuss the specific findings for Tense, *S/V* agreement and Case separately. Overall, both participant groups have a considerably low percentage of incorrect productions and omissions. Next, I explain how individual features are evaluated. As discussed in *Chapter 4*, evaluation of inflectional features is not only relative to the *target* utterance but also relative to the surrounding linguistic environment. This is important because the resulting utterance may not be the exact one targeted; however, it may still be a grammatical utterance and as such cannot be considered incorrect.

6.2.1 Overall Performance

I start with a report on how the participants perform overall. Before moving on to an examination of the results, I list and explain the evaluation labels used to categorise the CG_{DS} and CG_{TDC} performance.

(6.1) *Correct*: an inflectional feature is used as targeted and is grammatical in the linguistic environment it is used
Incorrect: an inflectional feature is not used as targeted and is ungrammatical in the linguistic environment it is used

Omission: entire word not produced when targeted by an experimental stimulus (contolled elicitation) or expected, based on the goal of an experimental task (free elicitation)[76]

Unexpected Addition: word is added when not required or expected

Root Omission: only suffixes are produced (usually due to stuttering or false starts)

Root Change: different root, usually a synonym of the target word; targeted inflection is maintained

Incomplete Utterance, Filler, Exclamation, Unrecognizable Utterance: utterances that were either incomplete, or could not be recognised as a meaningful morpheme. This also includes fillers like *uh*, *eh,* etc.[77]

Table 6.1 below shows the performance of CG_{DS} and CG_{TDC} based on these evaluation criteria. In particular, it shows the instances of each evaluation category in terms of its number (N) as well as in terms of the percentage (%). Percentages in the second column for each group are based on the overall *productions* (excluding omissions and incomplete utterances or fillers) (*Prod %*). The proportion of each category is calculated based on the *Production Total*. Omissions are not included in the analysis of productions, precisely because they are not produced. Besides, as shown above, I include *Omission* as a separate evaluation category. Incomplete utterances and fillers are also not considered: incomplete utterances do not meet the criteria for a grammatical sentence and fillers are not part of structure but are hesitation phenomena. *Table 6.1* also includes a third column for each group where the percentage of global use (*Global %*) can be found. This is calculated based on the production of every single utterance targeted by each participant group – whether a full word, incomplete utterance or a filler – including omitted words. I refer to this as the *Overall Performance*. This is calculated

[76] A *Targeted Utterance* mainly concerns stimuli used for controlled elicitation tasks as with *Experiments #1* and *#2*. An *Expected Utterance* refers to produced utterances triggered by free elicitation tasks, like those found in *Experiments #3* and *#4*. These are used as labels to to refer to and discuss examples given throughout the dissertation.

[77] An example for each of the evaluation labels used but not examined in this chapter can be found in *Appendix D*.

based on the *Overall Performance Total*. For a list of all abbreviations and conventions see the *List of Features, Abbreviations and Conventions*.

	CG_{DS}			CG_{TDC}		
	N	*Prod%*	*Global%*	*N*	*Prod%*	*Global%*
Correct	17,599	**93%**	77.5%	22,559	**97.9%**	91.1%
Incorrect	995	**5.3%**	4.4%	355	**1.5%**	1.4%
Omission	1,689	--	**7.4%**	249	--	**1%**
Root Omission	45	0.2%	0.2%	2	0%	0%
Root Change	68	0.4%	0.3%	6	0%	0%
Unexpected Addition	216	1.1%	1%	119	0.5%	0.5%
Incomplete, filler, exclamation, Unrecognizable	2,092	--	9.2%	1,471	--	5.9%
Production Total	18,923	--	--	23,041	--	--
Overall Performance Total	22,704	--	--	24,761	--	--

TABLE 6.1: DISTRIBUTION OF OVERALL PERFORMANCE BY CG_{DS} AND CG_{TDC}

Results in *Table 6.1* concern all word productions, whether they receive inflectional marking or not. When considering productions, we observe that the majority of utterances of both participant groups are correct: 93% accuracy versus 5.3% incorrect use for CG_{DS} and 97.9% versus 1.5% for CG_{TDC}. Moreover, while the percentage of unexpected additions, root omissions and root changes is collectively very small, there is a sizeable percentage of omissions for CG_{DS} (7.4%), but a much lower percentage for CG_{TDC} (1%). Thus, CG_{TDC} do not omit words as frequently as CG_{DS}. Furthermore, CG_{DS} are less likely to produce a word incorrectly rather than to omit it, while the reverse is true for CG_{TDC}. There is also a small percentage of incomplete utterances, fillers, exclamations, and unrecognizable utterances that are ignored for the purpose of the analysis for reasons explained above.

Statistical comparison was performed to determine whether the two groups differed in their *Overall Performance*, with full words in relation to or independent of inflectional or non-inflectional features. In particular, I tested whether (i) the two groups exhibit non-significant differences, i.e. whether the participants' mean performance with a full word omission is similar

across the two groups, or (ii) significant differences, i.e. whether their mean performance with a specific feature is so different (e.g. one group omits words more frequently than the other group) that it can no longer be said that the two groups have parallel performance. Statistical analysis only gives information on the comparison between the two groups; its purpose is not to evaluate or offer information on how well a group performs overall, based on the experimental stimuli and what is targete. The cut-off point is 0.05 with a *95% Confidence Level*. The *Independent Samples t-test* was used to compare the participants' means of correct and incorrect productions as well as omissions. Two variables were tested; the INDEPENDENT variable tested is the group type, with two levels of comparison (CG_{DS} and CG_{TDC}) and the DEPENDENT variable tested is the participants' performance again with two levels of comparison: *Overall Performance - Correct Overall Performance - Incorrect, and Overall Performance - Omission*. *Overall Performance* included the means for all instances of correct and incorrect production, and the means of omission for each participant, from each group. Statistical comparison reveals a highly significant difference on the CG_{DS} and CG_{TDC} correct and incorrect productions as well as their percentage of omissions (*Table 6.2*). CG_{DS} present higher means of incorrect production and omission than CG_{TDC}, while higher means of correct productions are recorded with CG_{TDC}.

STATISTICAL COMPARISON ACROSS GROUPS - OVERALL PERFORMANCE									
	CG_{DS}			CG_{TDC}					
	M	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Correct	.865	.067	.017	.973	.012	.003	-6.63	31	<.001
Incorrect	.051	.025	.006	.015	.007	.002	5.62	31	<.001
Omission	.085	.048	.012	.011	.009	.002	6.30	31	<.001

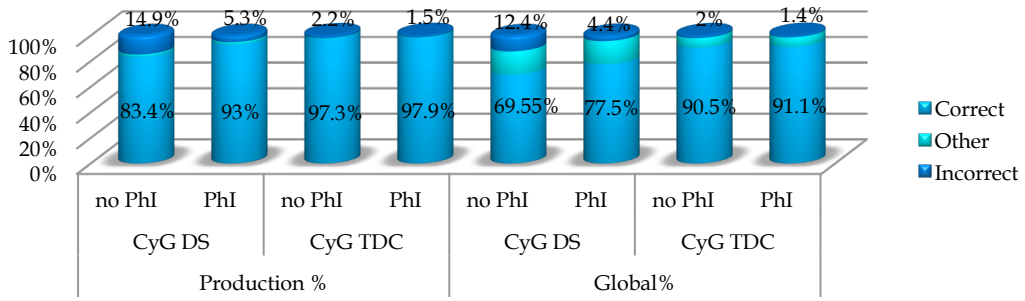
TABLE 6.2: STATISTICAL COMPARISON OF CG_{DS} AND CG_{TDC} OVERALL PERFORMANCE

The importance of controlling for the articulatory restrictions of CG_{DS} is obvious if we compare the above numbers with those we would arrive at if we were to categorise phonologically affected inflectional affixes as incorrect, as shown in *Table 6.3* and *Graph 3* below.

	CG_{DS}			CG_{TDC}		
	N	*Prod%*	*Global%*	*N*	*Prod%*	*Global%*
Correct	15,791	83.4%	69.55%	22,419	97.28%	90.54%
Incorrect	2,814	14.86%	12.39%	499	2.17%	2.02%
Other	329	1.7%	1.45%	127	0.55%	0.51%
Total	18,934	--	--	23,045	--	--

TABLE 6.3: DISTRIBUTION OF OVERALL PRODUCTIONS WITHOUT PHONETIC ANALYSIS

Table 6.3 shows that the percentages of incorrect productions, without a phonetic and phonological analysis, would have been much higher. Notice that while error rates for CG_{DS} increase significantly when not considering phonetic and phonological problems in the data analysis, the same is not true for CG_{TDC}: this group's error rates increase only minimally. [78] *Graph 1* illustrates the difference in percentage rates for the two groups when the phonetic and phonological issues (henceforth, PhI) are considered in the morpho-syntactic analysis and when they are not (no PhI). *Production %* includes all cases excluding omission, incomplete utterances and fillers, whereas *Global %* concerns all evaluation categories listed in (6.1) above.



GRAPH 6.1: COMPARISON OF OVERALL PRODUCTION WITH AND WITHOUT PHON. ANALYSIS

PhI effects (i.e. where the surfacing form appears to be of the same form as another form with different inflectional features) are observed with the following feature values: 2nd Person

[78] Percentages would have been even higher (about 3 - 4 times higher) if we were to evaluate as incorrect all words where their production differed phonologically from the target. The additional number of 5,441 for CG_{DS} and 1,562 for CG_{TDC} would surface a percentage of incorrect use of 43.6% and 8.3%, accordingly, if every difference between target and produced form was considered incorrect, even if the cause was not morpho-syntactic. Schmitt, et al. (1983) report that the percentage of words that match the adult pronunciation (*whole word match*) is above 80% by age 4-5 in *TDC*, but is below 60% (often far below 60%) in children of that age with *Protracted Phonological Development*.

Singular *S/V* agreement, Nominative and Genitive Case Singular and Accusative Case Plural. These are discussed in more detail when each feature is examined separately.

However, to fully evaluate the three hypotheses set up in *Chapter 1*, we need to determine whether all inflectional features are affected or only some. When features are affected I examine what differentiates the participants' productions from the adult CG_{TD} Grammar. In the following sections I discuss the participants' performance regarding their productions with each feature, but first I explain how feature value productions were evaluated.

6.2.2 Evaluation of Produced Feature Values

As explained in *Chapter 4*, I use a method of data evaluation that differs from previous studies. This method focuses on two parameters: (i) what is the targeted or expected production, based on the stimulus given or the task requirements and (ii) whether the surrounding environment of a production facilitates the use of the specific form produced by participants. More explicitly, when the appropriate value for a feature is used in exactly the same manner as in the adult CG_{TD} Grammar, the value for this feature is considered a *Match* and is labelled as such (*Feature Value + Match*). For example, in (6.2b) below, when the participant uses *o Nik-os* 'the Nikos' as the subject of the main clause, I tag both the determiner and noun as *Nominative Match* because the nominal phrase matches the exact same form used in an identical context by any CG_{TD} adult, native speaker of the language, as illustrated in (6.2a).

(6.2) <u>Example of Production Match: Experiment #1- Video I</u> (Controlled Elicitation)

(a) *Targeted Utterance: Targeting Nominal Inflection and Subjunctive*

O ***Nik-os*** vlep-i ton ...

DET.MASC.SG.NOM ***Nikos-MASC.SG.NOM*** *see.IMPF-PRES.3.SG DET.MACS.SG.ACC*

... eaft-on	tu	pu / na	tro-i	ʃokolat-a.
self-MASC.SG.ACC	3.MASC.SG.GEN	*that* SUBJ	*eat*.IMPF-PRES.3.SG	*chocolate*-FEM.SG.ACC

'Nikos is looking at himself eating chocolate.'

(b) *CG$_{DS}$ Production (AI)*

O	***Nik-os***	xo∅-i ...
DET.MASC.SG.NOM	***Nikos*-MASC.SG.NOM**	*see*.IMPF-PRES.3.SG

... pu	tro-i	ʃokolat-a.
that	*eat*.IMPF-PRES.3.SG	*chocolate*-FEM.SG.ACC

'Nikos is looking at himself eating chocolate.'

All features marked on the determiner and noun *o Nikos* are a match to the targeted features Masculine, Singular, and Nominative. All feature-match instances are considered correct. (6.2) is produced based on one of the experimental stimuli used in *Experiment #1 – Video I* (see *Figure 1*, *Chapter 4*, *Section 4.4.1.1* above).

In case the participant produces a form which differs from either the one targeted by the experimental stimulus or else expected to be present in uncontrolled speech, then that feature is considered an *Alternative* use to the targeted/expected feature (*Feature Value + Alternative)*. For example, in (6.2c), the participant uses *to* 'the-NEU' instead of *o* 'the-MASC', despite the fact that she uses the expected or targeted features for the form *Nikos*.

(6.2) Example of Incorrect Alternative CG$_{DS}$ Production *(SC)* (Controlled Elicitation)

(c)

to	***Nik-os***	vlep-i	to∅ ...
DET.NEU.SG.NOM	***Nikos*-MASC.SG.NOM**	*see*.IMPF-PRES.3.SG	DET.MACS.SG.ACC

... eaft-on	tu	pu	t∅o-i	[θ]okolat-a.
self-MASC.SG.ACC	3.MASC.SG.GEN	*that*	*eat*.IMPF-PRES.3.SG	*chocolate*-FEM.SG.ACC

'Nikos is looking at himself eating chocolate.'

The tags selected for *to* in (6.2c) are *Singular Match*, *Nominative Match* and *Neuter* ***Alternative***. That is, *to* is an alternative use for Gender and not Case (i.e. Accusative) due to additional analysis of the phonological environment: different intonation and duration of initial /n/. That is, to have the Masculine Accusative alternative, we would expect gemination of the initial /n/ of the nominal *Nik*os, which is not observed with this production. The values used for *Nikos* are *Singular Match*, *Nominative Match* and *Masculine* ***Match***. This alternative use for Gender is ungrammatical in adult CG_{TD} and SG_{TD}. The example below shows a grammatical instance of an alternative feature use for Tense.

(6.3) Example of Correct Alternative Production: Experiment #1 – Video III

(Controlled Elicitation)

(a) *Targeted Utterance: Targeting Past Tense*

Epses	ti	nixt-a	ena	korits-i ...
last.night	*DET.FEM.SG.ACC*	*night-FEM.SG.ACC*	*one.NEU.SG.NOM*	*girl.NEU.SG.NOM*

... fil-us-e	ena	aγor-i	s-to	maγul-o.
kiss-IMPF-PAST.3.SG	*one.NEU.SG.NOM*	*boy.NEU.SG.NOM*	*on-DET.NEU.SG.ACC*	*cheek-NEU.SG.ACC*

'Last night a girl was kissing a boy on the cheek.'

(b) CG_{DS} *Production* ***(AI)***

Dame filiund-e.

here ***kiss.IMPF-PRES.3.PL***

'Here they are kissing.'

In (6.3), the targeted Tense for the verb is Past, but the participant uses Present. This use is however evaluated correct, because, based on the given structure, Present Tense can be perceived as grammatical due to the presence of the demonstrative, which indicates that the participant is referring to what he sees the characters in the video doing at the present moment.

To sum up, when a feature value in a participant's production is identical to the targeted feature value, that feature is labelled as *Feature Value + Match*. When a feature value is used instead of the expected or targeted feature value then the appropriate tag is *Feature Value + Alternative*. This is in line with the findings reported in Schaner-Wolles (2004) who shows that Ger_{DS} performed syntactic and morphological reorganisation to accommodate a verb second construction. The evaluation analysis presented in this section concerns only the assessment of each individual feature inflected on a word. This is what I discuss in the remainder of this chapter. For the overall evaluation of words, we need additional criteria, beyond differentiating targeted versus alternative productions or correct and incorrect productions. The evaluation criteria used for the overall evaluation of words are summarised in *Section 6.2.1* above in combination with the nature of change information given in *Appendix B*.

What follows is a presentation of the results on the Tense, Person, and Number features for verbs and Case for nouns, determiners, adjectives, etc. A main section for each feature value gives the participants' overall performance for the feature in question. First, I provide a table with information on the participants' productions for each feature value. Second, statistical comparison on the productions of the overall feature is given. Third, I include a table giving information on omissions of entire words, based on the targeted feature value. Fourth, a statistical comparison of entire word omissions based on the targeted feature value is offered. The main section is followed by sub-sections, where each feature value is examined separately. Each section consists of three parts: (i) a graphic representation of the results for each feature value, (ii) statistical comparison of the two groups for each value, and (iii) examples for the production of each value.

6.3 TENSE

In this section, I show that both CG_{DS} and CG_{TDC} present very high percentages of accuracy and almost always use Tense inflection correctly. Interestingly however, there are instances where both groups use Tense values that differ from the expected or targeted form. Specifically, participants use one of three options: (i) an alternative feature value is used, the production of which may or may not result in a grammatical outcome, (ii) inflectional marking may be dropped altogether, and (iii) the entire targeted word may be omitted. The second option is not available for copulas and auxiliaries, since they are single morphemes (not root + suffix). If an alternative is used, it is mostly the Present or the Dependent. I start with a detailed description of the results on the Tense feature. I then move on to briefly illustrate how the same results would be treated under a method of data analysis used in most studies supporting *IIH*.

6.3.1 Tense – Overall Performance

In general, both CG_{DS} and CG_{TDC} use Tense inflection accurately over 95% of the time. Based on the results reported in the previous literature, this level of accuracy is unexpected. However, the results indicate that both CG_{DS} and CG_{TDC} sometimes use an alternative to the targeted form. The alternative used, sometimes produces a grammatical result (evaluated as correct) but sometimes also leads to an ungrammatical result (evaluated as incorrect). The most common alternative Tense feature value is Present. It therefore comes as no surprise that Present exhibits the highest percentages of incorrect use. In contrast, since other values are rarely used as alternatives, they are also rarely used incorrectly. We further observe that auxiliaries[79] and

[79] Auxiliaries in CG, as explained in *Chapter 3*, are only found with Subjunctive clauses and parallel the English *be going to* construction. The auxiliary in CG inflects for both Present and Past, but only has one form for each Tense, that of the 3rd Person SG/PL of the Present and Past copula respectively. For this reason, when providing results on

copulas are omitted more frequently, compared to verbs, where omissions are mostly observed with Past for CG_{DS} and Dependent for CG_{TDC}. In the following sub-sections I discuss the participants' performance relative to each feature.

I start by presenting the participants' productions for each Tense value. *Table 6.4* summarises the participants' use of each feature value based on what was targeted or expected. The rows in the confusion matrix[80] below indicate the targeted value and the columns show the produced value. For instance, we observe that for Past, there were 753 instances were Past was used as targeted by CG_{DS} and 328 times were CG_{DS} participants used Present instead of the targeted Past.

	CG_{DS}					CG_{TDC}				
	PRES	PAST	DEP	IMP	GER	PRES	PAST	DEP	IMP	GER
Present	2067	2	40	3	0	2046	0	7	2	0
Past	328	740	19	1	0	197	1245	3	0	0
Dependent	7	0	429	2	0	16	1	355	0	0
Imperative	1	1	18	138	0	3	0	18	228	0
Gerund	45	1	6	0	78	37	0	0	0	138

TABLE 6.4: CONFUSION MATRIX OF TENSE PRODUCTION BY CG_{DS} AND CG_{TDC}

Overall, the majority of productions match the target. Most of the productions that don't match the target are found under Present. That it, when a value is not produced as targeted, the most favoured option is Present, with the exception of Imperative, where most of the time, it is substituted by the Dependent. The choice of the Dependent as an alternative to the Imperative is credited to the participants' to choice use a Subjunctive construction to express a command (in a more subtle, polite manner), rather than the Imperative, which might be perceived as abrupt or even rude, at times. Another notable observation is that participants have a tendency to use the Present Tense inflection, instead of the Gerund. This will be discussed extensively in *Chapter 7*.

auxiliaries, I do not give any information on inflectional features carried or omitted. In addition, the Past auxiliary was not tested with CG_{DS} and CG_{TDC}.

[80] The type of confusion matrix used throughout this dissertation is a table providing information on actual and predicted classifications (productions) based on the experimental stimuli used. I use the terms *Table* and *Confusion Matrix* interchangeably, throughout *Chapters 6* and *7* to refer to this type of data summary.

Table 6.5 below charts the distribution of Tense productions in CG_{DS} and CG_{TDC}. In particular, it includes the number of instances each Tense value is used as targeted/expected (*Match - COR*). It also includes the overall number of instances of Tense values when used as an alternative correctly (*Alternative – COR*) and incorrectly (*Alternative – INC*), and the proportion of *incorrect uses* of the Tense value (*Alternative - INC %*), based ***only*** on the instances where a value is *used as an alternative*. For example, in the *Present* row of *Table 6.5* we see that CG_{DS} produce 381 uses of Present as an alternative, of which 130 (34.1%) were ungrammatical. Finally, *Table 6.5* gives the proportion of incorrect uses of a Tense value, when used as an alternative, *based on the overall* use of each feature value (Match + Alternative) (*Global INC%*).

	CG_{DS}					**CG_{TDC}**				
Verbs	*Match*	*Alternative*			*Global INC%*	*Match*	*Alternative*			*Global INC%*
	COR	*COR*	*INC*	*INC%*		*COR*	*COR*	*INC*	*INC%*	
Present	2,067	251	130	34.1%	5.3%	2,046	162	91	36%	4%
Past	740	2	2	50%	0.3%	1,245	0	1	100%	0.1%
Dependent	429	57	26	31.3%	5.1%	355	25	3	10.7%	0.8%
Imperative	138	0	6	100%	4.2%	228	0	2	100%	0.9%
Total	3,374	310	164	34.6%	4.3%	3,874	187	97	34.2%	2.3%
Affix Drop	74				1.9%	33				0.8%

TABLE 6.5: DISTRIBUTION OF TENSE PRODUCTION WITH VERBS

Overall, participants' Tense productions are mostly correct: only 4.3% are incorrect for CG_{DS} and 2.3% are incorrect for CG_{TDC}. Most incorrect productions result from the use of the Present value as an alternative to Past (95.3% or 124/130), Dependent (2.3% or 3/130), and the Gerund (2.3% 3/130) for CG_{DS}. The same is also true for CG_{TDC}, whose Present incorrect productions result from Present being used as an alternative to Past (95.6% or 87/91), the Dependent (3.3% or 3/91) and Gerunds (1.1% or 1/91). Whenever the production does not match the target, we observe two possible results: (i) an alternative Tense value is used, which may result in a grammatical or ungrammatical output, or (ii) the inflectional suffix is dropped altogether. Alternatives are mainly found with Present and Dependent. When only considering alternative

uses, both participant groups are less likely to produce an ungrammatical result when using the Present and the Dependent as alternatives, than when using the Imperative and Past Tense values. In fact, all attempts to use Imperative as an alternative by both CG_{DS} and CG_{TDC} are incorrect. Note that CG_{DS} use alternative values at a higher rate than CG_{TDC}. Furthermore, we observe a considerable difference between the percentage of *Alternative Incorrect* use (considering only the use of a feature value as an alternative, e.g. 381 for Present for CG_{DS}) and *Global Incorrect* use (considering the overall use of a feature value: e.g. 2,066 + 381 for Present for CG_{DS}): for Present, 34.6% vs. 4.3% for CG_{DS} and 34.2% vs. 2.3% for CG_{TDC}. This simply shows that, when considering the CG_{DS} and CG_{TDC}'s overall productions for each Tense value, we find very low rates of incorrect use. It also shows the likelihood of producing a grammatical use of an alternative Tense value. Furthermore, the percentage of affix drop (omission of a Tense suffix) with verbal inflection is low for both groups: 1.9% for CG_{DS} and 0.7% for CG_{TDC}.

Table 6.6 below shows that participants from either group rarely use the copula and auxiliary incorrectly. More explicitly, CG_{DS} use the Present copula as an alternative to the Past seven times, out of which only one is used incorrectly (14.3%), while CG_{TDC} use the Present copula as an alternative to the Past twenty times, out of which four are incorrect (20%).

	CG_{DS}					CG_{TDC}				
	Match	*Alternative*			*Global*	*Match*	*Alternative*			*Global*
Copula	*COR*	*COR*	*INC*	*INC%*	*INC%*	*COR*	*COR*	*INC*	*INC%*	*INC%*
Present	293	6	1	14.3%	0.3%	473	16	4	20%	0.8%
Past	32	0	0	0%	0%	68	0	0	0%	0%
Total	325	6	1	14.3%	0.3%	541	16	4	20%	0.7%
Auxiliary	77	0	0	0%	0%	86	0	0	0%	0%

TABLE 6.6: DISTRIBUTION OF TENSE PRODUCTION WITH COPULAS AND AUXILIARIES

Statistical comparison was performed to determine whether the groups differed in their overall performance of Tense, with regards to their correct and incorrect productions. In particular, I

tested whether the participants' mean performance with Tense is similar across the two groups (non-significant differences), or their mean performance with Tense is so different (e.g. one group uses Tense incorrectly more frequently than the other group) that it can no longer be said that the two groups have parallel performance (significant differences). The means of overall correct productions by each participant from each group were compared.[81] Results evidence that CG_{DS} inflected Tense on verbs correctly (M = 0.958, SD =0.024) as frequently as the CG_{TDC} control group (M = 0.977, SD = 0.031), $t(31) = -1.93$, $p = .062$. Moreover, based on the overall production of Tense with copula, CG_{DS} are as likely to inflect Tense on copulas as accurately (M = 0.999, SD = .006), as CG_{TDC} (M = 0.992, SD = 0.025), $t(31) = 0.98$, $p = .335$. Since there are no incorrect uses of the auxiliary, statistical analysis is non-applicable.

To summarise, results show that generally, CG_{DS} and CG_{TDC} show comparable results of Tense inflection with (i) a high percentage of accuracy, (ii) use of alternative Tense values, (iii) a small percentage of incorrect use, and (iv) a very low percentage of affix drop. Hence, overall neither of the two participant groups has much difficulty with Tense inflection. A more detailed description of the results for each individual Tense value is given in subsequent sections. This includes: (i) a graphic representation of the results, (ii) statistical analysis of each Tense value, and (iii) data examples to illustrate the participants' use of each Tense value.

Next, I present results on the third method participants use when a production does not match the target; rates of entire-word omission where Tense was targeted. More explicitly, I separate verb omissions based on the Tense value targeted by the experimental task. In general, percentages of verb omission are lower than percentages of copula and auxiliary omission, for both groups.

[81] For an analysis on the comparison of the means of correct productions only with alternative use see *Appendix D*.

Table 6.7 gives verbal omissions targeted or expected to appear in a specific environment by CG_{DS} and CG_{TDC}, offering details on the participants' overall number of targeted Tense use (N), of omissions (∅) and proportion of omissions for each *targeted* Tense value (%).

	CG_{DS}			CG_{TDC}		
Verbs	N	∅	%	N	∅	%
Present	2,259	75	3.3%	2,089	5	0.2%
Past	1,197	63	5.3%	1,496	11	0.7%
Dependent[82]	466	12	2.6%	392	7	1.8%
Imperative	174	8	4.6%	251	0	0%
Total	4,096	158	3.9%	4,228	23	0.5%

TABLE 6.7: DISTRIBUTION OF VERB OMISSIONS TARGETING TENSE

As summarised in *Table 6.7*, omissions of fully inflected verbs are rare in both groups. CG_{DS} tend to omit verbs inflected with intended Past more frequently than any other Tense value (5.3%), while CG_{TDC} mostly omit verbs with intended Dependent inflection (1.8%). *Table 6.8* provides the same information as above for copula and auxiliary omissions; compared to verbal omissions, higher percentages of omission are observed. Moreover, CG_{DS} are more likely to omit an auxiliary, a copula, or a verb inflected with Tense, than CG_{TDC}.[83]

	CG_{DS}			CG_{TDC}		
Copula	N	∅	%	N	∅	%
Present	404	109	27%	478	5	1%
Past	51	12	23.5%	79	1	1.3%
Total	455	122	26.6%	557	6	1.1%
Auxiliary	192	115	59.9%	105	19	18.1%

TABLE 6.8: DISTRIBUTION OF COPULA AND AUXILIARY OMISSIONS TARGETING TENSE

Concerning verbal omissions, as summarised in *Table 6.9*, based on the mean values CG_{DS} are more likely to omit a verb inflected with Present, Past, or Imperative than CG_{TDC}, while with the Dependent, the statistical comparison did not show a significant difference between the two

[82] The copula does not have Dependent and Imperative forms.
[83] The omission of the auxiliary in the [*en na* +verb] constructions is actually quite common in the dialect, especially when the /n/ of the Subjunctive marker *na* following the auxiliary is geminated. The gemination of /n/ shows that the auxiliary is present but not audible. Such cases were not considered incorrect.

groups. Highly significant differences between CG_{DS} and CG_{TDC} are also found with copula and auxiliary omissions, such that CG_{DS} are more likely to omit copulas and auxiliaries than CG_{TDC}.

STATISTICAL COMPARISON ACROSS GROUPS - OMISSION									
	CG_{DS}			CG_{TDC}					
	M	*SD*	*Std. Error*	*M*	*SD*	*Std. Error*	*t*	*df*	*p*
Verbs									
Present	.030	.024	.006	.002	.005	.001	4.53	31	<.001
Past	.051	.036	.009	.007	.012	.003	4.40	31	<.001
Dependent	.027	.038	.010	.017	.025	.006	0.87	31	.392
Imperative	.046	.064	.016	.000	.000	.000	2.98	31	.006
Copula									
Present	.209	.121	.030	.011	.019	.005	6.68	31	<.001
Past	.204	.195	.050	.012	.049	.012	3.93	30	<.001
Auxiliary	.355	.107	.027	.139	.116	.028	.5.56	31	<.001

TABLE 6.9: STATISTICAL COMPARISON OF OMISSIONS TARGETING TENSE

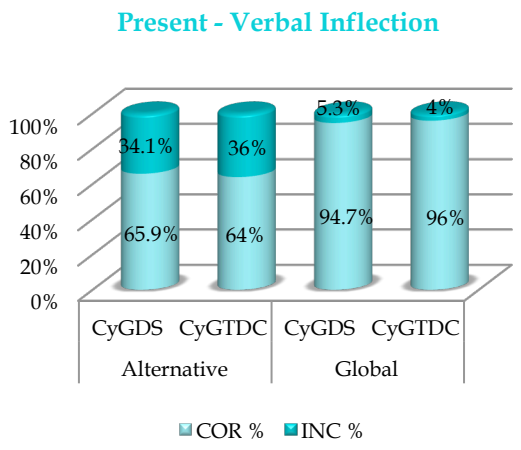
We can, therefore, conclude that CG_{DS} and CG_{TDC} differ in their performance with regards to verbal omission; CG_{DS} omit verbs with targeted Tense inflection at a higher percentage than CG_{TDC}. The same is also true for copula and auxiliary omissions.

In the next four sub-sections, I offer a more detailed examination of the correct and incorrect uses of the four Tense values. Graphic representation, statistical comparison, and data exemplifying the participants' performance for each Tense value are given in each sub-section.

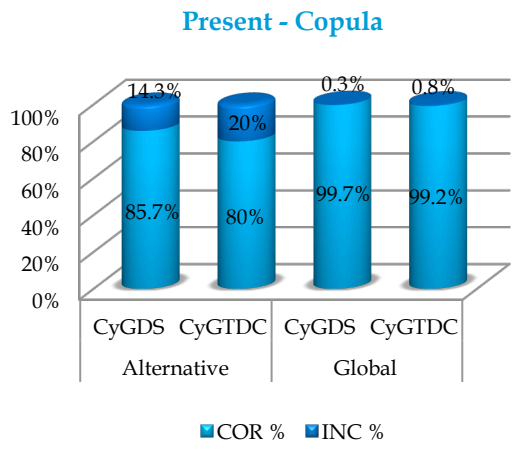
6.3.2 Productions of the Present Feature Value

In this section, I discuss the participants' use of Present Tense. We observe that, Present is often used as an alternative, but even in its use as an alternative it is mostly correct. This holds for both main verbs and copulas, across both participant groups.

Graph 2 illustrates the participants' correct and incorrect uses of Present verbal inflection when used as an alternative, while *Graph 3* illustrates the participants' correct and incorrect uses of the copula inflected with the Present Tense value, when used as an alternative. Percentages are based on (i) alternative use only and (ii) global use of the Present Tense value for each word category.



GRAPH 6.2: DISTRIBUTION OF PRESENT VERBAL INFLECTION BY CG_{DS} AND CG_{TDC}



GRAPH 6.3: DISTRIBUTION OF PRESENT COPULA BY CG_{DS} AND CG_{TDC}

Both participant groups use Present Tense mostly correctly, with only 5.3% incorrect uses for CG_{DS} and 4% for CG_{TDC}. The same is also true for copulas inflected with Present where only 0.3% incorrect uses in CG_{DS} and 0.8% in CG_{TDC} are recorded. Notice that CG_{TDC} are more likely to produce an ungrammatical result than CG_{DS} when inflecting a copula with Present as an alternative. These percentages concern the participants' use of Present as an alternative, but based on their overall use of the feature value, regardless of whether they were using Present as targeted or as an alternative. If we consider only the alternative uses of Present with the copula, we observe that the percentage of incorrect use increases, but again this holds across both participant groups: 34.1% for CG_{DS} and 36% for CG_{TDC}. The participants' performance with copulas is better than with fully-inflected verbs potentially because of the high token frequency of the copula as opposed to most individual inflected verb forms. That is, there are only five

given forms for the Present copula, whereas there are a considerably larger number of root-inflectional marking combinations for verbs. This might imply lexical storage of copulas.

On the basis of these findings, I can conclude that neither participant group has difficulties with Present inflection. The conclusion that CG_{DS} and CG_{TDC} perform similarly is supported by statistical comparison. Statistical analysis on individual feature values is only based on the alternative uses of a value, not the match cases. Where produced values matched the target, statistical analysis could not be performed because all such instances are evaluated as correct. A comparison of the overall correct mean productions of Present by the two groups revealed that CG_{DS} produce Tense inflection on verbs as accurately (M =0.949, SD = 0.367) as CG_{TDC} (M = 0.964, SD = 0.455), $t(31) = -1.05$, $p = .301$. Furthermore, concerning the production of copulas inflected with Present, once again, CG_{DS} present the same rates of correct inflection of Present on copulas (M = 0.998, SD = 0.007) as CG_{TDC} (M = 0.991, SD = 0.284), $t(31) = 0.92$, $p = .364$. In sum, statistical analysis verifies that the two groups are equally likely to use the value correctly or incorrectly. Data in (6.4) exemplify the participants' use of Present, when matching the target, or when being used as an alternative to another Tense value.

(6.4) <u>Present Match - Correct: Experiment #1 – Video II</u> (Controlled Elicitation)

(a) *Targeted Utterance*

O	Nikos	***vlep-i***	ta	pli-a.
DET.MASC.SG.NOM	*Nikos-MASC.SG.NOM*	***see.IMPF-PRES.3.SG***	*DET.NEU.PL.ACC*	*ship-NEU.PL.ACC*

'Nikos is looking at the ships.'

(b) *CG_{DS} Production* ***(EK)***

O	Nikos	***vlep-i***	ta	pli-a.
DET.MASC.SG.NOM	*Nikos-MASC.SG.NOM*	***see.IMPF-PRES.3-SG***	*DET.NEU.PL.ACC*	*ship-NEU.PL.ACC*

'Nikos is looking at the ships.

In (6.4), *EK* produced the form *vlep-i* 'he is seeing' in (6.4b), exactly as targeted in (6.4a). Example (6.5) below shows an incorrect use of the Present Tense, when used as an alternative to Past. That is, for *Experiment #1 – Video III*, while the target Tense inflection is Past, the participant uses Present. This is incorrect because the Past Tense adverbial is incompatible with Present Tense inflection. She immediately corrects herself and produces the appropriate Past inflection.[84] Example (6.6) shows a structure targeting Past Tense, while the CG_{DS} participant produces Present. This production is evaluated as correct for reasons explained below.

(6.5) Present Alternative – Incorrect: Experiment #1 – Video III (Controlled Elicitation)

(a) *Targeted Utterance*

Epses	ti	nixt-a	o	andr-as ...
last.night	*DET.FEM.SG.ACC*	*night-FEM.SG.ACC*	*DET.MASC.SG.NOM*	*man-MASC.SG.NOM*

... ***e-pinn-en***	kras-i.
PAST-drink.IMPF-PAST.3.SG	*wine-NEU.SG.ACC*

'Last night he was drinking wine.'

(b) *CG_{DS} Production* ***(EK)***

Epses	ti	nixt-a	***pinn-i*** ...
last.night	*DET.FEM.SG.ACC*	*night-FEM.SG.ACC*	***drink.IMPF-PRES.3.SG***

... ***e-pinn-en***	kras-i.
PAST-drink.IMPF-PAST.3.SG	*wine-NEU.SG.ACC*

'Last night he was drinking wine.'

(6.6) Present Alternative – Correct: Experiment #1 – Video III (Controlled Elicitation)

(a) *Targeted Utterance*

Epses	ti	nixt-a	tut-i	e-kle-e.
last.night	*DET.FEM.SG.ACC*	*night-FEM.SG.ACC*	*3DEM.FEM.SG.ACC*	***PAST-cry.IMPF-PAST.3.SG***

'Last night she was crying.'

[84] Some of these cases, however – especially those found in *Experiment #3 – Task I*, can be considered instances of "narrative Present", i.e. when one starts narrating a story in Past Tense and then continues in Present, despite the fact that the events narrated still occurred in the Past.

(b) CG_{DS} *Production* ***(FA)***

Dame tut-i kle-i.

here *3DEM.FEM.SG.ACC* ***cry.IMPF-PRES.3.SG***

'Here, this one is crying.'

In (6.5b), the CG_{DS} participant uses Present instead of the targeted Past in the first occurrence of the verb 'drink'. This is incorrect because the Past Tense adverbial is incompatible with Present Tense inflection. However, she immediately corrects herself and produces the appropriate Past Tense inflection. In (6.6), the participant produces Present instead of the targeted Past. The production is considered correct however, because the presence of a demonstrative shows that the participant is not intending the use of a Past feature value. Moreover, there is no other lexical element in the sentence (e.g. Past adverbial), which would cause the Present alternative production to be evaluated as ungrammatical. Next, I give examples on the participants' correct and incorrect use of Present as targeted and as an alternative with the copula. In (6.7b), we see an exact match of the copula *ine* 'is/are' as shown in the target stimulus in (6.7a). In (6.8), there is a morpho-syntactic difference between the target and production.

(6.7) <u>Present Copula Match – Correct: Experiment #2 – Task I</u> (Controlled Elicitation)

(a) *Targeted Utterance*

o Andre-as ke i Xristian-a ...

DET.MASC.SG.NOM *Andreas-MASC.SG.NOM* *and* *DET.FEM. SG.NOM* *Christiana-FEM.SG.NOM*

... ***ine*** aγapimen-i fil-i.

be.IMPF.PRES.3.SG/PL *loving-MASC.PL.NOM* *friend-MASC.PL.NOM*

"Andreas and Christiana are loving friends.'

(b) *CG_{TDC} Production (NN)*

o Andre-as ke i Xristian-a ...

DET.MASC.SG.NOM *Andreas-MASC.SG.NOM* *and* *DET.FEM.SG.NOM* *Christiana-FEM.SG.NOM*

... ***ine*** aγapimen-i fil-∅.

be.IMPF.PRES.3.SG/PL *loving*-MASC.PL.NOM *friend/kiss*

"Andreas and Christiana are loving friends.'

(6.8) Present Copula Alternative – Correct: Experiment #2 – Task I (Controlled Elicitation)

(a) *Targeted Utterance*

E-prep-e na e-vlep-es tes ikon-es.

PAST-*must*.IMPF-PAST.3.SG SUBJ PAST-*see*.IMPF-PSST.3.SG DET-FEM.PL.ACC *picture*-FEM.PL.ACC

Itan polla omorf-es.

be.IMPF.PAST.3.SG/PL *very* *beautiful*-FEM.PL.ACC

'You should have seen the pictures. They were very beautiful.'

(b) *CG_{TDC} Production (AC)*

E-prep-e na e-vlep-es tes ikon-es.

PAST-*must*.IMPF-PAST.3.SG SUBJ PAST-*see*.IMPF-PSST.3.SG DET-FEM.PL.ACC *picture*-FEM.PL.ACC

En polla omorf-es.

be.IMPF.PRES.3.SG/PL *very* *beautiful*-FEM.PL.ACC

'You should have seen the pictures. They are very beautiful.'

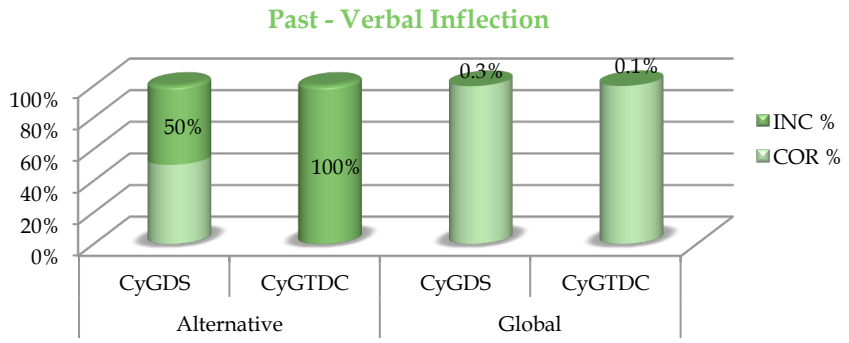
In (6.8b), the CG_{TDC} participant *AC* uses the Present copula *en* 'is' instead of the Past form *itan* 'was' of the copula. The production is considered correct because, given the context and structural environment, there is nothing which causes the Tense alternative value to be ungrammatical (e.g. a Past adverbial). Moreover, the copula use of Present is describing a general state characterising the pictures and not a past action or state. In other words, this is a grammatical sentence in CG_{TD}.

6.3.3 Productions of the Past Feature Value

In this section I discuss the participants' performance with Past Tense inflection on verbs and the copula. Overall, both CG_{DS} and CG_{TDC} use Past Tense inflection on verbs and the copula

correctly. However, when they attempt to use Past Tense inflection as an alternative to another Tense value (4 instances for CG_{DS} and 1 for CG_{TDC}), they are more likely to use it incorrectly.

Graph 4 illustrates the participants' correct and incorrect productions of Past Tense inflection on verbs. The first two bars show the correct and incorrect uses of Past Tense when used as an alternative, while the last two show the percentage of correct and incorrect uses of Past overall.



GRAPH 6.4: DISTRIBUTION OF PAST VERBAL INFLECTION BY CG_{DS} AND CG_{TDC}

Graph 4 shows that while CG_{DS} use Past Tense inflection correctly half of the time they attempt to use it as an alternative, CG_{TDC} always use Past Tense incorrectly when using it as an alternative. The instances of Past Tense use as an alternative are quite minimal, and therefore, when considering the participants' overall Past Tense use, the error percentages reduce drastically: 0.3% for CG_{DS} and 0.1% for CG_{TDC}. These percentages show that the limited number of times participants attempt to use Past as an alternative are very few compared to their overall use of the Past Tense value. Neither of the two groups produced any (correct or incorrect) uses of the copula inflected with Past Tense as an alternative. A statistically non-significant result shows that the CG_{DS} participants' use of Past Tense ($M = 0.991$, $SD = 0.026$) is comparable with CG_{TDC} ($M = 0.999$, $SD = 0.003$), $t(31) = -1.20$, $p = .281$. It should be noted that due to the small number of tokens this result is rather fragile, such that, conclusive generalizations cannot be

drawn with such a small number of tokens. Based on the production of Past with copula, statistical comparison could not be performed due to the lack of incorrect uses. In (6.9) - (6.11) are examples of Past-Tense productions, targeted versus alternative (to Present Tense).

(6.9) Past Match – Correct: Experiment #1 – Video III (Controlled Elicitation)

(a) *Expected Utterance*

epses	ti	nixt-a	o	aθrop-os ...
last.night	*DET.FEM.SG.ACC*	*night-FEM.SG.ACC*	*DET.MASC.NOM.SG*	*man-MASC.NOM.SG*

... ***e-ppe-s-e***	kato.
PAST-fall-PRF-PAST.3.SG	*down*

'Last night the man fell down.'

(b) *CG_{DS} Production (SC)*

e[t]ses	ti	ni[s]t-a	*epp	***e-ppe-s-e*** ...
last.night	*DET.FEM.SG.ACC*	*night-FEM.SG.ACC*	*FS*[85]	*PAST-fall-PRF-PAST.3.SG*

... o	aθ∅op-os	xame.
DET.MASC.NOM.SG	*man-MASC.NOM.SG*	*down*

'Last night (the) man fell down.'

(6.9b) illustrates that the participant *SC* uses the appropriate feature value for Tense (Past), Aspect (Perfective), Person (3rd), and Number (Singular) with the verb *e-ppe-s-e* 's/he fell', as targeted by the experimental task. This is deduced by a comparison of (6.9a) and (6.9b).

(6.10) Past Alternative – Incorrect: Experiment #1 – Video II (Controlled Elicitation)

(a) *Targeted Utterance*

o	***Nik-os***	vlep-i	kopell-es ...
DET.MASC.SG.NOM	***Nikos-MASC.SG.NOM***	*see.IMPF-PRES.3.SG*	*girl-FEM.PL.ACC*

[85] False start or stuttering.

... na vur-***usi*** / trex-u(si).

SUBJ run.IMPF-PRES.3.PL

'Nikos is watching girls (that are) running.'

(b) *CG_{DS} Production (FM)*

o	***N***ik-os	∅lep-i	vurus-***e***.
DET.MASC.SG.NOM	***Nikos-MASC.SG.NOM***	*see.IMPF-PRES.3.SG*	*run.IMPF-PAST.3.SG*

'Nikos is watching, s/he was running.'

In (6.10b), we observe a morpho-syntactic difference to the comparable example in (6.10a). While the task was targeting the verb *vur-usi* 'they are running' in **Present**-3rd Person-Plural, the participant produces the verb *vur-us-e* 's/he was running' in **Past**-3rd Person-Singular. The produced form deviates from the target in Tense and Number, and it is ungrammatical. In this example of obligatory control Subjunctive, the agreement in Tense marking between the subordinate and matrix clause is violated. Next, I give an example of correct use of Past copula.

(6.11) <u>Past Copula Match – Correct: Experiment #3 Task I</u> (Free Elicitation)

(a) *Expected Utterance*

e-kam-en	tin	asxim-i,	alla ...
PAST-do.PRF-PAST.3.SG	*DET.FEM.SG.ACC*	*ugly-FEM.SG.ACC*	*but*

... i	Leti	***itan***	omorf-i.
DET.FEM.SG.NOM	*Leti*	*be.IMPF.PAST.3.SG/PL*	*beautiful-FEM.SG.NOM*

'Leti was pretending to be ugly, but she was beautiful (in reality).'

(b) *CG_{DS} Production (FA)*

e-kam-e∅	ti∅	ti∅	asxim-i, ...
PAST-do.PRF-PAST.3.SG	*DET.FEM.SG.ACC*	*DET.FEM.SG.ACC*	*ugly-FEM.SG.ACC*

... alla	i	i	Leti	***ita∅***	omorf-i.
but	*DET.FEM.SG.NOM*	*DET.FEM.SG.NOM*	*Leti*	*be.IMPF.PAST.3.SG/PL*	*beautiful-FEM.SG.NOM*

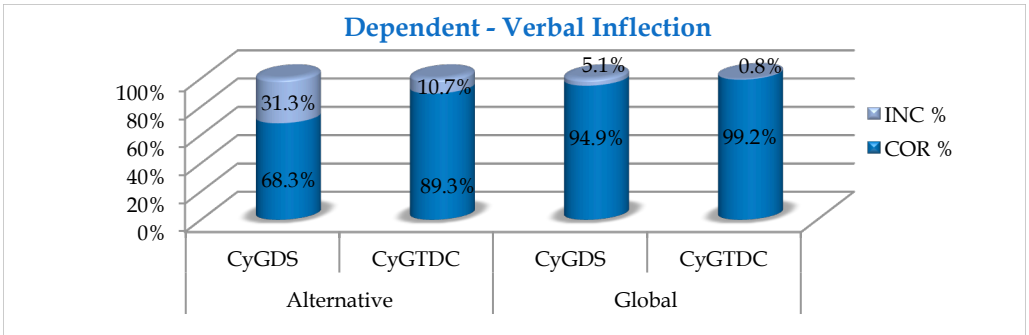
'Leti was pretending to be ugly, but (in reality) she was beautiful.'

The CG_{DS} participant *FA* omits the final /n/ used in adult CG_{TD}, based on a phonological rule found in CG. The omission of /n/ has no effects on the morpho-syntactic features targeted.

6.3.4 Productions of the Dependent Feature Value

Both CG_{DS} and CG_{TDC} are able to use Dependent correctly. When using Dependent as an alternative to another Tense (commonly Present or Imperative), they are likely to use it correctly.

Graph 5 illustrates the participants' correct and incorrect productions with the Dependent. The first two bars show the correct and incorrect uses of the Dependent when used as an alternative, based only on the alternative uses, while the last two bars show the percentage of correct and incorrect uses of Dependent based on the overall use of Dependent (match and alternative).



GRAPH 6.5: DISTRIBUTION OF THE DEPENDENT VALUE BY CG_{DS} AND CG_{TDC}

When producing it as an alternative to another Tense inflection, CG_{DS} use Dependent incorrectly 31.3%, while CG_{TDC} produce it incorrectly 10.7%. The participants' overall Dependent productions, however, are correct in over 94% of tokens: 5.1% incorrect for CG_{DS} and 0.8% for CG_{TDC}. Concerning the participants' overall use, CG_{DS} are more likely to produce less correct productions of Dependent ($M = 0.948$, $SD = 0.052$) than CG_{TDC} ($M = 0.991$, $SD = 0.028$), $t(31) = -2.91$, $p = .007$. Examples below illustrate the participants' use of the Dependent.

(6.12) Dependent Match – Correct: Experiment #3 – Task II (Free Elicitation)

(a) *Expected Utterance*

k'	istera	en	na	***skola-s-u-me***.
and	*later*	*be.IMPF.PRES.3SG/PL*	***SUBJ***	***get.off-PRF-DEP-1.PL***

'And then we'll get off school.'

(b) *CG_{DS} Production (SS)*

k'	istera	∅n	na	***skola-s-u-me***.
and	*later*	*be.IMPF.PRES.3SG/PL*	***SUBJ***	***get.off-PRF-DEP-1.PL***

'And then we'll get off school.'

In example (6.12b), participant *SS* uses the Dependent Tense value accurately. Compare the expected utterance in (6.12a) with the CG_{DS} production in (6.12b). The two verbal forms in the 'be going to' construction are an exact match. The phonological form for the auxiliary does not surface fully, but in a reduced form: the gemination of the initial /n/ found in the Subjunctive suggests that the auxiliary is produced.[86] Examples (6.13) and (6.14) illustrate a correct and incorrect use of the Dependent feature value when used as an alternative:

(6.13) Dependent Alternative – Correct: Experiment #4 – Task II (Free Elicitation)

(a) *Expected Utterance*

Stamat-a	na	xtip-as	ta	poð-ia ...
stop-PRF-DEP-2SG	*SUBJ*	*hit-PRF-DEP-2SG*	*DET-NEU-ACC-PL*	*foot-NEU-ACC-PL*

... su	s-to	patom-a.
2-GEN-SG	*on-DET-NEU-ACC-SG*	*floor-NEU-ACC-SG*

'Stop stamping your feet on the floor.'

(b) *CG_{TDC} Production (NE)*

na	***stamat-is-is***	na	xtip-as	ta	poð-ia ...
SUBJ	***stop-PRF-DEP-2SG***	*SUBJ*	*hit-PRF-DEP-2SG*	*DET-NEU-ACC-PL*	*foot-NEU-ACC-PL*

[86] I perceive this as gemination for two reasons: (i) there is no pause or non-continuous speech between the two words and (ii) the duration of what I find to be a geminated /n/ appears to be shorter, than if it were two separate phonemes.

... su	s-to	patom-a.
2-GEN-SG	*on-DET-NEU-ACC-SG*	*floor-NEU-ACC-SG*

'You should stop stamping your feet on the floor.'

(6.14) Dependent Alternative – Incorrect: Experiment #1 – Video I (Controlled Elicitation)

(a) *Targeted Utterance*

o	Nik-os	vlep-i	ton	eaft-on ...
DET.MASC.SG.NOM	*Nikos-MASC.SG.NOM*	*see.IMPF-PRES.3.SG*	*DET.MASC.SG.ACC*	*self-MASC.SG.ACC*

... tu	na	***ðkiavaz-i***	ena	vivli-o.
3.MASC.SG.GEN	*SUBJ*	*read.IMPF-PRES.3.SG*	*one.NEU.SG.ACC*	*book-NEU.SG.ACC*

'Nikos is watching himself read a book.'

(b) *CG_{DS} Production (FA)*

o	Nik-o∅	vlep-i	ti ...
DET.MASC.SG.NOM	*Nikos-MASC.SG.NOM*	***see.IMPF-PRES.3.SG***	*DET.FEM.SG.ACC*

... fats-an	tu	pu	***∅kiava-[s]-i***.
face-FEM.SG.ACC	*3.MASC.SG.GEN*	*that*	***read-PRF-DEP.3.SG***

'Nikos is watching his face, which/who reads.'

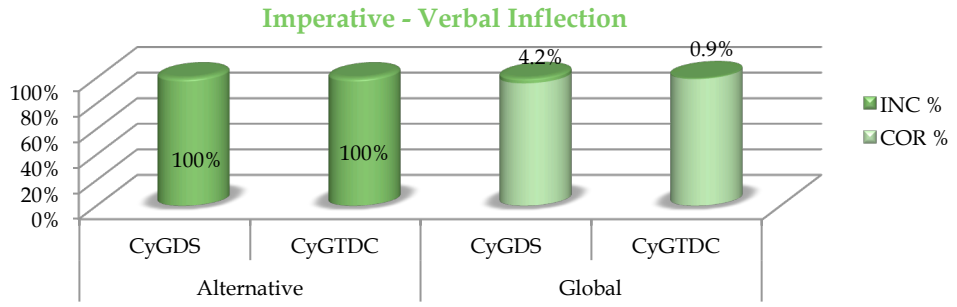
In example (6.13), the CG_{TDC} used a Subjunctive clause instead of the targeted Imperative. This use of the Subjunctive is grammatical but expresses a "less than a forceful command" rather than an order. In (6.14b), the participant *FA* produces the sound [s] in the root ***ðkiavaz-*** instead of /z/. This causes the change of the aspectual feature inflected on the root from Imperfective to Perfective and Tense features from Present to Dependent. That is, the participant's production has the same phonetic realisation as the verbal form used for Dependent-3rd Person-Singular. The produced form is considered ungrammatical based on the target and the structural environment in which it is used, i.e. it must be accompanied by an inflectional marker, such as Subjunctive, negative, or Future (in Standard Greek). Moreover, the obligatory control verb found in the main clause imposes the use of the Present, and not Dependent feature value. Though we see that

CG_{DS} exhibit similar error rates for Present and the Dependent, with CG_{TDC} we observe higher error rates for Present Tense than for the Dependent.

6.3.5 Productions of the Imperative Feature Value

Imperatives considered by many as tenseless constructions (Joseph and Philippaki-Warburton 1987 for Greek, and Chomsky 1981 for English). Results show that both CG_{DS} and CG_{TDC} use Imperative correctly at a very high percentage. Imperatives are rarely used as alternatives to another Tense value and when they are used as alternatives, they are always considered incorrect.

Graph 6 illustrates the participants' correct and incorrect productions of Imperative. Error analysis for both the incorrect productions of the Imperative when used as an alternative, based only on the alternative uses (Alternative), and incorrect productions based on the participant's overall use of the Imperative (match and alternative, meaning Global) are included in this graph.



GRAPH 6.6: DISTRIBUTION OF THE IMPERATIVE VALUE BY CG_{DS} AND CG_{TDC}

Graph 6 summarises the CG_{DS} and CG_{TDC} productions of the Imperative. When Imperative is used as an alternative to another Tense inflection, CG_{DS} produce the Imperative incorrectly 100% of the time. The same is also true for CG_{TDC}. However, when considering the participants' overall Imperative productions, error rates are less than 5% for both groups: 4.2% for CG_{DS} and

0.9% for CG_{TDC}. A statistically non-significant result suggests that the two groups do not differ in their overall Imperative productions, such that CG_{DS} (M = 0.935, SD = 0.131) and CG_{TDC} (M = 0.991, SD = 0.026) are equally likely to inflect Imperative correctly, $t(31) = -1.71$, $p = .097$. The following two examples illustrate the participants' use of the Imperative verbal inflection.

(6.15) Imperative Match – Correct: Experiment #2 – Task I (Controlled Elicitation)

(a) *Targeted Utterance*

perimen-e	me	pende	lept-a.
wait.IMPF-IMP.2.SG	*1.ACC.SG*	*five*	*minute-NEU.ACC.PL*

En	ime	etim-i	akoma.
NEG	*be.IMPF.PRES.1.SG*	*ready-FEM.NOM.SG*	*yet*

'Wait for me for five minutes. I'm not ready yet.'

(b) *CG_{DS} Production (PP)*

perimen-e	me	pe∅[t]e	lept-a.
wait.IMPF-IMP.2.SG	*1.ACC.PL*	*five*	*minute-NEU.ACC.PL*

En	ime	etim-i	akoma.
NEG	*be.IMPF.PRES.1.SG*	*ready-FEM.NOM.SG*	*yet*

'Wait for me for five minutes. I'm not ready yet.'

In (6.15b), the participant uses the Imperative form *perimen-e* 'wait' exactly as targeted (6.15a), with no difference whatsoever (morpho-syntactic or phonetic/phonological). The following example shows how Imperative is used incorrectly as an alternative to the Present-Tense value.

(6.16) Imperative Alternative – Incorrect: Experiment #1 – Video I (Controlled Elicitation)

(a) *Targeted Utterance*

o	Nik-os	vlep-i	ton	eaft-on ...
DET.MASC.SG.NOM	*Nikos-MASC.SG.NOM*	*see.IMPF-PRES.3.SG*	*DET.MASC.SG.ACC*	*self-MASC.SG.ACC*

... tu	na	pin-***i***	ner-o.
3.MASC.SG.GEN	*SUBJ*	*drink.IMPF-PRES.3.SG*	*water-NEU.SG.ACC*

'Nikos is watching himself drink water.'

(b) *CG_{TDC} Production (EF)*

o	Nik-os	pin-***e***	ner-o, ...
DET.MASC.SG.NOM	*Nikos-MASC.SG.NOM*	*drink.IMPF-IMP.2.SG*	*water-NEU.SG.ACC*
... sto	potir-i.		
on-DET.NEU.SG.ACC	*glass-NEU.SG.ACC*		

'Nikos drink water, in the glass.'

(6.16) gives an example of a morpho-syntactic difference between the target and produced form, where two inflectional features differ: Tense and Person. In (6.16a), we see that the targeted inflection of the verb *pin-i* 's/he is drinking'in the main clause is Present–3rd Person–Singular. In (6.16b), the participant produces *pin-e* 'drink', inflected with Imperative–2nd Person–Singular.

Concerning Imperative productions, the two participant groups almost always use Imperative inflection correctly. This is particularly important because in English and German, the Imperative has no overt inflectional marking. Consequently, it could be argued that in such cases, Eng_{DS} and Ger_{DS} are merely using a bare stem or the infinitive for Eng_{DS}. However, results from this section verify that CG_{DS} are able to produce Imperative inflection grammatically in the appropriate constructions in the majority of times. In the limited instances where Imperative is used as an alternative to another Tense value, however, it is always used incorrectly. Imperatives can only be used in a limited number of environments. This is possibly the reason why when used as alternatives they never result to a grammatical production.

6.3.6 Summary on Tense Results

In *Section 6.3* I presented results on the participants' use of the Tense inflection. Overall, participants are able to produce all Tense values as targeted or expected at a very high percentage (approximately 95%). Concerning the overall use of each Tense value (match + alternative), error rates for both groups are quite low. When using a Tense value from what was targeted as an alternative to other Tense values, CG_{DS} and CG_{TDC} exhibit a small percentage of errors. There are many instances where the context facilitates the alternative values used and the production is evaluated as grammatical. Participants from both groups use Present and Dependent as alternative Tense values more frequently than Past and Imperative, though most occurrences of alternative use are with the Present-Tense value. In their use of Dependent as an alternative, participants' make fewer mistakes than when using Present or any other Tense value as an alternative. It should be noted that the use of Dependent in a Subjunctive construction in main clauses (e.g. parallel to the Imperative) requires very complex syntactic operations and the fact that both participant groups are able to form such constructions suggests that an analysis based on a morpho-syntactic impairment is doubtful. An overall discussion on the results for the Tense domain and whether they are morphologically or syntactically conditioned follows in *Chapter 7*.

6.3.7 Traditional Method of Analysis Evaluating Tense

In this section, I show how results from this study would have been evaluated based on the traditional method of analysis used by most studies proposing *IIH.* Under the traditional analysis where the production does not morphologically match the target is considered incorrect. This method focuses only on the target for the evaluation of the participants' productions. I provide an example of this study's results based only on whether they matched or deviated from the target

utterance. I also make note of Tense omissions and affix drop for each Tense value to give a better idea of how different the results would look for verbs under the traditional method of analysis. *Table 6.10* charts the participants' performance with the four Tense values, giving details on the overall number of times a Tense value was targeted (*Tokens – N*), the number of instances that do not match the *target* (*Non-Match – N*), as well as the proportion of the *Non-Match* use for each Tense value based on the overall number of times it was targeted (*Non-Match* - %). For example, from CG_{DS} productions, Past was targeted 1,197 times, out of which participants produced either the Present, Dependent, or Imperative value 338 times. Moreover, *Table 6.10* also gives the number and proportion of Tense *Omission* (Omissions - ∅) and omitted suffixes (*Affix Drop* - ∅) by the two participant groups. We observe that on average both CG_{DS} and CG_{TDC} use Tense inflection (apart from Past) as targeted in all experimental tasks.

	CG_{DS}							**CG_{TDC}**						
Verbs	*Tokens*	*Non Match*		*Omissions*		*AffixDrop*		*Tokens*	*Non Match*		*Omissions*		*AffixDrop*	
	N	N	%	∅	%	∅	%	N	N	%	∅	%	∅	%
PRES	2,259	46	2%	75	3.3%	27	1.2%	2,089	9	0.4%	11	0.2%	11	0.5%
PAST	1,197	338	28.2%	63	5.3%	17	2.6%	1,496	207	13.8%	7	0.7%	15	1%
DEP	466	19	4.1%	12	2.6%	9	1.9%	392	8	2%	4	1.8%	5	1.3%
IMP	174	18	10.3%	8	4.6%	5	3.4%	251	22	8.8%	1	0%	2	0.8%
Total	4,096	421	10.3%	158	3.8%	74	1.8%	4,228	267	6.3%	23	0.5%	33	0.8%

TABLE 6.10: TENSE USE BY CG_{DS} AND CG_{TDC} – TARGET BASED

Based on this analysis, Present Tense is close to a perfect match for both groups: 2% *Non-Match* for CG_{DS} and 0.4% *Non-Match* for CG_{TDC}. Moreover, Past inflection shows the highest percentage of *Non-Match* for both CG_{DS} and CG_{TDC}. However, the two groups deviate: CG_{DS} presents a percentage of 28.2% *Non-Match* for Past, while, compared to CG_{DS}, CG_{TDC} exhibit a considerably lower percentage (13.8%). On the contrary, CG_{TDC} tend not only to use Dependent less frequently than CG_{DS}, but in addition, they tend to use an alternative Tense value instead of the Dependent more frequently than CG_{DS}: 4.1% versus 2% correspondingly. Moreover, both

groups often use an alternative to Imperatives. Concerning *Omissions*, CG_{DS} participants omit mostly verbs inflected with Past, while CG_{TDC} omit mostly verbs inflected with Dependent.

Overall, based on this traditional method of analysis, CG_{DS} have higher percentages of *Non-Match* production, *Omissions* and *Affix Drop* than CG_{TDC}. The use of Present, however, under this type of analysis surfaces lower percentages of "incorrect" (*Mon-Match*) use. Nevertheless, this system gives us information only on the grounds of what was targeted or expected by participants and not on what is actually produced instead of the target and how it is used. This type of analysis gives different but still useful information, which I also provide through the confusion matrices for each inflectional feature.

6.4 SUBJECT - VERB AGREEMENT

This section presents information on *S/V* agreement: Person and Number. The main finding is that both CG_{DS} and CG_{TDC} perform remarkably comparable to adult CG_{TD} speakers. These results are consistent with Schaner-Wolles (2004) on Ger_{DS}, who are reported to use *S/V* agreement correctly in 98% of tokens. Moreover, these results contradict the results on Eng_{DS}, where the 3rd Person Singular Present agreement is reported impaired. Crucially, the phonological exponent of English 3rd Person Singular is *–s*, the sound most affected by articulatory restrictions individuals diagnosed with *DS* face, as independently argued by previous research on Eng_{DS}, and as is shown in *Chapter 5* for CG_{DS}. Moreover, the results on CG_{DS} and CG_{TDC} show that the use of 3rd Person as an alternative to the other two Person values is more common than the 1st and 2nd Person values being used as alternatives to the 3rd Person value. The same is also true for Singular, which is used as an alternative to Plural much more frequently than Plural is used as an alternative to Singular.

Recall from *Chapter 3* that all verbs in Greek are inflected to agree with their subject in Person and Number. Crucially for our purposes, verbs display *S/V* agreement whether they are Tensed or not. In this section, I examine Person and Number features, both as a bundle and individually.

6.4.1 Overall Results on Person - Number Combinations

S/V agreement in Greek involves two distinct features: Person and Number. In this section, I examine whether a specific combination of Person and Number features poses more problems than others. *Table 6.11* charts the distribution of Person, based on the Singular value of Number on verbs. It provides details on (i) the number of Singular-Person productions (Match – COR), where Singular is used as targeted, (ii) the number of productions for each Person-Singular combination when Singular is used correctly (*Alternative – COR*) and incorrectly (*Alternative – INC*) as an alternative to Plural, (iii) the proportion (in percentage) of incorrect uses of each Person-Singular alternative combination, and (iv) the global proportion of incorrect uses of each Person-Singular combination (Match and Alternative). Highlighted rows in light green give the participants' performance with Singular and the three Person values when used as they were targeted. Non-highlighted rows give the participants' performance with Singular and the three Person values when used as an alternative to the targeted Person value. For example, the intersecting cell of the row 1st Match and column *Alternative – COR* (N=3), gives us the number of instances where participants used the 1st Person value as targeted, but used the Singular Number value as an alternative to Plural. Those uses where evaluated as correct based on the target and the given structural environment they were produced in. The percentages of *Global Incorrect* are calculated based the overall performance of participants with the alternative AND target productions for both features. For example, for the 2nd Person Alternative – Singular

Alternative, the result 2 was divided by all 2nd Person – Singular productions ((211+7)+118 + (9+ 2+1) = 0.6%), where a match or an alternative to the target.

Singular	CG_{DS}					CG_{TDC}				
	Match	*Alternative*			*Global*	*Match*	*Alternative*			*Global*
Person Value	*COR*	*COR*	*INC*	*INC%*	*INC%*	*COR*	*COR*	*INC*	*INC%*	*INC%*
1st Match	752	3	0	0%	0%	580	5	6	54.5%	1%
1st Alternative	16	5	1	16.7%	0.1%	5	0	1	100%	0.2%
2nd Match	211	0	7	100%	2%	523	0	0	0%	0%
2nd Match PhI_{2nd}	118	--	--	--	--	18	--	--	--	--
2nd Alternative	9	1	2	66.7%	0.6%	2	0	1	100%	0.2%
3rd Match	1,821	16	13	44.8%	0.7%	1,875	3	4	57.1%	0.2%
3rd Alternative	36	13	4	23.5%	0.2%	6	3	1	25%	0.05%
Total	2,963	38	27	41.5%	0.9%	3,009	11	13	54.2%	0.4%

TABLE 6.11: DISTRIBUTION OF PERSON– SINGULAR COMBINATIONS ON VERBS

Overall, the percentage of incorrect uses of Person–Singular combinations is quite low: 0.9% for CG_{DS} and 0.4% for CG_{TDC}. Most productions are found when both 3rd Person and Singular match the target: 1,821 for CG_{DS} and 1,875 for CG_{TDC}. Of all Person–Singular alternative combinations, it is more probable for both participant groups to make a mistake when using the combination 2nd Person–Singular alternative, than when using the 3rd or 1st Person with Singular alternative. CG_{TDC} exhibit the same problem when also using the combination 1st Person–Singular alternative. In general, I observed that there are very few instances where Singular is used as an alternative, especially with 1st and 2nd Person. Furthermore, the number of instances where *both* Singular and a Person value are used as alternatives is quite low for both groups. When considering the participants' performance overall, percentages of incorrect use do not surpass 1% for either group. On a final note, based on arguments that a generic suffix of 3rd Person-Singular was found to be overused by $Greek_{TDC}$ (Varlokosta et al. 1996), we might expect that to also be the case for CG_{DS} and CG_{TDC}, if the *IIH* reduced to *EOI*. However, we see that this is not attested by the data, since a higher percentage of 3rd Person Plural forms is used. Moreover, participants do use other feature value combinations as alternatives. Furthermore,

even if we did observe such a tendency, the higher number of alternative uses for 3rd Person Singular, by the two participant groups, could have also be explained as a frequency effect.

Table 6.12 summarises results for the distribution of Person, based on Plural when used as targeted or as an alternative value to Singular or instead of the Gerund suffix.

Plural	**CG_{DS}**					**CG_{TDC}**				
	Match	*Alternative*			*Global*	*Match*	*Alternative*			*Global*
	COR	*COR*	*INC*	*INC%*	*INC%*	*COR*	*COR*	*INC*	*INC%*	*INC%*
1st Match	294	0	0	0%	0%	454	0	1	100%	0.2%
1st Alternative	11	8	0	100%	2.5%	1	0	0	0%	0%
2nd Match	43	0	0	0%	0%	100	0	0	0%	0%
2nd Alternative	1	0	0	0%	0%	0	0	0	0%	0%
3rd Match	422	2	6	75%	1.3%	532	2	4	66.7%	0.4%
3rd Alternative	6	28	1	3.4%	0.2%	1	34	0	0%	0%
Total	777	38	7	15.6%	0.9%	1088	36	5	12.2%	0.4%

TABLE 6.12: DISTRIBUTION OF PERSON – PLURAL COMBINATIONS ON VERBS

Table 6.12 shows that in general, Plural is more frequently used as targeted with 1st and 3rd Person. Moreover, CG_{DS} and CG_{TDC} often use 3rd Person-Plural when both features are used as an alternative. The same is also true for 1st Person Alternative and Plural Alternative for CG_{DS}. The 2nd Person Alternative - Plural Alternative combination is never used by either group. The high numbers of alternative use for both 3rd Person and Plural are a result of substituting the Gerund suffix with a Person-Number suffix. Therefore, results show that participants tend to use Person and Number inflectional marking, instead of Gerund marking to express the targeted information. The reason Plural is used instead of the more frequent Singular value is related to the tested stimuli. Namely, the grammatical alternative to the Gerund suffix in the given task is 3rd Person-Plural (i.e. the values inflected on the subject).

Considering both Number values in combination with Person values, percentages of incorrect use are lower than 3%. Moreover, we see that participants are more likely to use 3rd Person with either Singular or Plural as an alternative. Furthermore, though minor problems with specific

combinations are observed like 2nd Person Alternative - Singular Alternative, or 3rd Person Match – Plural Alternative, we cannot safely say that one combination is more challenging than any other combination for either of the two groups. This prediction is verified with results from each feature given below. When Plural is used as an alternative to Singular we observe higher *Global Incorrect* percentages. I hypothesise that this is mainly due to the fact that it is less common for Plural to be used as an alternative to Singular than the opposite. Therefore, more alternative uses result to more incorrect uses. Next, I present and discuss the participants' productions when using Person (*Section 6.4.2*) and Number (*Section 6.4.3*) feature values.

6.4.2 Person – Overall Performance

In the section, I consider the CG_{DS} and CG_{TDC} use of Person marking in the context of *S/V* agreement (both on verbs and copulas). As before, I do not evaluate all instances that deviate from the target as incorrect. Rather, sometimes the alternatives used result in perfectly grammatical utterances. As shown above, the Person-Number combinations do not evidence any major problems with *S/V* agreement. Therefore, we expect that neither Person nor Number are affected individually. In fact, CG_{DS} and CG_{TDC} use Person marking accurately at rates higher than 98%. As previously mentioned, it is difficult to draw firm conclusions from the study of *S/V* agreement in Eng_{DS}, partly due to the fact that it is hard to isolate *S/V* agreement from Tense marking, but also due to previous evidence that word-final consonants, and more specifically /s/, are challenging for Eng_{DS}. To the best of my knowledge, no results on all Person-Number combinations for CG_{DS} are available in any language. In the present study, we can examine *S/V* agreement separately from Tense in a variety of diverse environments, with all Person-Number combinations (see *Chapter 3*). Furthermore, Person and Number can be studied separately because of the different phonetic exponents across the different Person-Number combinations.

Next, I give the distribution of the three Person values based on the value that was targeted by the various experimental tasks and actual productions by CG_{DS} and CG_{TDC}. The sum of each row corresponds to the overall number of tokens targeted and the sum of the columns gives the overall number of productions for each Person value. For example, in the confusion matrix under *Table 6.13*, we observe that for 3rd Person, there were 2,421 instances where 3rd Person was used as targeted by CG_{TDC} and 4 times were CG_{TDC} used 1st Person instead of the targeted 3rd Person.

	CG_{DS}				CG_{TDC}			
	1st	2nd	3rd	Gerund	1st	2nd	3rd	Gerund
1st Person	1,038	3	35	0	1,003	0	5	0
2nd Person	17	391	14	0	2	696	5	0
3rd Person	19	10	2,281	0	4	3	2,421	0
Gerund	7	0	41	71	0	0	35	135

TABLE 6.13: CONFUSION MATRIX OF PERSON PRODUCTION ON VERBS BY CG_{DS} AND CG_{TDC}

Overall, the majority of productions match the target. It is clear however, that most of the ones that do not are found under 3rd Person. That it, when a value is not produced as targeted, the most favoured alternative is 3rd Person. We also find quite a few instances where the Gerund inflection was targeted, but 3rd Person was used instead. This is particularly important as mentioned above and is extensively discussed in *Chapter 7*.

Results presented in *Table 6.14* below confirm that both groups use Person inflection almost as accurately as CG_{TD} adults with percentages of correct use over 97%. However, on occasion participants from both groups use an alternative value to the one targeted. The alternative can be either correct or incorrect. The most common alternative is 3rd Person. The most commonly incorrect alternative uses are found with the 2nd Person value. *Table 6.14* summarises the distribution of the Person marking, providing details on the number of *Match* and *Alternative* (*COR* and *INC*) uses for each Person value. Further, it gives information on the percentage of incorrect uses of Person based only on the productions of Person as an alternative. Finally, it

provides the proportion of incorrect uses of the three Person values based on their overall use (Match + Alternative). For 2nd Person, I give all productions with and without /s/ omission PhI_{2nd}), which was established as a phonetically triggered process in *Chapter 5*.

	CG_{DS}					**CG_{TDC}**				
Verbs	*Match*	*Alternative*			*Global*	*Match*	*Alternative*			*Global*
	COR	*COR*	*INC*	*INC%*	*INC%*	*COR*	*COR*	*INC*	*INC%*	*INC%*
1st Person	1,038	28	15	34.9%	1.4%	1,003	1	7	87.5%	0.7%
2nd Person	272	2	11	84.6%	3.9%	678	0	3	100%	0.4%
PhI_{2nd}	119	--	--	--	--	18	--	--	--	--
2nd Person Total	391	2	11	84.6%	2.7%	696	0	3	100%	0.4%
3rd Person	2,281	59	31	34.4%	1.3%	2,421	43	2	4.4%	0.1%
Total	3,710	89	57	39%	1.5%	4,120	44	12	17%	0.3%
Affix Drop	74				1.9%	32				0.8%

TABLE 6.14: DISTRIBUTION OF PERSON PRODUCTION ON VERBS

Table 6.14 shows that CG_{DS} and CG_{TDC} produce Person values accurately more than 97% of the time. When the produced form deviates from the target three possibilities are available: (i) the verbal suffix is entirely omitted, (ii) an alternative Person value to the one targeted is used, resulting to either a grammatical or ungrammatical production, and (iii) the entire word is omitted. The percentage of affix drop (omission of inflectional suffix) is low for both groups, though higher for CG_{DS}: 1.9% for CG_{DS} and 0.8% for CG_{TDC}. Furthermore, when a Person value is used as an alternative, in total, it is used incorrectly only 1.5% by CG_{DS} and 0.3% by CG_{TDC}. The highest incorrect percentage of the Person values used as alternatives is found with the 2nd Person value for CG_{DS} and the 1st Person value for CG_{TDC}. Moreover, results in *Table 6.14* show that 3rd Person is used most frequently as an alternative. We also find a considerable number of 2nd Person productions lacking the final /s/ of the suffix. With /s/ omission the produced form appears to be of the same form as the form bearing 3rd Person-Singular. However, ample evidence has independently shown that /s/ omission in any word position is phonetically and phonologically conditioned. Regardless of such cases, which could be considered instances of

the 3rd Person being used as an alternative, there are still instances where the 3rd Person is used as an alternative, independent of /s/ omission. Those are categorised under 3rd Person – Alternative.

Statistical comparison reveals that despite the very small mean difference between the two groups, CG_{TDC} presented a higher mean of correct Person productions with verbs (M = 0.998, SD = 0.004) than CG_{DS} (M = 0.985, SD = 0.013), $t(31) = -3.57$, $p = .001$.More explicitly, on average, CG_{DS} produce significantly more incorrect productions of the Person feature than CG_{TDC}. It has nothing to say however, on how well each group performs, overall.

Table 6.15 below summarises results on Person productions for the copula and the auxiliary.

	CG_{DS}					CG_{TDC}				
Copula	*Match*	*Alternative*			*Global INC%*	*Match*	*Alternative*			*Global INC%*
	COR	*COR*	*INC*	*INC%*		*COR*	*COR*	*INC*	*INC%*	
1st Person	28	0	0	0%	0%	21	0	0	0%	0%
2nd Person	22	0	0	0%	0%	51	0	0	0%	0%
3rd Person	280	1	1	50%	0.4%	479	0	0	0%	0%
Total	330	1	1	50%	0.3%	551	0	0	0%	0%
Auxiliary	77	0	0	0%	0%	86	0	0	0%	0%

TABLE 6.15: DISTRIBUTION OF PERSON PRODUCTION ON COPULAS AND AUXILIARIES

Neither of the two participant groups appears to have a problem with Person marking on copulas. Only one incorrect use of the 3rd Person value being used as an alternative to the 1st Person is recorded. Moreover, of the 77 for CG_{DS} and 86 for CG_{TDC} auxiliary productions, none are used incorrectly from either participant group. Statistical comparison was not possible for copulas either, since CG_{TDC} did not produce any copulas inflected with an incorrect Person value.

Concerning Person feature productions, based on the above results, CG_{DS} and CG_{TDC} have acquired and can use all Person feature values almost with the same accuracy as adult CG_{TD}. There are however, some verb, copula and auxiliary omissions. Next, I consider these omissions, based on the three Person feature values targeted, to examine whether participants are more

likely to omit verbs and copulas based on a certain Person value, as a third strategy when they fail to produce a targeted verb inflected with Person features.

As seen with the categorization of verb omissions with Tense, omission of verbs is quite limited for both groups. *Tables 6.16* and *6.17* below give the CG_{DS} and CG_{TDC} verb, copula and auxiliary omissions, separated into the three Person values targeted. Specifically, they show the overall number of the Person value targeted (N), the number of times each Person value is omitted (∅) and the proposition of omission for each Person value (%).

	CG_{DS}			CG_{TDC}		
Verbs	N	∅	%	N	∅	%
1st Person	1,156	23	2%	1,043	6	0.6%
2nd Person	458	31	6.8%	713	1	0.1%
3rd Person	2,482	104	4.2%	2,472	15	0.6%
Total	4,096	157	3.8%	4,228	22	0.5%

TABLE 6.16: DISTRIBUTION OF VERB OMISSIONS TARGETING PERSON

For CG_{DS}, verbs targeted with 2nd Person are omitted more frequently than verbs and copulas targeting any of the other two Person values, while the reverse is true for CG_{TDC}. In addition, as evident from *Table 6.17* below, copula omission is more frequent than verb omission. We see a large number of copula and auxiliary omissions with CG_{DS}. CG_{TDC} omit copula and auxiliaries at a much lower rate.

	CG_{DS}			CG_{TDC}		
Copula	N	∅	%	N	∅	%
1st Person	31	2	6.5%	21	0	0%
2nd Person	30	7	23.3%	51	0	0%
3rd Person	394	112	28.4%	485	6	1.2%
Total	455	121	26.6%	557	6	1.03%
Auxiliary	192	115	59.9%	105	19	18.1%

TABLE 6.17: COPULA AND AUXILIARY OMISSION TARGETING PERSON

Concerning copula omissions, CG_{TDC} omit only copulas inflected with 3rd Person, while CG_{DS} omit copulas inflected with any Person value. The CG_{DS} highest omission percentage is observed

with copulas inflected with 3rd Person. Auxiliaries present the highest percentage of omission, relative to verb and copula omission, for both groups.. In CG, auxiliaries are found with the 'be going to' construction of the Subjunctive only. However, as explained in *Chapter 3*, auxiliaries are also frequently omitted in colloquial speech in CG_{TD} (see footnote 27).[87] Statistical comparison was performed to determine whether the groups differed in their verbal, copula and auxiliary omissions based on Person. *Table 6.18* summarises the results:

STATISTICAL COMPARISON ACROSS GROUPS - OMISSION									
	CG_{DS}			CG_{TDC}					
	M	*SD*	*Std. Error*	*M*	*SD*	*Std. Error*	*t*	*df*	*p*
Verbs									
1st Person	.020	.028	.007	.006	.011	.003	1.89	31	**.069**
2nd Person	.075	.071	.018	.002	.007	.002	4.21	31	<.001
3rd Person	.038	.026	.006	.006	.007	.002	4.98	31	<.001
Copula									
1st Person	.054	.145	.039	.000	.000	.000	1.48	28	1.49
2nd Person	.152	.195	.054	.000	.000	.000	3.23	28	.003
3rd Person	.212	.123	.031	.012	.019	.005	6.60	31	<.001

TABLE 6.18: STATISTICAL COMPARISON OF OMISSIONS TARGETING PERSON

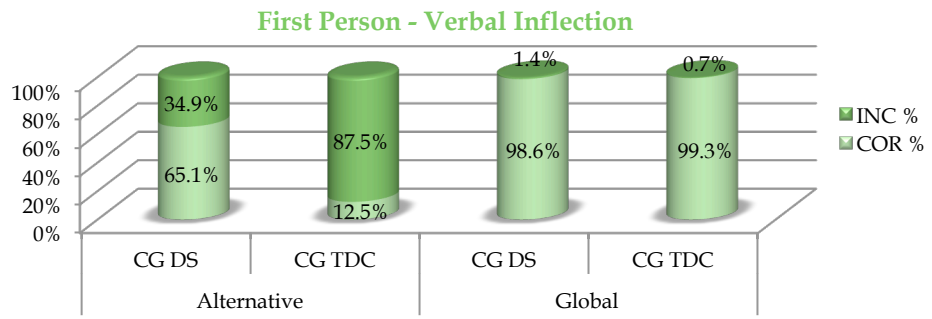
2nd and 3rd Person values for targeted Person inflection on verbs and copulas, unlike the 1st Person value, evidence a highly significant difference between the two groups. Namely, CG_{DS} are more likely to omit full verbs and copulas inflected with 2nd and 3rd Person than CG_{TDC}. Results for auxiliary use are the same as those presented in *Section 6.3.1*.

In sum, based on the Person feature, both CG_{DS} and CG_{TDC} rarely omit verbs, while omission of copulas and auxiliaries is more common. Note however, that auxiliary omission does not always result in an ungrammatical utterance since the Subjunctive clause can, on most occasions, stand on its own or through /n/ gemination realised on the Subjunctive marker *na*. In the following sub-sections I discuss results on the participants' performance for each Person value separately.

[87] In fact, I would expect the CG_{TD} adult omission rates to be parallel, if not higher, to those reported here for CG_{TDC}.

6.4.2.1 Productions of the First Person Feature Value

In this section, I discuss the participants' performance with regards to the 1st Person feature value by giving a graphic representation of the CG_{DS} and CG_{TDC} productions, statistical analysis and data examples of the 1st Person value. In general, both CG_{DS} and CG_{TDC}'s use of 1st Person inflection was almost at ceiling with 98% accuracy, parallel to CG_{TD}. However, on the rare occasion that CG_{DS} and CG_{TDC} use 1st Person as an alternative, they are likely to use it incorrectly, though CG_{TDC} exhibit a much higher percentage of incorrect use than CG_{DS}. *Graph 7* illustrates the participants' performance with the 1st Person.



GRAPH 6.7: DISTRIBUTION OF 1ST PERSON INFLECTION BY CG_{DS} AND CG_{TDC}

Occasions where 1st Person alternative is correct involve re-structuring of the target stimulus to accommodate the change. This can be seen with the examples given below. Statistical comparison was performed to determine whether the groups differed in their overall performance of 1st Person, with regards to their correct and incorrect productions when 1st Person is used as an alternative. Results on the participants means with 1st Person evidence that CG_{DS} participants produce verbs inflected with 1st Person (M = 0.985, SD = 0.029) as accurately as CG_{TDC} (M = 0.992, SD = 0.011), $t(31) = -0.99$ $p = .328$. There are no incorrect uses of the 1st Person value with copulas by either group.

Below, I give an example of a correct use of 1st Person matching the targeted verb (6.17), and an example where the produced verb does not match the targeted verb, but the production is nevertheless evaluated as correct (6.18). The relevant verbs are in boldface.

(6.17) First Person Match – Correct: Experiment #3 – Task I (Free Elicitation)

(a) *Expected Utterance*

ip-a	tis	man-as	mu	oti ...
tell.PRF-PAST.1.SG	*DET.FEM.SG.GEN*	*mother-FEM.SG.GEN*	*1.SG.GEN*	*that*

... en	na	pca-o	θcio.
be.IMPF.PRES.3.SG/PL	*SUBJ*	*take.PRF-PRES.1.SG*	*two*

'I told my mother (me) to take two/ I'll take two.'

(b) *CG_{DS} Production (EA)*

ip-a	tis	man-a∅	mu ...
tell.PRF-PAST.1.SG	*DET.FEM.SG.GEN*	*mother-FEM.SG.ACC*	*1.SG .GEN*

... [f]kio	∅a	pca-o.
two	*SUBJ*	*take.PRF-PRES.1.SG*

'I told my mother (me) to take two/ I'll take two.'

In example (6.17b) the participant *EA* uses all of the inflectional features on the produced verb exactly as expected. Moreover, there is no phonetic change altogether which might distinguish the expected and the produced form. In (6.18), I give an example of a correct use of 1st Person when used as an alternative to 2nd Person.

(6.18) First Person Alternative – Correct: Experiment #2 – Task I (Controlled Elicitation)

(a) *Targeted Utterance*

etelio-s-es	na	ðin-***is***	ta	ram-ata ...
PAST-finish-PRF-PAST.2.SG	*SUBJ*	*tie.IMPF-PRES.2.SG*	*DET.NEU.ACC.SG*	*shoelace-NEU.ACC.SG*

... ton paputs-io su?

DET.MASC.GEN.SG *shoe-MASC.GEN.SG* *2.GEN.SG*

'Have you finished tying the shoelaces of your shoes?'

(b) *CG_{DS} Production (FA)*

∅-telio-s-a ∅a ðin-***o*** paputsio mu?

finish-PRF-PAST.1.SG *SUBJ* *tie.IMPF-PRES.**1.SG*** *shoe-MASC.GEN.SG* *1.GEN.SG*

'Have you finished tying the shoelaces of your shoes?'

An alternative use of 1st Person is a change in Person value from either 2nd or 3rd Person to 1st. Example (6.18b) illustrates just that: instead of producing *e-telio-s-es* 'were you done?' the participant uses *∅-telio-s-a* 'Was I done?'. This example is evaluated as correct; the participant inflects the 1st Person value on all words with targeted 2nd Person. Hence, there is no agreement violation and despite the fact that the production differs from the target, it is nonetheless perfectly grammatical, as the Person change is facilitated by the context. It was observed that the vast majority of 2nd to 1st Person alternatives and some 1st to 2nd Person alternatives have the exact same source: participants interpreted the structure as actually referring to them or the speaker, respectively. Note that it is generally difficult to elicit 1st and 2nd Person *S/V* agreement and pronoun inflection, even in fieldwork with adult *TD*. Next, I give an example of incorrect use of the 1st Person when used as an alternative.

(6.19) <u>First Person Alternative – Incorrect: Experiment #1 – Video III</u> (Controlled Elicitation)

(a) *Targeted Utterance*

extes ti nixt-an ta peðj-a ...

last.night *DET.FEM.SG.ACC* *night-FEM.SG.ACC* *DET-NEU.PL.NOM* *child-NEU.PL.NOM*

... (e-)xorév-an.

(PAST-)dance.IMPF-PAST.3.PL

(b) *CG_{DS} Production (DK)*

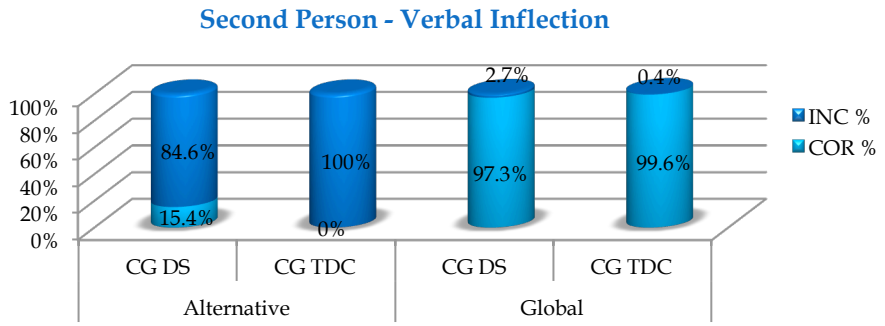
ni∅t-a	***kam-u-me***	xoro.
night-FEM.SG.ACC	*make*.PRF-PRES-1.PL	*dance*-MASC.SG.ACC

'Last Night we made dance.'

In example (6.19) the CG_{DS} participant *DK* did not only fail to mark the appropriate Tense on the verb, but he also used an alternative to the targeted Person value: 1st Person instead of 3rd Person.

6.4.2.2 Productions of the Second Person Feature Value

In this section, I present results on the 2nd Person value and illustrate through examples how participants produce 2nd Person as targeted and as an alternative to another Person value. In *sections 6.4.1* and *6.4.2*, we saw a general problem with the 2nd Person value such that, the highest percentage of incorrect productions is recorded with the 2nd Person when used as an alternative to other Person values. *Graph 8* illustrates the distribution of the 2nd Person value, with percentages based only on the alternative use of 2nd Person (Alternative) and the overall use of the 2nd Person value (Global).



GRAPH 6.8: DISTRIBUTION OF 2ND PERSON INFLECTION BY CG_{DS} AND CG_{TDC}

When considering the CG_{DS} and CG_{TDC} overall performance with the 2nd Person, the error percentages are considerably low: 2.7% for CG_{DS} and 0.4% for CG_{TDC}. However, when either

group uses 2nd Person as an alternative to another Person value, they almost always use it incorrectly. Note that the 2nd Person inflection has not been studied in Eng_{DS} due to the absence of overt inflectional morphology encoding this feature. A statistical comparison of the means of correct productions across the two groups, for the verbal 2nd Person, revealed that CG_{DS} do not produce verbs inflected with 2nd Person (M = 0.962, SD = 0.057) as accurately as CG_{TDC} (M = 0.995, SD = 0.011), $t(31) = -2.37$, $p = .024$. Moreover, there are no incorrect uses of the 2nd Person value with copulas. Therefore, a statistical comparision was not plausible. In example (6.20) below, I illustrate how participants use the 2nd Person value as targeted, with a controlled elicitation stimulus from *Experiment #2*.

(6.20) <u>Second Person Alternative – Correct: Experiment #2 – Task I</u> (Controlled Elicitation)

(a) *Targeted Utterance*

Ak-u!	E	θa	mu	***p-is*** ...
listen.PRF-IMP.2.SG	*NEG*	*FUT*	***1**.GEN.SG*	***tell.PRF-DEP.2.SG***

... ti	e	na	kam-o.
what	*be.IMPF.PRES.3.SG/PL*	*SUBJ*	*do.PRF-DEP.1.SG*

'Listen, you will not tell me what I am going to do.'

(b) *CG_{DS} Production (EK)*

Ak-u!	E	θa	mu	***p-is***	ti	θa	na	ka∅-∅.
listen.PRF-IMP.2.SG	*NEG*	*FUT*	***1**.GEN.SG*	***tell.PRF-DEP.2.SG***	*what*	*FUT*	*SUBJ*	*do*

'Listen, you will not tell me what I will do.'

In example (6.20b) participant *EK* inflects the verb *p-is* 'you tell' exactly as targeted by the experimental stimulus. The feature values Dependent, Perfective, 2nd Person, and Singular are inflected on the CG_{DS} production as targeted. Though the use of 2nd Person as an alternative is rare, it is almost always incorrect. There were however, two instances where the use of 2nd Person as an alternative surfaced a correct production, one of which is given in (6.21):

(6.21) Second Person Alternative – Correct: Experiment #2 – Task I (Controlled Elicitation)

(a) *Targeted Utterance*

Arkep-s-a	na	xorefk-u	molis	e-fi-a.
start-PRF-PAST.3.PL	*SUBJ*	*dance.IMPF-PRES.3.PL*	*as.soon.as*	*PAST-leave.PRF-PAST.1.SG*

'They started to dance as soon as I was gone.'

(b) *CG_{DS} Production (TM)*

[e]r∅e[t]-s-a	@tze	xorefk-u	mo∅is	e-fiγ-es.
start-PRF-PAST.3.PL	*and*	*dance.IMPF-PRES.3.PL*	*as.soon.as*	*PAST-leave.PRF-PAST.2SG*

'They started to dance as soon as I was gone.'

In (6.21), we find another instance where the participant interpreted the 1st Person value inflected on the verb of the targeted stimulus to actually refer to the speaker (i.e. me). When the participant was asked to repeat the utterance he kept the reference to me constant, by inflecting the 2nd Person value on the verb. The following example shows how the participant use 2nd Person as an alternative but the context does not facilitate his production.

(6.22) Second Person Alternative – Incorrect: Experiment #1 – Video I (Controlled Elicitation)

(a) *Targeted Utterance*

o	***Nik-os***	vlep-i	mian ...
DET.MASC.SG.NOM	***Nikos-MASC.SG.NOM***	*see.IMPF-PRES.3.SG*	*one.FEM.SG.ACC*

... kopell-a	na	fken-i	apo/pu	to	aftokinit-o.
girl-FEM.SG.ACC	*SUBJ*	*exit.IMPF-PRES.3.SG*	*from*	*DET.NEU.SG.ACC*	*car-NEU.SG.ACC*

'Nikos is watching a girl coming out of the car.'

(b) *CG_{DS} Production (SI)*

o	Nik-os	∅lep-i	***fk-a***	∅∅tokinit-o.
DET.MASC.SG.NOM	*Nikos-MASC.SG.NOM*	*see.IMPF-PRES.3.SG*	*exit.PRF-IMP.2.SG*	*car-NEU.SG.ACC*

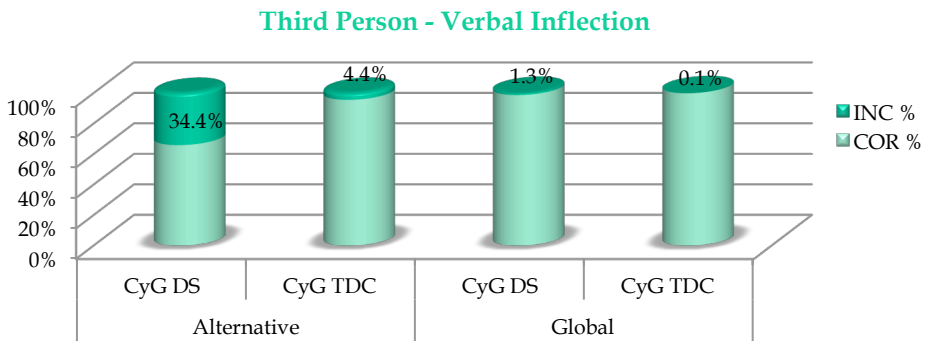
'Nikos is watching, come out, car.'

Though the target video clip required the production of 3rd Person agreement for the verb *fken-i* 's/he is coming out', as shown in (6.22a), CG_{DS} participant produced the verb *fk-a* 'come out', a

2nd Person value instead, as shown in (6.22b). Moreover, the targeted Tense inflection is Present but the participant uses Imperative instead.

6.4.2.3 Productions of the Third Person Feature Value

In this section, I discuss the 3rd Person value. The 3rd Person Singular agreement is used on a much higher rate than 1st and 2nd Person as seen in *Table 6.14*, *Section 6.4.2*. In *Graph 9*, I give the distribution of 3rd Person, with percentages based only on the alternative use of 3rd Person (Alternative) and the overall use of the 3rd Person value (Global).



GRAPH 6.9: DISTRIBUTION OF 3RD PERSON VERBAL INFLECTION BY CG_{DS} AND CG_{TDC}

Graph 9 shows that both participant groups perform almost at ceiling with the use of the 3rd Person value. Most of these cases involved the Gerund suffix. The percentages of incorrect use of 3rd Person, when used as an alternative are lower than 2% when considering the participants overall use the 3rd Person feature value. Based only on the alternative use of 3rd Person, we see that CG_{DS} participants are more likely to use it incorrectly than CG_{TDC}. We conclude that it is less likely that CG_{DS} and CG_{TDC} will use 3rd Person as an alternative incorrectly than when using any other Person value as an alternative. The same is also true when considering the participants' productions of 3rd Person in combination with the Singular Number value seen in *Section 6.4.1*.

The *Independent Samples t-test* comparing the means of 3rd Person productions between the two groups revealed that CG_{DS} do not produced verbs inflected with 3rd Person (M = 0.987, SD = 0.011) as accurately (i.e. produce a higher percentage of incorrect 3rd Person productions) as CG_{TDC} (M = 0.999, SD = 0.003), $t(31) = -4.14$, $p = <.001$. There are not enough incorrect uses of the 3rd Person value with copulas to perform statistical testing. (6.23), (6.24) and (6.25) exemplify the participants' use of the 3rd Person value.

(6.23) Third Person Alternative – Correct: Experiment #1 – Video III (Controlled Elicitation)

(a) *Targeted Utterance*

e-trav-***an***	tin	fanell-an	tu	all-u.
*PAST-pull.IMPF-PAST.**3.SG***	*DET.FEM.SG.ACC*	*t.shirt-FEM.SG.ACC*	*DET.MASC.SG.GEN*	*other-MASC.SG.GEN*

'He was pulling the other guy's shirt.'

(b) CG_{DS} *Production (TM)*

e-trav-***a***∅	tin	fanell-a∅	tu	all-u.
*PAST-pull.IMPF-PAST.**3.SG***	*DET.FEM.SG.ACC*	*t.shirt-FEM.SG.ACC*	*DET.MASC.SG.GEN*	*other-MASC.SG.GEN*

'He was pulling the other guy's shirt.'

The CG_{DS} production in (6.23b) is an exact match to the targeted verb production in (6.23a) for Aspect (Imperfective), Tense (Past), Person (3rd), and Number (Singular). Next, I give an example of a correct use of the 3rd Person value when used as an alternative. Specifically, instead of using the Gerund suffix, the CG_{TDC} participant used a Tense-Person-Number suffix.

(6.24) Third Person Alternative – Correct: Experiment #2 – Task II (Controlled Elicitation)

(a) *Targeted Utterance*

Perpat-u	s-to	ðrom-o	sfir-***ondas***.
walk.IMPF-PRES.3.PL	*on-DET.MASC-SG-ACC*	*street-MASC-SG-ACC*	*whistle-GER*

'They are walking down the street whistling.'

(b) *CG_{TDC} Production (AA)*

Perpat-u	ke	sfir-***u***.
walk.IMPF-PRES.3.PL	*and*	*whistle*.IMPF-PRES.3.PL

'They are walking and they are whistling.'

Instead of the suffix ***–ondas***, the participant inflects the root with the Present-3rd Person-Plural suffix ***–u***. Next, I give an example where 3rd Person is incorrectly used as an alternative to 1st.

(6.25) Third Person Alternative – Incorrect: Experiment #3 – Task II (Free Elicitation)

(a) *Targeted Utterance*

Pez-ume	me	tis	fil-es	mu.
play.IMPF-PRES.**1.PL**	*with*	DET.FEM.PL.GEN	*friend*-FEM.PL.GEN	*1*.SG.GEN

'We are playing with my friends.'

(b) *CG_{DS} Production (FM)*

em	***Pez-u***	me	∅	fil-es	mu.
	play.IMPF-PRES.**3.PL**	*with*		*friend*-FEM.PL.GEN	*1*.SG .GEN

'They are playing with my friends.'

In example (6.25b) the CG_{DS} participant *FM* uses 3rd Person instead of 1st Person for the verb *pez-* 'play'. Notice that there is no change in the inflectional features of Number and Tense. This production is perceived as incorrect because the participant is referring to her daily activities and this implies that she is the "agent" of those activities. Therefore, the possibility of the speaker referring to some other people playing with her friends while talking about her everyday activities is implausible. Nonetheless, it should be mentioned that outside the particular context described above, this structure, is perfectly grammatical.

6.4.2.4 Summary

We have now established that participants from both groups use inflection for Person highly accurately across all values. When an alternative is used it may but need not result in ungrammaticality. We have observed that the use of 2nd Person as an alternative is always incorrect for both groups. In contrast, when 1st or 3rd Person values are used as alternatives they are often used correctly. Statistical comparisons confirmed that the two participant groups differ significantly only in their 3rd Person productions. Percentages of affix drop parallel those of Tense; that is, they are lower than 2% for either group. This was expected as on most instances the Tense and *S/V* agreement suffix is fused in a portmanteau morpheme. Moreover, neither participant group exhibits incorrect use of the copula and the auxiliary. Concerning omissions, though the percentages are rather low for verbs (lower than 10%), auxiliary omission is quite frequent with CG_{DS}. Copula omissions are also more common with CG_{DS}, ranging from 5% to 30% for CG_{DS}. Finally, 3rd Person is the value most likely to be used as an alternative.

6.4.3 Number – Overall Performance

Once again, in English it is challenging to test whether Number agreement is affected because the only *S/V* agreement suffix is 3rd Person Singular *–s* which is fused with the Present Tense. Therefore, Number agreement on verbs cannot be fully studied in Eng_{DS} (apart from the copula and auxiliary). In Greek, however, it is possible to tease apart Number from Person. Below, I show that both participant groups use Singular and Plural inflection accurately. A higher percentage of omissions is observed with Plural agreement, for both CG_{DS} and CG_{TDC}. Most copula omissions are observed with the form *ine* or *e(n)*, used for both Singular and Plural.

In this section, I discuss the participants' overall use of Number. Both participant groups are more likely to produce an incorrect use of a Number value when using Plural as an alternative to Singular than when using Singular as an alternative to Plural. When considering the participants overall use of either value however, the error rates are lower than 1% for both groups. No alternative use of the copula based on Number agreement is recorded. As a first step I give the participants' productions for each Number value. The highlighted cells indicate those productions that match the target.

	CG_{DS}			CG_{TDC}		
	SG	PL	Gerund	SG	PL	Gerund
Singular	2,954	11	0	2,976	4	0
Plural	60	776	0	23	1,087	0
Gerund	6	34	71	1	34	135

TABLE 6.19: CONFUSION MATRIX OF NUMBER PRODUCTION ON VERBS BY CG_{DS} AND CG_{TDC}

Table 6.19 summarises the participants' use of each Number value based on what was targeted or expected. While the majority of productions match the target, there were a few instances where both groups used one of the Number values as an alternative to the other. *Table 6.20* summarises the distribution of Number inflection on verbs. As illustrated below, the percentages of incorrect forms when considering the participants' overall use of each Number value are, as always, quite low: 0.9% for CG_{DS} and 0.4% for CG_{TDC}.

	CG_{DS}					CG_{TDC}				
Verbs	*Match*	*Alternative*			*Global*	*Match*	*Alternative*			*Global*
	COR	*COR*	*INC*	*INC%*	*INC%*	*COR*	*COR*	*INC*	*INC%*	*INC%*
Singular	2,954	38	28	42.4%	0.9%	2,976	11	13	54.2%	0.4%
Plural	776	38	7	15.6%	0.9%	1,087	34	4	10.5%	0.4%
Total	3,730	76	35	31.5%	0.9%	4,063	45	17	27.4%	0.4%
Affix Drop	74				1.9%	32				0.8%

TABLE 6.20: DISTRIBUTION OF NUMBER PRODUCTION WITH VERBS

The produced Number value matches the targeted value at a very high percentage. As with the other two values inflected on verbs seen so far, there are three different strategies participants use

when the target is not met: (i) either an alternative is used which may result in a grammatical or ungrammatical output, (ii) the Number affix is dropped, or (iii) the verb is omitted. We observe a very low percentage of incorrect uses of the Number feature overall. However, if an alternative is used it is often used incorrectly (apart from the cases where Plural is used as an alternative to a Gerund). Moreover, the overwhelming majority of cases where Plural is used as an alternative are traced back to the targeted Gerund inflection. That is, participants from both groups chose to use Tense-Person-Number inflection instead of only verbal inflection that carries neither Tense nor *S/V* agreement. The percentages of affix drop including a Number feature are also considerably low for both groups: 1.9% for CG_{DS} and 0.8% for CG_{TDC}.

A statistically significant result determined that the two participant groups do not perform similarly with their overall Number productions; that is, CG_{DS} are less likely to produce verbs inflected with Number (M = 0.990, SD = 0.008) as accurately as CG_{TDC} (M = 0.996, SD = 0.004), $t(31) = -2.62$, $p = .014$. This, however, does not cancel the fact that both groups use Number inflection correctly over 99% of the time they use it.

Table 6.21 shows the Number inflection on the copula and the auxiliary. The auxiliary in CG only has one form, which corresponds to the 3rd Person-Singular/Plural form of the copula. Therefore, no incorrect uses of the copula or auxiliary are recorded.

	CG_{DS}				CG_{TDC}			
	Match	*Alternative*		*Global*	*Match*	*Alternative*		*Global*
Copula	*N*	*N*	*INC%*	*INC%*	*N*	*N*	*INC%*	*INC%*
Singular	34	0	0%	0%	51	0	0%	0%
Plural	13	0	0%	0%	20	0	0%	0%
SG/PL	280	0	0%	0%	476	0	0%	0%
Total	327	0	0%	0%	547	0	0%	0%
Auxiliary	77	0	0%	0%	86	0	0%	0%

TABLE 6.21: DISTRIBUTION OF NUMBER PRODUCTION WITH COPULAS AND AUXILIARIES

Overall, neither CG_{DS} nor CG_{TDC} have a problem with producing Number inflection on verbs, copulas, and auxiliaries. Furthermore, the production of Number marking shows the lowest percentage for incorrect use seen so far for verbs (for any value apart from Past). Due to the lack of incorrect productions by both groups, statistical analysis is not applicable.

Next, I discuss the participants' omissions targeting Number inflection to examine whether participants are more likely to omit verbs inflected with either Singular or Plural. When looking at Tense and Person, we saw that the percentages of omission concerning the verbs are low for both groups, while the percentages of copula and auxiliary omission are rather high for CG_{DS} but not as high for CG_{TDC}. Therefore, we expect to see the same with Number. Results presented in *Tables 6.22* and *6.23* verify the above expectation; while verb omissions do not surpass 5%, auxiliary omissions reach 60% for CG_{DS} but only 17.6% for CG_{TDC}.

	CG_{DS}			CG_{TDC}		
Verbs	N	∅	%	N	∅	%
SG	3,194	111	3.5%	3,090	14	0.5%
PL	902	47	5%	1,138	8	0.7%
Total	4,096	158	3.8%	4,228	22	0.5%

TABLE 6.22: DISTRIBUTION OF VERB OMISSION TARGETING NUMBER

As explained in *Chapter 3*, with the 3rd Person copula the Number value is indistinguishable between Singular and Plural. *Table 6.23* below shows that these copulas are the most frequently omitted ones by both groups, in contrast to copulas encoding Singular or Plural Number.

	CG_{DS}			CG_{TDC}		
Copula	N	∅	%	N	∅	%
SG	39	3	8.1%	54	0	0%
PL	22	7	31.8%	21	0	0%
SG/ PL	394	111	28.2%	482	6	1.2%
Total	455	121	26.6%	557	6	1.1%
Auxiliary	192	115	59.9%	105	19	18.1%

TABLE 6.23: DISTRIBUTION OF COPULA AND AUXILIARY OMISSIONS TARGETING NUMBER

Once again, with the above division of the targeted Number value, verb, copula, and auxiliary omissions the two groups were statistically compared with *Independent Samples t-tests*.

STATISTICAL COMPARISON ACROSS GROUPS - OMISSION									
	CG_{DS}			CG_{TDC}					
	M	*SD*	*Std. Error*	*M*	*SD*	*Std. Error*	*t*	*df*	*p*
Verbs									
Singular	.032	.021	.005	.004	.007	.002	5.08	31	<.001
Plural	.053	.054	.014	.006	.010	.002	3.45	31	.002
Copula									
Singular	.074	.158	.042	.012	.049	.012	1.54	29	**1.35**
Plural	.176	.217	.060	.000	.000	.000	3.36	28	.002
SG/PL	.210	.122	.031	.011	.0183	.004	6.67	31	<.001

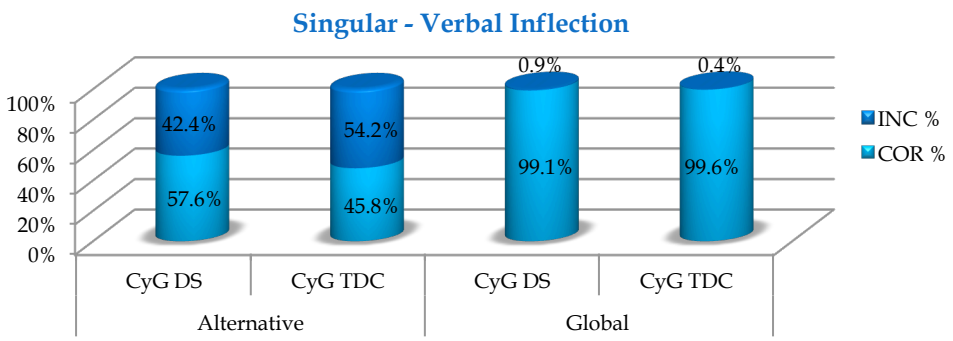
TABLE 6.24: STATISTICAL COMPARISON OF OMISSIONS TARGETING NUMBER

Based on the targeted Number value, verb omission produced a statistically highly significant result for both Singular and Plural Number: CG_{DS} omit significantly more verbs with intended Number inflection than CG_{TDC}. Concerning copula omission, Singular Number evidenced a non-significant result, such that CG_{DS} omit as many copulas inflected with the targeted Singular Number. The cut-off point is 0.05 with a *95% Confidence Level*. As for the omission of copulas where either Plural or SG/PL was targeted, CG_{TDC} omit significantly fewer copulas than CG_{DS}. Once again, results for the auxiliary omission are the same as in *Section 6.3.1*. These statistical results on Number productions and omissions establish that CG_{DS} use all Person values not as accurately as CG_{TDC}. However, the percentages of error for both groups are surprisingly low, when compared to the results reported for Eng_{DS} but somewhat expected, when compared to the results reported for Ger_{DS}.

6.4.3.1 Productions of the Singular Feature Value

Singular is used at a much higher rate than Plural as seen in *Table 6.19 and*, *6.20 Section 6.4.3*. Singular Number presents the lowest error rates in comparison with any other feature value seen

so far (other than Past) for both CG_{DS} and CG_{TDC}. *Graph 10* gives the CG_{DS} and CG_{TDC} productions of Number on verbs, considering (i) only the alternative use of Singular (Alternative) and (ii) the overall use of the Singular value (Global).



GRAPH 6.10: DISTRIBUTION OF SINGULAR VERBAL INFLECTION BY CG_{DS} AND CG_{TDC}

While CG_{DS} produce considerably more verbs marked with Singular as an alternative, both groups are more likely to make a mistake when using Singular as an alternative to Plural. CG_{DS} has a slightly lower percentage of incorrect productions (M = 0.991, SD = 0.008) than CG_{TDC} (M = 0.996, SD = 0.004), but this does not approach significance $t(31) = -2.40$, $p = .023$. Below, I give an example for a match and alternative use of the Singular Number value.

(6.26) <u>Singular Match – Correct: Experiment #2 – Task I</u> (Controlled Elicitation)

(a) *Targeted Utterance*

kanen-as	mas	ðe	***θel-i*** ...
no.one-MASC.SG.NOM	*1.PL.ACC*	*NEG*	*want.IMPF-PRES.3.SG*

... kak-us	fil-us.
bad-MASC.NOM.PL	*friend-MASC.NOM.PL*

'None of us want bad friends.'

(b) CG_{DS} *Production (MH)*

kanen-a∅	ma∅	∅e	***θel-i*** ...
no.one-MASC.SG.ACC	*1.PL.ACC*	*NEG*	*want-IMPF.PRES..3SG*

... kak-u∅ ∅a[t]-u∅ fil-∅∅.

bad-MASC.NOM.SG *bad-MASC.NOM.SG* *friend/kiss*

'None of us wants bad ....'

In (6.26b), the participant inflected the verb *θel-i* 's/he want' with Imperfective, Present, 3rd Person and Singular exactly as targeted by the experimental stimulus of the imitation production task. Compared to the structure in (6.26a), no morpho-syntactic or phonetic change differentiates the target and produced verb. In (6.27), the Plural value inflected on the targeted form is realised as Singular in the CG_{TDC} production, but the production is nevertheless correct. There is nothing in the utterance that causes the evaluation of this form to be considered ungrammatical.

(6.27) Singular Alternative – Correct: Experiment #2 – Task I (Controlled Elicitation)

(a) *Targeted Utterance*

Fefk-umen! E-pina-s-a ke θel-o ...

leave.IMPF-PRES.1.PL *PAST-take-PRF-PAST.1.SG* *and* *want.IMPF-PRES.1.SG*

... na pa-me spit-i.

SUBJ *go.IMPF-PRES.1PL* *home-NEU.SG.ACC*

(b) *CG_{TDC} Production (AA)*

Fefk-o! E-pina-s-a ke θel-o ...

leave.IMPF-PRES.1.SG *PAST-take-PRF-PAST.1.SG* *and* *want.IMPF-PRES.1.SG*

... na fan-∅ (n)a fa-me spit-i.

SUBJ *eat* *SUBJ* *eat.IMPF-PRES.1.PL* *home-NEU.SG.ACC*

In (6.27b), the CG_{TDC} participant fails to use the Plural Number value inflected on the target verb *fefk-umen* 'we are leaving/let's go', producing the Singular verb *fefk-o* 'I am leaving', instead. The morpho-syntactic change of Number here, based on the context, is grammatical, though slightly semantically odd with the fourth verb of the sentence, *fa-me* 'we eat', still in Plural. I give an example of how Singular was used incorrectly when used as an alternative below.

(6.28) Singular Alternative – Incorrect: Experiment #2 – Task I (Controlled Elicitation)

(a) *Targeted Utterance*

Pien-e-te	spiti	sas!	E-nixto-s-e.
go.IMPF-IMP-2.PL	*house-NEU-ACC-SG*	*2-ACC-PL*	*PAST-get.dark-PRF-PAST-3.SG*

'Go home! It's dark (i.e. it's getting late).'

(b) *CG_{TDC} Production (MS)*

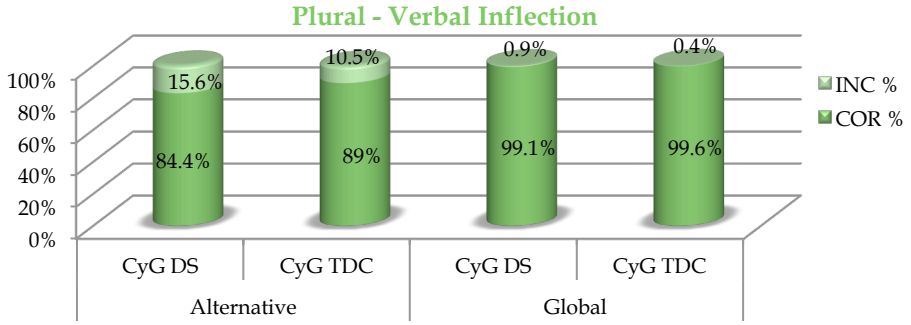
Pien-i	spiti	sas!	E-nixto-s-∅.
go.IMPF-PRES.3.SG	*house-NEU-ACC-SG*	*2-ACC-PL*	*PAST-get.dark-PRF*

'Go home! It's dark (i.e. it's getting late).'

In example (6.28) above we see that the participant inflected the first verb with the Present-3rd Person-Singular suffix, instead of the targeted Imperative-2nd Person Plural. In addition, he omitted the utterance final /ɛ/ targeting Past-3rd Person-Singular.

6.4.3.2 Productions of the Plural Feature Value

Both CG_{DS} and CG_{TDC} participants have the same percentage of overall incorrect use of Plural, as they did for Singular. *Graph 11* charts the distribution of Plural, offering details on the proportion of Plural incorrect uses based only on the alternative uses and based on the overall use of the feature Plural (*Match + Alternative*: *Global INC%*).



GRAPH 6.11: DISTRIBUTION OF PLURAL VERBAL INFLECTION BY CG_{DS} AND CG_{TDC}

Both participant groups display an almost perfect accuracy: 99.2% for CG_{DS} and 99.3% for CG_{TDC}. When Plural inflection is used as an alternative, it is not always incorrect. This is mostly attributable to the alternative use of Plural instead of Gerund marking, where participants produced Present-3rd Person-Plural, instead of the Gerund suffix. Statistical comparison of the participants' means evidenced that CG_{DS} produce verbs inflected with Plural (M = 0.931, SD = 0.249) as accurately as CG_{TDC} (M = 0.995, SD = 008), $t(31) = -1.07$, $p = .292$. Examples (6.29) and (6.30) present utterances, where the Plural Number value is used accurately: (i) as targeted, and (ii) as an alternative to Singular.

(6.29) Plural Match – Correct: Experiment #2 – Task I (Controlled Elicitation)

(a) *Targeted Utterance*

Var-te	zest-a	rux-a!	En ...
put.PRF-IMP.2.PL	*warm*-NEU.PL.ACC	*cloth*-NEU.PL.ACC	*be*.IMPF.PRES.3.SG/PL

... kri-os	o	ʃimon-as	fetos.
cold-MASC.SG.NOM	DET.MASC.SG.NOM	*winter*-MASC.SG.NOM	*this.year*

'Put on warm clothes. This winter is a cold one.'

(b) CG_{TDC} *Production (AK)*

Var-te	zest-a	rux-a!	En ...
put.PRF-I.MP.2.PL	*warm*-NEU.PL.ACC	*cloth*-NEU.PL.ACC	*be*.IMPF.PRES.3.SG/PL

... kri-os	o	ʃ[u]mon-as	fetos.
cold-MASC.SG.NOM	DET.MASC.SG.NOM	*winter*-MASC.SG.NOM	*this.year*

'Put on warm clothes. This winter is a cold one.'

In (6.29b), the CG_{TDC} participant inflects Plural Number on the verb *var-te* 'put' exactly as targeted by the experimental stimulus given in (6.29a). (6.30) presents an instance where Plural was used as an alternative and the result was grammatical.

(6.30) Plural Alternative – Correct: Experiment #2 – Task II (Controlled Elicitation)

(a) *Targeted Utterance*

ol-i zoγrafiz-***u*** xamoγel-***ondas***.

all-MASC-PL-NOM *draw*.IMPF-PRES.3.PL *smile*-GER

'They are (all) drawing **smilingly**.'

(b) CG_{DS} *Production (PP)*

ul-i ∅ xamoγel-***u***.

all-MASC-PL-NOM *smile*.IMPF-PRES.3.PL

'They are all **smiling**.'

In the above example the participant did not produce the verb of the main clause. Instead, she inflected the verb targeting Gerund inflection, with a Present-3rd Person-Plural inflection. (6.31) presents an instance where the participant produces a verb inflected with Plural, while the target stimulus, based on the video clip, requires the use of Singular Number on the verb.

(6.31) Plural Alternative – Incorrect: Experiment #1 – Video II (Controlled Elicitation)

(a) *Targeted Utterance*

o Nik-os ***vlep-i*** mor-a ...

DET.MASC.SG.NOM *Nikos*-MASC.SG.NOM *see*.IMPF-PRES.***3.SG*** *baby*-NEU.PL.ACC

... pu / na vur-u / trex-u.

that SUBJ *run*.IMPF-PRES.3.PL

'Nikos is watching children (that are) running.'

(b) CG_{DS} *Production (SC)*

o Nik-oł ***∅lep-u*** mor-a ...

DET.MASC.SG.NOM *Nikos*-MASC.SG.NOM *see*.IMPF-PRES.3.***PL*** *baby*-NEU.PL.ACC

... pu [p]ur-u.

that *run*.IMPF-PRES.3.PL

'Nikos is watching girls (that are) running.'

In (6.31b), the CG_{DS} participant uses Plural instead of Singular for the verb /vle.pi/ →[∅le.p-u]. In addition, the initial /v/ is omitted possibly due to restriction on consonant clusters.

6.4.3.3 Summary

Concerning Number agreement on verbs and copulas, results show that CG_{DS} and CG_{TDC} are equally likely to use Singular correctly as an alternative to Plural and vice versa. Statistically, a non-significant difference between the two groups verifies that the two groups perform in similar manner. Below, I give a brief summary of the overall results of *S/V* agreement.

6.4.4 Summary on *S/V* Agreement Results

I have now established that both CG_{DS} and CG_{TDC} use *S/V* agreement almost as adult CG_{TD} Grammar, (accuracy rates surpass 98%). I have shown that participants use all Person-Number combinations quite accurately. Minor problems for both groups are observed with 2nd Person-Singular when these values are used as an alternative to 1st and 3rd Person Plural. The 3rd Person Plural Combination, when Plural is used as an alternative also appeared slightly problematic.

Concerning each feature individually, participants perform almost at ceiling with over 98% accuracy. However, minor problems with both CG_{DS} and CG_{TDC} are observed when 2nd Person is used as an alternative. CG_{TDC} present a high percentage of incorrect use of 1st Person when used as an alternative (87.5%). In consequence, statistical comparison determined that in relation to CG_{DS}, CG_{TDC} perform significantly lower, when using the 3rd Person value. Concerning Number, both participant groups perform similar to adult CG_{TD} with less than 1% error for both groups. Statistical comparisons between the two groups verified that they perform similarly.

Considering the participants' overall use of Person and Number separately, as well as their performance with the feature combinations, it can be argued that problems with agreement are limited with overall error percentages less than 3% for CG_{DS} and less than 1% for CG_{TDC}. What is noteworthy is that, as with the Tense feature, we see frequent use of one Person and one Number value as an alternative over others: 3rd Person and Singular respectively.

6.5 CASE – OVERALL PERFORMANCE

Morphological Case is an instance of nominal inflection and as such bears on the question as to whether inflectional features other than Tense are affected in CG_{DS}. As discussed in *Chapter 1*, the distribution of Case is closely related to Tense; in many languages, the presence or absence of Nominative Case is dependent on the presence or absence of Tense marking on a verb, such that non-finite verbs cannot license a Nominative subject. Therefore, the study of Case will aid in evaluating whether the problems *DS* face with inflection are syntactically or morphologically conditioned. A Case impairment, especially one that involves problems with Nominative Case assignment, depending on how they are manifested, could indicate that the *IIH* is syntactically conditioned. Thus far, we have seen minimal problems with Tense and *S/V* agreement (specifically in Past), which by no means support a general impairment of inflection.

In what follows, I show that both CG_{DS} and CG_{TDC} participants inflect nominal Case almost completely accurately. Nominal omissions present a slightly higher percentage than verbal omissions, while affix-drop percentages are similar to those features already discussed.

First, I discuss the distribution of the participants' performance with the four Case values from data collected by the four experiments conducted. Results are divided based on the targeted

value. The sum of each row gives the overall number of tokens targeted and the sum of the columns gives the overall number of productions for each Case. For example, in the confusion matrix under *Table 6.25* we observe that, there were 917 instances where Genitive was used as targeted by CG_{DS} and 5 times were CG_{DS} used Nominative instead of the targeted Genitive.

	CG_{DS}				CG_{TDC}			
	NOM	ACC	GEN	VOC	NOM	ACC	GEN	VOC
Nominative	3,889	26	10	0	4,453	4	1	0
Accusative	184	4,807	11	1	19	6,850	6	0
Genitive	6	12	920	0	1	5	1,583	0
Vocative	0	0	0	100	0	0	0	59

TABLE 6.25: CONFUSION MATRIX OF CASE PRODUCTION BY CG_{DS} AND CG_{TDC}

It is observed that all four Case values are produced as targeted. A very clear preference for Nominative as an alternative to the other three Case values emerges from both groups. Moreover, there is also a clear preference for Accusative over Genitive and Vocative for CG_{DS} and CG_{TDC}.

Table 6.26 charts the distribution of Case, offering details on the number of match and alternative (*COR* and *INC*) Case productions for all Case values and the proportion of incorrect uses when a Case value is used as an alternative to another Case value. The table also includes forms where the difference between the targeted or expected form and surfacing production is phonetically or phonologically conditioned (PhI). In particular, as shown in *Chapter 5*, /s/ omission creates an ambiguity between the targeted form and another form with different inflectional features. However, a long list of evidence establishes that /s/ omission is phonetically conditioned. Therefore, these forms are categorised under the appropriate Case value, when there is sufficient evidence to show that they were used as targeted.

	CG$_{DS}$					CG$_{TDC}$				
	Match	*Alternative*			*Global*	*Match*	*Alternative*			*Global*
Case	*COR*	*COR*	*INC*	*INC%*	*INC%*	*COR*	*COR*	*INC*	*INC%*	*INC%*
Nominative[88]	3,249	15	175	92.1%	5.1%	4,408	5	15	75%	0.3%
PhI $_{Nom}$	640	--	--	--	--	45	--	--	--	--
NOM Total	3,889	15	175	92.1%	4.3%	4,453	5	15	75%	0.3%
Accusative	4,748	0	38	100%	0.8%	6,841	0	9	100%	0.1%
PhI $_{Acc}$	59	--	--	--	--	9	--	--	--	--
ACC Total	4,807	0	38	100%	0.8%	6,850	0	9	100%	0.1%
Genitive	831	0	21	100%	2.5%	1,569	2	7	77.8%	0.4%
PhI $_{Gen}$	89	--	6	100%	6.3%	14	--	--	--	--
GEN Total	920	0	27	100%	2.9%	1,583	2	7	77.8%	0.4%
Vocative	100	0	1	100%	1%	59	0	0	0%	0%
PhI $_{Voc}$	0	--	--	--	--	0	--	--	--	--
VOC Total	100	0	1	100%	1%	59	0	0	0%	0%
PhI $_{Total}$	788	0	6	100%	0.8%	68	0	0	0%	0%
Overall Total	9,716	15	241	93.8%	2.4%	12,945	7	31	83.8%	0.2%
Affix Drop	143				1.4%	77				0.6%

TABLE 6.26: DISTRIBUTION OF CASE PRODUCTION

I observe that Case is mostly used correctly. Whenever the Case production does not match the targeted Case Value CG$_{DS}$ and CG$_{TDC}$, three possibilities are available: (i) an alternative is used, which may produce a grammatical or ungrammatical result; (ii) Case inflection is omitted; (iii) the entire word is omitted. Considering the overall performance of participants, if a Case feature is used as an alternative, it is incorrect in only 2.4% of tokens for CG$_{DS}$ and 0.2% for CG$_{TDC}$. Most nominal phrase productions are observed with the Accusative Case for both groups. This is also the Case value with the lowest incorrect percentage based on the participants' overall use of Accusative. The highest incorrect percentage is recorded with Nominative Case for CG$_{DS}$ (4.3%) and Genitive Case for CG$_{TDC}$ (0.3%). Almost all CG$_{DS}$ and CG$_{TDC}$ attempts to use Genitive and Vocative (only for CG$_{DS}$) values, as an alternative, result to an ungrammatical production. As discussed in *Chapter 5*, a large number of phonetic and phonological issues created ambiguity between the targeted or expected form and another form carrying inflectional features, other than

[88] Note that (Cypriot) Greek is a *pro*-drop language, where a clause can surface without an overt subject. In the greater part of literature on Greek syntax (Panagiotidis and Tsiplakou 2006, *inter alia*) overt subjects are actually considered to be topics. This is possibly the reason there is a smaller number of nominal phrases inflected with Nominative rather than Accusative.

those targeted. A considerable number of nominal phrases that exhibit phonetic and phonological issues are found. As shown in *Table 6.26*, these are considered separately. The highest number of phonetically and phonologically affected forms (PhI) is observed with Nominative, with the omission of final /s/[89], for both groups. Nominative also exhibiting the highest number of alternative uses such that, CG_{DS} and CG_{TDC} participants used Nominative as an alternative Case value to Accusative and Genitive. Notice that in comparison with Nominative, alternative uses of other Case values are considerably less. Finally, as with verbal inflection, the percentages of affix drop are considerably low: 1.4% for CG_{DS} and 0.6% for CG_{TDC}.

Statistical comparison revealed a highly significant result: CG_{DS} do not produce nominal expressions inflected with Case as accurately (M = 0.975, SD = 0.024) as CG_{TDC} (M = 0.998, SD = 0.002), $t(31) = -3.88$, $p = .001$. Nevertheless, both groups are over 97% accurate when using Case marking. Next, I consider results on the omission of nouns, adjectives, determiners, pronouns etc., based on the Case feature which is targeted in a specific experimental stimulus or is expected to appear in the context of a free elicitation task such that of storytelling.

Percentages for verbal omissions presented above show a relatively low omission rate of verbs: lower than 5% for CG_{DS} and lower than 2% for CG_{TDC}. Copula and auxiliary omissions on the other hand, evidence high omission rates: up to almost 60% for CG_{DS} and up to 20% for CG_{TDC}. In this section, I discuss omissions of word categories inflected with Case. Examining the omission of nominal phrases based on the Case value intended or targeted, we can discover whether the two groups are more likely to omit words inflected with one Case value as opposed to another. In general, omissions of nouns, determiners, adjectives, pronouns etc., though slightly higher than verbal omissions, are mostly within the same range. *Table 6.27* shows the

[89] More than 60% of the affected PhI Nominative instances were recorded with the exact same word: *Nik-os*.

participants' nominal omissions, giving details on the number of nominal productions targeted for each Case (N), with the number (∅) and proportion (%) of omissions for each Case value.

	CG_{DS}			CG_{TDC}		
Case	N	∅	%	N	∅	%
Nominative	4,436	446	10.1%	4,596	92	2%
Accusative	5,312	213	4%	6,973	32	0.5%
Genitive	1,087	117	10.7%	1,621	23	1.4%
Vocative	112	7	6.3%	59	0	0%
Total	10,946	783	7.2%	13,249	147	1%

TABLE 6.27: DISTRIBUTION OF NOMINAL OMISSIONS TARGETING CASE

Overall, the percentage of nominal omission is higher than that of verbal omissions. In particular, I find the lowest omission rates with Accusative for both groups: 4% for CG_{DS} and 0.5% for CG_{TDC}. Nominative and Genitive are somewhat frequently omitted by CG_{DS}, while CG_{TDC} have much lower rates of omission. While nominal expressions with targeted Vocative are never omitted by CG_{TDC}, CG_{DS} omit nominal expressions targeting Vocative at a 6.3% rate. Statistical comparison was performed to examine whether the two groups differed in their omissions of nominal phrases targeting the four Case values. Results are summarised in *Table 6.28*.

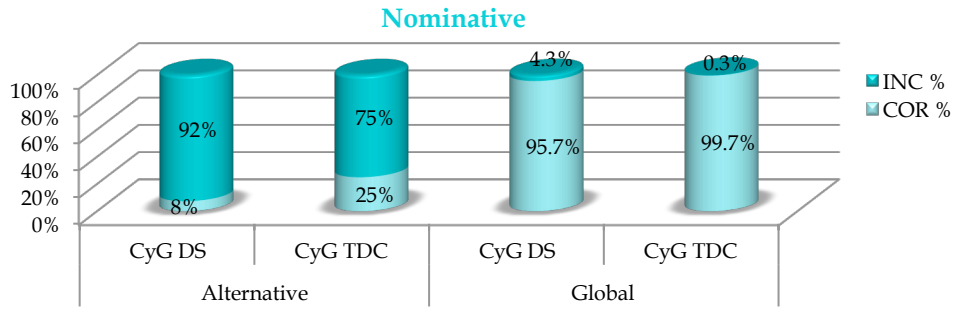
STATISTICAL COMPARISON ACROSS GROUPS - OMISSION									
	CG_{DS}			CG_{TDC}					
Case	*M*	*SD*	*Std. Error*	*M*	*SD*	*Std. Error*	*t*	*df*	*p*
Nominative	.090	.085	.021	.020	.019	.005	3.31	31	.002
Accusative	.043	.030	.007	.005	.005	.001	5.27	31	<.001
Genitive	.090	.052	.013	.017	.028	.007	5.08	31	<.001
Vocative	.104	.134	.036	.000	.000	.000	3.21	29	.003

TABLE 6.28: STATISTICAL COMPARISON OF OMISSIONS TARGETING CASE

Statistical comparison on the omission of nominal phrases targeting Nominative, Accusative, Genitive, and Vocative evidence highly significant results. That is, based on the means of omission for the each participant from each group CG_{DS} omit nominals targeting Case marking more frequently than CG_{TDC}.

6.5.1 Productions of the Nominative Feature Value

In this section, I offer a more detailed presentation and analysis of the results for Nominative Case by providing a graphic representation of correct and incorrect instances based on (i) only the use of Nominative as an alternative to the other Case values, but also (ii) based on the participants' overall use of Nominative Case (Match + Alternative). I also provide statistical analysis comparing the two participant groups' performance with respect to Nominative Case. In *Table 6.26* above, I showed that Nominative is the Case with the highest number of alternative uses and the highest percentage of incorrect use. A considerably high percentage of Nominative productions by both CG_{DS} and CG_{TDC} are evaluated as correct: over 95% for CG_{DS} and over 99% for CG_{TDC}. *Graph 12* illustrates the participants' productions with Nominative Case based on the percentages of correct and incorrect use.



GRAPH 6.12: DISTRIBUTION OF NOMINATIVE INFLECTION BY CG_{DS} AND CG_{TDC}

Overall, participants produce Nominative Case correctly: 95.7% correct productions by CG_{DS} and 99.7% correct productions by CG_{TDC}. However, almost all alternative uses of Nominative Case from CG_{DS} are evaluated as incorrect. CG_{TDC} productions of Nominative as an alternative are mostly evaluated as incorrect as well. That is, the targeted environments in which participants used Nominative as an alternative does not facilitate their production.

An *Independent Samples t-test* was conducted to compare the means of Nominative productions from each CG_{DS} participant to the means of Nominative production from the CG_{TDC} group. Results revealed that CG_{DS} did not produced Nominaitve as accurately (M = 0.958, SD = 0.041) as CG_{TDC} (M = 0.997, SD = 0.006), $t(31) = -3.93$, $p = <.001$. The following examples illustrate how CG_{DS} and CG_{TDC} produce nouns, determiners, etc. inflected with Nominative as targeted and as an alternative to another Case value.

(6.32) Nominative Match – Correct: Experiment #1 – Video I (Controlled Elicitation)

(a) *Targeted Utterance*

O	***Nikos***		vlep-i	ton ...
DET.MASC.SG.NOM	***Nikos-MASC.SG.NOM***		*see.IMPF-PRES.3.SG*	*DET.MACS.SG.ACC*
... eafton	tu	na	troi	sokolata.
self-MASC.SG.ACC	*3.MASC.SG.GEN*	*SUBJ*	*eat.IMPF-PRES.3.SG*	*chocolate-FEM.SG.ACC*

'Nikos is looking at himself eating chocolate.'

(b) CG_{DS} *Production (SC)*

O	***Nikos***		vlep-i	to(n) ...
DET.MASC.SG.NOM	***Nikos-MASC.SG.NOM***		*see-IMPF.PRES.3.SG*	*DET.MACS.SG.ACC*
... eafton	tu	pu	t(r)o-i	[θ]okolata.
self-MASC.SG.ACC	*3.MASC.SG.GEN*	*that*	*eat-IMPF.PRES.3.SG*	*chocolate-FEM.SG.ACC*

'Nikos is looking at himself who is eating chocolate.'

(6.32b) shows how the CG_{DS} participant *SC* uses the nominal phrase *o Nik-os* 'the Nikos', serving as the subject of the matrix clause, as targeted. Compare the determiner phrase in the CG_{DS} production with the one found in the target production in (6.32a).

(6.33) Nominative Alternative – Correct: Experiment #2 – Task I (Controlled Elicitation)

(a) *Targeted Utterance*

O	ðik-os	mu	pap-as	me ...
DET.MASC.SG.NOM	*my-MASC.SG.NOM*	*1.SG.GEN*	*father-MASC.SG.NOM*	*with*

... tin	maman	tis	ine	aðerfia.
DET.FEM.SG.ACC	*mother.FEM.SG.ACC*	*1FEM.SG.GEN*	*be.IMPF.PRES.3SG/PL*	*sibling-**NEU**.PL.NOM*

'My father and her mother are siblings.'

(b) *CG_{TDC} Production (AS)*

O	ðik-os	mu	pap-as	ke ...
DET.MASC.SG.NOM	*my-MASC.SG.NOM*	*1.SG.GEN*	*father-MASC.SG.NOM*	*and*

...i	mam-a	tis	ine	aγapimen-i.
DET.FEM.SG.NOM	*mother.FEM.SG.ACC*	*1FEM.SG.GEN*	*be.IMPF.PRES.3SG/PL*	*get.along-**MASC**.PL.NOM*

'My father and her mother get along.'

In example (6.33), the participant used a conjunction for the subject phrase, instead of a preposition and this allowed the use of Nominative Case instead of Accusative. Next, I give an example where a CG_{DS} participant used the Nominative Case as an alternative to the Accusative, but the Nominative production was ungrammatical.

(6.34) <u>Nominative Alternative – Incorrect: Experiment #1 – Video II</u> (Controlled Elicitation)

(a) *Targeted Utterance*

o	*Nikos*	vlep-i	ton	kosm-***o.***
DET.MASC.SG.NOM	*Nikos-MASC.SG.NOM*	*see.IMPF-PRES.3.SG*	*DET.MASC.SG.ACC*	*people-MASC.SG.**ACC***

'Nikos is seeing people.'

(b) *CG_{DS} Production (EA)*

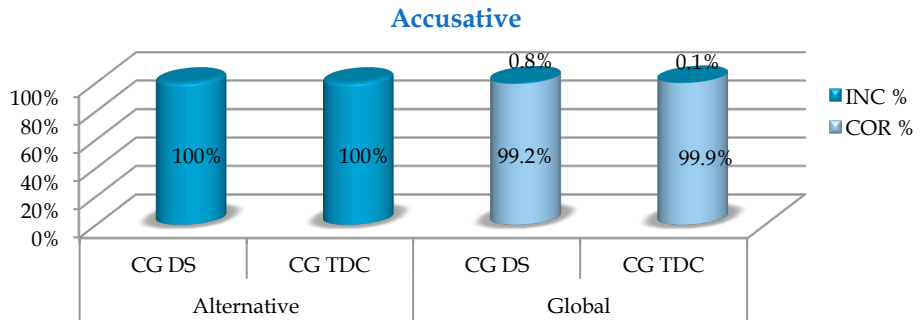
∅	Nik-os	[x]or-i	∅	kosm-***os***.
	Nikos-MASC.SG.NOM	*see.IMPF-PRES.3.SG*		*people-MASC.SG.**NOM***

'Nikos is seeing people.'

In example (6.34b), the CG_{DS} participant *EA* used Nominative in *kosm-os* 'people' instead of Accusative for the nominal phrase *ton kosm-o* 'the people'. This production could potentially be a case where the participant fails to apply subject to object raising.

6.5.2 Productions of the Accusative Feature Value

Accusative is the Case value that is more widely used by both participant groups. As seen in *Table 6.26*, it is also the Case value with the lowest error percentage of alternative use, compared to the other Case values when used as alternatives. In this section, I examine the participants' performance with Accusative, offering a graphic representation of the results, statistical analysis comparing the performance of the two groups with regards to Accusative Case, and examples of correct and incorrect use of Accusative Case. Results show that overall, neither CG_{DS} nor CG_{TDC} have problems inflecting Accusative Case accurately. *Graph 13* illustrates the participants' performance with Accusative when matching and when deviating from the target utterance.



GRAPH 6.13: DISTRIBUTION OF ACCUSATIVE INFLECTION BY CG_{DS} AND CG_{TDC}

The production of nominals inflected with Accusative Case presents the lowest percentage of incorrect use from all feature values examined. The lowest for verbal inflection was 0.5% with the Past-Tense value for CG_{DS}, and 0.1% for Past and 3rd Person for CG_{TDC}. When only considering Accusative as an alternative to other Case values, participants are equally likely to use it incorrectly. The statistical comparision between the two groups was significant, such that CG_{DS} are less likely to produce nominal expression inflected with Accusative (M = 0.995, SD = 0.005) as accurately as CG_{TDC} (M = 0.999, SD = 0.001), $t(31) = -3.16$, $p = .004$. Examples (6.35) and (6.36) show how participants use Accusative as targeted and as an alternative.

(6.35) Accusative Match – Correct: Experiment #1 – Video II (Controlled Elicitation)

(a) *Targeted Utterance*

o	Nik-os	vlep-i	to	s***kil-ak-i.***
DET.MASC.SG.NOM	*Nikos-MASC.SG.NOM*	*see.IMPF-PRES.3.SG*	*DET.NEU.SG.ACC*	***dog-NEU-DIM-SG.ACC***

'Nikos is looking at the little dog/puppy.'

(b) CG_{DS} *Production (AI)*

o	[l]ik-o∅	vlep-i	∅	***[x]kil-ak-i.***
DET.MASC.SG.NOM	*Nikos-MASC.SG.NOM-PH$_I$*	*see.IMPF-PRES.3.SG*		***dog-NEU-DIM-SG.ACC***

'Nikos is seeing little dog.'

Example (6.35b) illustrates that the CG_{DS} participant *AI* inflected Accusative on the nominal *[x]kil-ak-i* 'doggy' as targeted by the target stimulus, but changed the word initial /s/ sound to [x]. This change occurs in the root of the word and does not affect the inflectional features of the nominal. The next example shows how participants used the Accusative Case value as an alternative and their used was evaluated as ungrammatical:

(6.36) Accusative Alternative – Incorrect: Experiment #3 – Task II (Free Elicitation)

(a) *Expected Utterance*

i	ʃokolat-a	lion-i	ta	ðonɟa.
DET-FEM.SG.NOM	*chocolate-FEM.SG.NOM*	*melt.IMPF-PRES.3.SG*	*DET.NEU-ACC-SG*	*tooth-NEU-ACC-SG*

'Chocolate causes tooth decay.'

(b) CG_{DS} *Production (ES)*

ti	ʃokolat-a	lion-i	ta	ðonɟa.
DET-FEM.SG.ACC	*chocolate-FEM.SG.NOM*	*melt.IMPF-PRES.3.SG*	*DET.NEU-ACC-SG*	*tooth-NEU-ACC-SG*

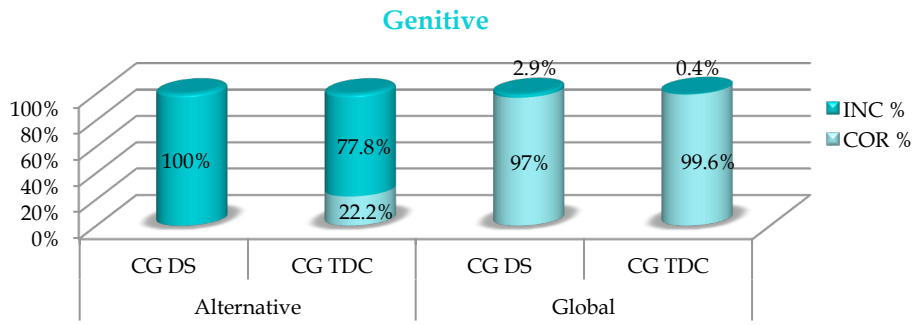
'Chocolate causes tooth decay.'

Instead of the expected Feminine-Nominative determiner *i* shown in (6.36a) the participant uses *ti*, inflected with Accusative in (6.36b). There were no grammatical instances of Accusative used as an alternative.

In sum, both CG_{DS} and CG_{TDC} inflect the Accusative Case value in almost the same way as adult CG_{TD}. Their attempts to use it as an alternative to other Case values are always incorrect. Inflection on nominal phrases in Eng_{DS} – apart from Plural, possessive *'s* and comparative-superlative – has not previously been studied.

6.5.3 Productions of the Genitive Feature Value

Participants are accurate in their overall use of the Genitive Case, though almost all attempts to use Genitive as an alternative are incorrect. *Graph 14* presents the participants' use of Genitive.



GRAPH 6.14: DISTRIBUTION OF GENITIVE INFLECTION BY CG_{DS} AND CG_{TDC}

Results show that participants use Genitive with high accuracy: CG_{DS} are 97.1% accurate, while CG_{TDC} are 99.6% accurate. Almost all uses of Genitive as an alternative to the other three Cases are incorrect. Statistical comparison of the two groups revealed a significant result with the Genitive Case value. Namely, CG_{DS} do not produce correct productions of nominal expressions inflected with Gentive ($M = 0.972$, $SD = 0.035$) as frequently as CG_{TDC} ($M = 0.996$, $SD = 0.008$), $t(31) = -2.73$, $p = .010$. This is yet another instance where CG_{DS} and CG_{TDC} are not found to have identical performance, with regards to the correct use of a given feature value. Next, I give examples to demonstrate Genitive productions in certain contexts by CG_{DS} and CG_{TDC}.

(6.37) Genitive Match – Correct: Experiment #1 – Video III (Controlled Elicitation)

(a) *Targeted Utterance*

extes ti nixt-a en-as andr-as ...
last.night DET.FEM.SG.ACC *night*-FEM.SG.ACC *one*-MASC.SG.NOM *man*-MASC.SG.NOM

... e-fkal-en to pukamis-on
PAST-*take.off*.PRF-PAST.3.SG DET.NEU.SG.ACC *shirt*-NEU.SG.ACC

... ***tu*** ***all-u*** ***andr-a*** ke tu ...
DET.MASC.SG.GEN ***other*-MASC.SG.GEN** ***man*-MASC.SG.GEN** *and* 3.MASC.SG.GEN

... to travus-e.
3.NEU.SG.ACC *pull*.IMPF-PAST.3.SG

'Last night a man took off the other man's shirt and he was pulling it.'

(b) CG_{DS} *Production (MH)*

ex # exte∅ ti nixt-a, e-fkal-en ...
FS *last.night* DET.FEM.SG.ACC *night*-FEM.SG.ACC PAST-*take.off*.PRF-PAST.3.SG

to pukamis-on tu-: ***tu*** all-***u***
DET.NEU.SG.ACC *shirt*-NEU.SG.ACC DET.NEU.SG.GEN DET.NEU.SG.**GEN** *other*-NEU.SG.**GEN**

... ***tu*** peθk-***iu*** tze max-unde pez-u.
DET.NEU.SG.GEN ***guy*-NEU.SG.GEN** *and* *try*.IMPF-PRES.3.PL *play*.IMPF-PRES.3.PL

'Last night s/he took off the other guy's shirt and they are playing around.'

In example (6.37b) the participant *MH* inflected the targeted feature Genitive on the produced nominal phrase. Moreover, in the nominal phrase produced ***tu*** *all*-***u*** ***tu*** *peθk*-***iu*** 'the other guy's', she used a different root, which inherently carries Neuter Gender, instead of the targeted Masculine. This however, does not result in ungrammaticality. The following example illustrates the way a CG_{TDC} participant correctly uses Genitive as an alternative to Accusative.

(6.38) Genitive Alternative – Correct: Experiment #2 – Task I (Controlled Elicitation)

(a) *Targeted Utterance*

i	Mari-a	en	na	ðoki ...
DET.FEM.SG.NOM	*Maria-FEM.SG.NOM*	*be-IMPF-PRES.3.SG/PL*	*SUBJ*	*give-PRF-DEP.3.SG*

... tis	kukl-es	tis	s-tin	aðerf-in	tis.
DET.FEM.PL.ACC	*doll-FEM.PL.ACC*	*3.SG.GEN*	*to-DET.FEM.SG.ACC*	*sister.FEM.SG.ACC*	*1FEM.SG.GEN*

'Maria is going to give her dolls to her sister.'

(b) CG_{TDC} *Production (MT)*

i	Mari-a	en	na	∅oki ...
DET.FEM.SG.NOM	*Maria-FEM.SG.NOM*	*be-IMPF-PRES.3.SG/PL*	*SUBJ*	*give-PRF-DEP.3.SG*

... tis	kukl-es	∅	***tis***	***aðerf-is***.
DET.FEM.PL.ACC	*doll-FEM.PL.ACC*		*DET.FEM.SG.GEN*	*sister.FEM.SG.GEN*

'Maria is going to give the dolls to her sister.'

(6.38) is the only example in which Genitive is found to be used as an alternative correctly. The CG_{TDC} participant uses a determiner phrase *tis aðerf-is* inflected with Genitive, instead of a prepositional phrase inflected with Accusative. The utterance was evaluated as grammatical because both options are equally available in CG. However, this is an alternative use of Genitive because the experimental task necessitated the repetition of a prepositional phrase in Accusative.

(6.39) Genitive Alternative – Incorrect: Experiment #4 – Task II (Free Elicitation)

(a) *Targeted Utterance*

Par-e	***to***	mikrofon-o.
take.PRF-IMP.2.SG	*DET.NEU.SG.ACC*	*microphone-NEU.ACC.SG*

'Take the microphone.'

(b) CG_{TDC} *Production (SO)*

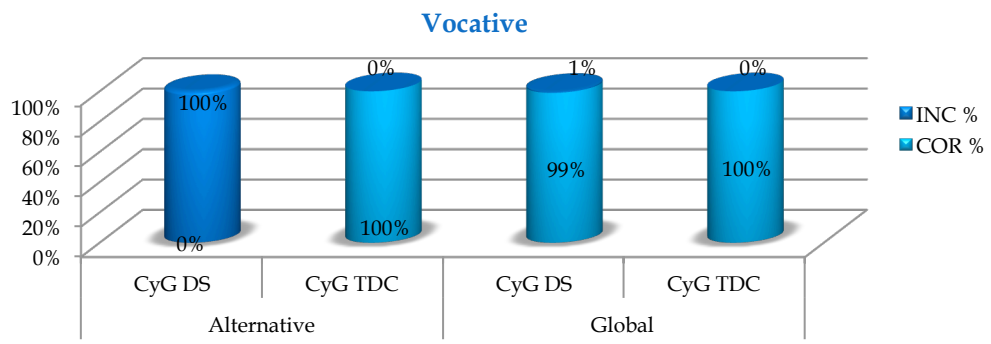
Pa[l]-e	***tu***	mikrofon-o.
take.PRF-IMP.2.SG	*DET.NEU.SG.GEN*	*microphone-NEU.ACC.SG*

'Take the microphone.'

In (6.39b), the CG_{TDC} participant *SO* does not use Accusative Case as expected in the specific structure. She inflects the determiner with Genitive Case instead, resulting to the production *tu*. The participant however, inflects the noun *mikrofon-o* 'microphone', accompanying the determiner, correctly with an Accusative suffix.

6.5.4 Productions of the Vocative Feature Value

Vocative is the Case used in direct speech to identify the addressee. Vocative is never accompanied by a determiner. Apart from Masculine nouns belonging to the first inflectional paradigm ending in *–os* (Masculine), Vocative has the same phonetic realisation as the Accusative in all other inflectional paradigms. That is, Vocative exhibits a relatively high degree of syncretism. *Graph 15* illustrates the participants' performance with Vocative Case.



GRAPH 6.15: DISTRIBUTION OF VOCATIVE INFLECTION BY CG_{DS} AND CG_{TDC}

Once again both participants' performance with Vocative is at ceiling: 99% for CG_{DS} and 100% for CG_{TDC}. There is only one instance of Vocative being used as an alternative by CG_{DS} and it surfaces as ungrammatical, based on the context it is produced in. overall correct mean productions of Vocative by the two groups revealed that CG_{DS} produce Vocative on nominals as accurately (M =0.984, SD = 0.63) as CG_{TDC} (M = 1.000 SD = 0.000), $t(31) = -1.03$, $p = .310$.

Due to the fact that there is only one incorrect use of Vocative by only one of the two groups, statistical comparison is not possible. Example (6.40) illustrates how Vocative Case is used exactly as targeted. In the final example for this section, I give the sole alternative use of Vocative Case.

(6.40) Vocative Match – Correct: Experiment #4 – Task I (Free Elicitation)

(a) *Targeted Utterance*

uh ***panai-a*** mu. En mor-a akoma.

holy.Mary-FEM.SG.VOC *1.SG.GEN* *be.IMPF.PRES.3.SG/PL* *baby-NEU.PL.NOM* *still*

'Oh my holy Mary, they're still babies.'

(b) *CG_{DS} Production (MH)*

uh ***panai-a*** mu. En mor-a akoma.

holy.Mary-FEM.SG.VOC *1.SG.GEN* *be.IMPF.PRES.3.SG/PL* *baby-NEU.PL.NOM* *still*

'Oh holy Mary, they're still babies.'

In (6.40), *MH* produces the nominal *panai-a* 'holy Mary' exactly as one would expect it to be used in adult CG_{TD} speech with no phonetic or morpho-syntactic differences.

(6.41) Vocative Alternative – Incorrect: Experiment #2 – Task I (Controlled Elicitation)

(a) *Targeted Utterance*

θor-is tzin-on to ***psil-on*** anθrop-o?

see.IMPF-PRES.2.SG *that-MASC.SG.ACC* *DET.MASC.SG.ACC* *tall-MASC.SG.ACC* *human-MASC.SG.NOM*

en/ine o andr-as mu.

be.IMPF.PAST.3.SG/PL *DET.MASC.SG.NOM* *man-MASC.SG.NOM* *1.SG.GEN*

'Do you see that tall man? He's my husband.'

(b) *CG_{DS} Production (SC)*

∅ ∅ ∅ ***psil-e*** *aft-o∅* *to∅* anθropo?

tall-MASC.SG.VOC *DEM-MASC.SG.ACC* *DET.MASC.SG.ACC* *human-MASC.SG.NOM*

∅	o	andr-a[x]	mu.
	DET.MASC.SG.NOM	*man-MASC.SG.NOM*	*1.SG.GEN*

'Tall, that man? My husband.'

In this final example, the participant *SC* does not use the targeted Accusative Case for the adjective *psil-on* 'tall' but instead she inflects it with Vocative, hence producing the form *psil-e* 'tall'. The demonstrative *aft-o∅*, determiner *to∅* and noun *anθrop-o* in the same nominal phrase however, are all inflected with Accusative, as targeted. They are however, lacking a final /n/, which due to a phonological rule, should not be deleted from this environment in adult CG_{TD}.

6.5.5 Summary

We have established that there is only a small percentage of incorrect use of the four Case values when participants use any of the values as alternatives. Hence, both groups mark Case inflection almost as accurately as adult CG_{TD}. The omission percentages of nouns, determiners, adjectives, and other words found in nominal phrases is higher than that of verbal omissions but not as high as the percentage of copula and auxiliary omissions. However, we observed some isolated problems with Case, especially with Nominative and Genitive, when used as alternatives.

For the remainder of this chapter, I provide (i) a brief overview of the results, (ii) a comparison between CG_{DS} and CG_{TDC}, and (iii) the significance of the results in evaluating whether the differences observed between the CG_{DS}, CG_{TDC}, and CG_{TD} Grammar are phonetic, phonologically, morphologically or syntactically conditioned. More discussion as well as a proposal for a unified analysis follows in *Chapter 7*.

6.6 OVERALL DISCUSSION AND COMPARISON OF CG_{DS} AND CG_{TDC}

The goal of *Chapter 6* was to determine whether (i) CG_{DS} have a general problem with morpho-syntax (as it has been argued for Eng_{DS} (*IIH*)), and (ii) whether specific inflectional features are proven to be challenging for CG_{DS} (in case an overall inflectional impairment is not observed).

An additional goal of this chapter was to compare the performance of CG_{DS} and CG_{TDC} and determine whether adult CG_{DS} exhibit similar performance to CG_{TDC} at or past the last stage of language acquisition. In *Chapter 5*, I established that the greater number differences found between the two groups as phonetic and phonologically conditioned. I also showed that there were a number of differences that were not phonetically or phonologically conditioned. Along with an overall presentation of results on morpho-syntactic features, these differences between the two groups and CG_{TD} were examined in this chapter and were categorised under the relevant feature. What remains is to determine whether the remaining differences observed in the results throughout this chapter are morphologically or syntactically conditioned.

I start with a summary of the overall results where the participants' performance with the four features can be compared. First, in *Sections 6.2* through *6.5* we observed that both CG_{DS} and CG_{TDC} exhibited high accuracy with all four inflectional features, as summarised in *Table 6.29*.

	CG_{DS}					**CG_{TDC}**				
	Match	*Alternative*			*Global*	*Match*	*Alternative*			*Global*
Verbs	*COR*	*COR*	*INC*	*INC%*	*INC%*	*COR*	*COR*	*INC*	*INC%*	*INC%*
Tense	3,372	310	164	34.6%	4.3%	3,874	187	97	34.2%	2.3%
Person	3,710	87	46	34.6%	1.2%	4,120	44	9	17%	0.2%
Number	3,730	76	35	31.5%	0.9%	4,063	45	17	27.4%	0.4%
Affix Drop	74				1.9%	33				0.8%
Case	9,715	16	241	93.8%	2.4%	12,946	6	31	83.8%	0.2%
Affix Drop	143				1.4%	77				0.6%

TABLE 6.29: DISTRIBUTION OF OVERALL PERFORMANCE PER FEATURE BY CG_{DS} AND CG_{TDC}

The vast majority of utterances match the target, suggesting no major problems with the use of the three inflectional domains. These results are consistent with Schaner-Wolles (2004) who reports 98% accuracy for *S/V* agreement by Ger_{DS}. Considering previous studies on Eng_{DS}, these results appear surprising. Clearly, 95% to 99% accuracy by CG_{DS} does not suggest an (overall) inflectional impairment. The feature with the least matches is Tense for both groups, while the feature with the most matches is Number for CG_{DS} and Person and Case for CG_{TDC}.

Apart from the instances where the production matched the target, three other options are observed: (i) the use of alternative feature values instead of the targeted ones, resulting to either a grammatical or ungrammatical production, (ii) the inflectional suffix is entirely omitted or, (iii) the entire word is omitted. For the use of alternatives, the *first strategy* used when a production dos not much the target, we observe a very low percentage of incorrect use when considering the overall performance of the participants with each feature. Once again, Tense presents the highest percentage of incorrect uses, but still low, at 4.3% for CG_{DS} and 2.3% for CG_{TDC}. Both participant groups' performance with *S/V* agreement (Person and Number) is almost at ceiling,. The same is true for Case. It was shown with examples throughout this chapter that at times the context facilitates the use of the alternative feature value. With the overall feature of Tense on verbs, the two participant groups differ significantly in their overall use of Number, Person, and Case, but not Tense. Concerning individual feature values on verbs, I found non-significant differences with Present, Past, Imperative, 1st Person, and Singular for verbs, and Vocative for nominal expressions. Notice that for both affix drop and alternative feature value, CG_{DS} present higher percentages than CG_{TDC}. *Table 6.29* shows that, based on the overall total of all feature value productions. This *second strategy* does not exceed 2% for CG_{DS} and 1% for CG_{TDC}. These percentages are much lower than the percentages of affix drop reported for Eng_{DS}.

We observed in *Sections 6.2* through *6.5* that participants sometimes omit full words (*third strategy*). In particular, participants omit nominals, determiners, adjectives, etc. more frequently than verbs. Note, however, that omission is not specific to words that receive inflectional marking. Percentages for non-inflected (conjunctions, adverbs, negation markers,etc.) word omission for CG_{DS} are almost parallel to words targeted with Case but twice as high as verb omissions. Omission rates for copulas and auxiliaries are high, with the auxiliary evidencing an omission rate at 60% for CG_{DS} and at 18% for CG_{TDC}. When all inflectional categories are considered, the percentage of omission for inflectional words is lower than for non-inflectional for CG_{DS}, but higher for CG_{TDC}. *Table 6.30* summarises results on the omission of full words.

	CG_{DS}			CG_{TDC}		
	N	∅	%	N	∅	%
Verb	4,096	158	3.8%	4,228	22	0.5%
Copula	455	121	26.6%	557	6	1.07%
Auxiliary	189	112	59.9%	104	19	18.1%
N, DET, ADJ	10,946	783	7.2%	13,249	147	1%
Inlfectional	15,686	1,174	7.48%	18,138	194	1.07%
Non-Infl	6,317	502	7.9%	6,071	51	0.8%

TABLE 6.30: DISTRIBUTION OF VERBAL, COPULA AND AUXILIARY OMISSION BY CG_{DS} AND CG_{TDC}

In general, CG_{DS} participants, as opposed to CG_{TDC} participants, tend to omit a full verb or a nominal or the expected/targeted inflection rather than producing it incorrectly. Therefore, the omission percentages for each domain for CG_{DS} are higher than the incorrect percentages for each value. This is not true for CG_{TDC}, who typically have higher error rates than omission rates. The same is also true for copulas and auxiliaries. Both CG_{DS} and CG_{TDC} rarely produce incorrect auxiliary or copula forms – only one occurrence of incorrect copula use is recorded – but they do tend to omit them quite frequently. As shown in *Table 6.30*, participants do tend to omit both copulas and auxiliaries frequently. However, it also shows that both groups tend to omit inflected and non-inflected words equally. Therefore, omission of verbs and nouns, determiners, etc, is not restricted to nflected words and–therefore cannot, be explained through the *IIH* (i.e.

overall inflectional impairment), as part of an overall inflectional impairment. This is discussed in more detail in *Chapter 7*. We do also observe instances of root omission with CG_{DS}. These presented a very low percentage of 0.2% (see *Section 6.2.1*). This can also not be accounted for by the *IIH*, reducing to *EOI*. Therefore, since no inflectional features are affected with root omission, this may suggest a problem with vocabulary insertion. Therefore, the difficulties observed with the productions of CG_{DS} and CG_{TDC} do not seem to be syntactically conditioned.

Throughout *Chapter 6* we have sometimes seen parallel performance of CG_{DS} and CG_{TDC}, such that both groups can use inflectional features as targeted or expected, but they also employ the same alternative techniques when they do not produce a form as targeted or expected. Thus, while the methods employed by the two groups are the same, we cannot argue that the CG_{DS} Grammar is a delayed version of the CG_{TD} Grammar. Contrasting evidence to a delyed version of the CG_{TD} Grammar come primarily from the articulatory and phonological restrictions CG_{DS} are facing. In *Chapter 5* I established that, similarly to results from phonological studies on Eng_{DS}, CG_{DS}, face phonetic and phonological restrictions associated with *DS*, particularly with the production of lingual sounds. At first glance, some omission and substitution cases appear to be syntactically conditioned because they appear to affect the inflectional features marked on verbs or nouns, adjectives, determiners etc. However, further analysis determined the majority of these omissions and substitutions are phonetically and phonologically conditioned. Despite the fact that *TDC* at a younger age exhibit a great number of these omissions and substitutions, the CG_{TDC} participants aged 7 to 8 show only minimal issues with phonological processes and they certainly do not present any articulation restrictions.[90] It should also be noted that CG_{DS} make use of phonemes that are part of neither the CG nor the SG Phonetic Alphabet, like the lateral

[90] With the exception of a single participant who had a cleft palate.

fricative [ɬ]. Furthermore, statistical comparison on morpho-syntactic features also supports that the two groups have similar but not identical use of inflectional features, as CG_{DS} and CG_{TDC} performance is statistically non-significant only with the overall use of Tense, though for most individual feature values inflected on verbs the two groups presented similar performance.

In summary, throughout this chapter I presented evidence that is inconsistent with the *IIH*, such that an overall inflectional impairment is not supported by the results of this study. I have shown that participants use Tense, *S/V* agreement and Case quite successfully, though they sometimes use an alternative feature value than the one targeted. Alternative values can be correct or incorrect depending on the surrounding structure and the targeted feature value.

It is observed that for each feature there is a value that is more frequently used as an alternative to other values of the same feature. I consider these to be the default value for each inflectional feature. Extensive discussion on this follows in *Chapter 7*. *Table 6.31* below summarises how often each default feature is used as an alternative by CG_{DS} and CG_{TDC}. The 2nd column shows the value that acts as the default for each feature. In the 3rd and 4th column show the number and proportion of tokens in which this default value is used. The proportion is based on the sum of all alternative uses found with each feature; for example, of the 422 times that a form does not match the targeted Tense, the CG_{DS} participants' choose Present as an alternative 336 times. The 4th and 5th columns show the number and percentage a default form is used, based on the overall use of the feature value. For example, there are 2,262 productions of Present by CG_{TDC}, out of which in 216 instances Present is used as an alternative. The final two columns show the participants' overall use of the feature: CG_{DS} use Tense (any value) 3,796, while for CG_{TDC} I recorded 4,121 Tense productions.

Verbs		N of defaults/ overall use of alt		N of default / φ use		Overall φ use	
Feature	Default	CG_{DS}	CG_{TDC}	CG_{DS}	CG_{TDC}	CG_{DS}	CG_{TDC}
Tense	Present	336/422	216/247	336/2,396	216/2,262	3,796	4,121
		79.6%	87.4%	14%	9.5%		
Person on Verbs	3rd	49/98	10/21	49/2,323	10/2,466	3,808	4,141
		50%	47.6%	2.1%	0.4%		
Number on Verbs	SG	60/71	23/27	60/2980	23/2965	3,801	4,090
		84.5%	85.2%	2.0%	0.8%		
Case	NOM	190/256	20/38	190/3,439	20/4,428	9,972	12,983
		73.9%	51.3%	5.5%	0.5%		

TABLE 6.31: DEFAULT USE OF VERBAL TENSE, *S/V* AGREEMENT AND CASE BY CG_{DS} AND CG_{TDC}

Percentages show that both groups use the same designated feature values as an alternative to other feature values at a higher percentage than any other value (except CG_{TDC} for Person on verbs). We also observe that the percentages of the specific value being used as an alternative, based on all alternative uses, are very similar for both groups; for example, CG_{TDC} use Present as an alternative to the targeted form 87.4% of the time. CG_{DS} use Present as an alternative to the targeted form 79.6% of the time. Gerund suffix productions were excluded. For a table that considers Gerund in the calculations, see *Appendix D*. I performed two different analyses including and excluding cases where a Gerund inflection was targeted, but participants used a Tense-Person-Number inflection instead. I excluded these because they had an effect on the results, as Gerund is not one of the four Tense values examined in this Dissertation, and does not carry any inflectional features. Finally, we see more defaults being used for Tense for each group, than Number and Person agreement on verbs and Case on determiners, nouns, adjectives etc. The use of 3rd Person as the favoured alternative Person value on verbs is lower than for other features due to the effects described in *Sections 5.3.2* and *6.4.2*, where participants change the reference of an experimental stimulus from 1st to 2nd Person and vice versa.

As a final point, it should also be noted that testing a great number of data in a variety of environments with two elicitation methods has been proven quite beneficial since that enabled

me to control for any factors which might have affected results like restricted sentence structures, experimental methods inflectional paradigms, lexical categories, etc. In particular, the use of a variety of both controlled and free elicitation tasks was proven essential since participants used longer continuous sentences in free elicitation, with no pauses, but more complex structures in controlled elicitation. This played a critical role in determining whether CG_{DS} exhibit a syntactic impairment, like Ring and Clahsen (2005) suggest, by proposing that Eng_{DS} exhibit the same problems observed during the *EOI* stage.

I observed that some structures were not readily used by CG_{DS} in controlled elicitation, especially the use of Subjunctive in *Experiment #1, Video I*. However, these very structures were very "naturally occurring" in free elicitation. Compare the two examples below; (6.42) is (.612) (*Free Elicitation: Experiment #3 – Task II*) and (6.42) is (6.2) (*Controlled Elicitation: Experiment #1 – Video I*), repeated for convenience:

(6.42) k' istera ∅n na ***skola-s-u-me***.
and later be.IMPF.PRES.3SG/PL ***SUBJ*** ***get.off-PRF-DEP-1.PL***
'And then we'll get off school.' *CG_{DS} Production (SS)*

(6.43) ***O*** ***Nik-os*** xo∅-i ...
DET.MASC.SG.NOM ***Nikos-MASC.SG.NOM*** *see.IMPF-PRES.3.SG*
... pu tro-i sokolat-a.
that eat.IMPF-PRES.3.SG chocolate-FEM.SG.ACC
'Nikos is looking at himself eating chocolate.' *CG_{DS} Production (AI)*

In (6.42), the participant produced a Subjunctive clause to talk about his daily routine. In (6.43), while the target was a Subjunctive subordinate clause, the participant produced a relative clause in its place, using the reduced relative pronoun *pu*. Had the study only conducted experiments with controlled elicitation tasks, we would have inevitably concluded that CG_{DS} have a problem

forming Subjunctive structures. In general, the participants' performance with Tense, *S/V* agreement and Case presents differences across the numerous experimental tasks.

Both participant groups presented their highest percentages of incorrect Tense production with *Experiment #1*. As expected from the results reported in this chapter, the highest percentage of incorrect use for Present Tense, when used as an alternative was observed with *Experiment #1-Video III* (4.82% for CG_{DS} and 3.73% for CG_{TDC})[91], where participants needed to produce verbs with Past Tense inflection, based on visual stimuli. The same is also true for the Dependent Tense value. Moreover, the highest percentages for Nominative Case evaluated as incorrect for CG_{DS} were recorded with *Experiment #1, Video II* (0.86%), *Experiment #2 Task I* (0.9%), and *Experiment #3* (0.4% for each task). Additionally, the highest percentages of incorrect (2nd) Person use for CG_{DS} were found in *Experiment #2* (1.2% for *Task I* and 0.5% for *Task II*). The same was also true for CG_{TDC} but for 1st Person: 0.3% for *Task I* and 0.2% for *Task II*. Finally, with regards to Number inflectional marking, participants exhibit their highest percentages of incorrect Singular use with *Experiment #2 Task I* (0.5% for CG_{DS} and 0.3% for CG_{TDC}). Remaining percentages were mostly spread evenly across the four experiments. Overall, participants presented their highest percentages of incorrect use with stimulus production and imitation production tasks. However, a wide spread across the nine experimental tasks was observed, confirming the importance of applying a variery of numerous, diverse methods of data collection. Detailed tables summarising the participants' performance across the nine experimental tasks, can be found in *Appendix D*.

[91] Note that the percentages of incorrect use given here reflect a fraction of the overall percentage of incorrect use for each feature value given in *Tables 6.5* to *6.29*.

Having established that results do not support (i) an overall inflectional impairment of the CG_{DS} morpho-syntactic system/Grammar, or (b) a delayed version of the CG_{TDC} Grammar (with major differences between the CG_{DS} and CG_{TDC} Grammar), I pursue a unified, alternative analysis in *Chapter 7*. First, I discuss why an overall impairment analysis (*IIH*) and a syntactically conditioned impairment analysis (*IIH* reducing to *EOI*, initially proposed for Eng_{SLI}) cannot account for the results on CG_{DS} and CG_{TDC}. I propose a unified analysis in progress, based on the use of alternative feature values, which can account for all the morphologically, phonetically, and phonologically conditioned differences (including full-word omissions), and can best explain the results presented in this thesis. I argue that the alternative values employed by the participants when the target is not met, are either universal or language-specific defaults, which become available to CG_{DS} and CG_{TDC} participants due to failure of the *Blocking* mechanism (and its more refined version, the *Subset Principle*) to apply during *Spell Out*. This, results in the failure of the competition between the most specified form, and an underspecified form to be resolved in favour of the former one.

I conclude with three important points, based on the results presented in *Chapters 5* and *6*. First, overall inflectional impairment is not supported by the results not only because of the high percentages of accuracy with all features examined, but also due to the low percentages of affix drop for both verbs and nouns. Second, phonological and phonetic challenges can indeed affect the data in a misleading way, but when acknowledged and isolated, we observe a more accurate, objective, and comprehensive representation of the CG_{DS} Grammar. Third, the consistency of use with regards to alternative values and substituting consonants, imply a structured system governing the use of alternative feature value and substituting consonants.

Chapter 7

Discussion and Theoretical Analysis

7.1 INTRODUCTION

Prior research on individuals diagnosed with Down Syndrome has shown that there are differences between the speech of Eng_{DS} and Eng_{TDC}:

(i) phonological studies report differences in the production of sounds,

(ii) morpho-syntactic studies report differences in the realisation of inflectional marking.

I refer to the latter as the Inflectional Impairment Hypothesis (*IIH*).

No research, which studies both and investigates the effects of one domain onto the other, is currently available. Hence, could differences reported by phonological studies be reduced to the differences reported in the morpho-syntax of the *DS* Grammar, or reversely, could differences observed with morpho-syntactic marking be reduced to differences in phonetics and phonology?

I evaluate three hypotheses to determine what conditions the differences between CG_{DS} adults and 7- to 8-year old CG_{TDC}:

I. The differences in the production of the inflectional system are morphologically conditioned

II. The differences in the production of the inflectional system are syntactically conditioned

III. The differences between CG_{DS} and CG_{TDC} are phonetically and phonologically conditioned.

Naturally, the possibility remains that the differences are conditioned by a combination of the aforementioned factors.

In *Chapter 2*, I concluded that the three hypotheses cannot be evaluated based on previous studies because a number of empirical, methodological and analytical shortcomings arise. These shortcomings are addressed in *Chapters 3* through *6*. Therefore, with the study of Cypriot Greek, an innovative methodology and the consideration of additional factors in relation, and external to morpho-syntax these three hypotheses can now be properly evaluated.

This chapter is organised as follows: in *Section 7.2*, I evaluate the three hypotheses outlined above, based on the results reported in *Chapters 5* and *6*. I conclude that the majority of the differences observed between CG_{DS}, CG_{TDC} and CG_{TD} Grammar are phonetically conditioned. That is, the differences arise due to articulatory restrictions imposed by differences in the articulation apparatus. Moreover, I maintain that a small percentage of the differences are phonologically conditioned: (i) based on the phonological environment, and (ii) the use of default/underspecified sounds. I argue that, the residue of differences, not falling under either of the two categories above, are morphologically conditioned. Specifically, participants make use of default/underspecified morpho-syntactic features. I conclude that this leaves us with three questions: (i) what is responsible for the use of default sounds and default features? (ii) what does the residue of differences tell us about the CG_{DS} Grammar and its interfaces (i.e., articulatory restrictions and vocabulary insertion), and (iii) what does it tell us about UG? In *Section 7.3*, I develop a unified analysis for the observed pattern to account for the default features, affix omissions, and full-word omissions. I start with an account on the morpho-

syntactic features, where I argue that it can be understood as the result of a failure of *Blocking*. *Blocking* is argued to be a filtering device, which does not apply during the process of a derivation, but rather concerns the output generated from a derivation (Wunderlich, 1996). I start by using a more refined version of *Blocking*, namely the *Subset Principle*, and then generalise. I then show that under this analysis we can also explain the use of default sounds. Finally, I discuss affix drop and full word omissions and potential alternative analyses. In *Section 7.4*, I conclude and discuss some implications of the findings, as well as avenues of further research.

7.2 THE DIFFERENCES BETWEEN CG_{DS} AND CG_{TDC} ARE PHONETICALLY, PHONOLOGICALLY, AND MORPHOLOGICALLY CONDITIONED

The results from a morpho-syntactic, phonetic and phonological analysis do not support the hypothesis that inflection is impaired (i.e., *IIH*). If we control for articulatory restrictions, 95% of overall word production (and up to 99% of feature value use) are correct. Hence, there is a 5% residue of incorrect productions. As I have shown however, there is a systematic pattern to these incorrect productions: if the target is not met, then a default form is used.

In this section, I examine whether the recorded differences between the CG_{DS}, CG_{TDC}, and the CG_{TD} Grammar are (i) syntactically, (ii) phonetically and phonologically, (iii) morphologically conditioned. I evaluate the three hypotheses summarised in *Section 7.1*. Concerning the first hypothesis, I already established, at the end of *Chapter 5*, that a large number of production differences between CG_{DS} and CG_{TDC} are phonetically and phonologically conditioned. I briefly summarise those results in *Section 7.2.1*. However, it was determined that there was a small

residue of issues that cannot be categorised as phonetically or phonologically conditioned. The question remains whether this residue is syntactically or morphologically conditioned.

7.2.1 Differences are mainly Phonetically and Phonologically Conditioned

The Phonetic and Phonological analysis reported in *Chapter 5* provides evidence for phonetically and phonologically conditioned differences between the CG_{DS} and the CG_{TDC} (and CG_{TD}) Grammars. I suggest that these are due to articulatory restrictions imposed by the physiology of CG_{DS} participants and issues with their phonological system, relative to the phonological environment. Here, I briefly summarise the most important results.

Evidence in favour of this hypothesis comes from consistent omissions and consonant substitutions. Concerning ***phonetically conditioned*** differences resulting from articulatory restrictions, we find that CG_{DS} (and CG_{TDC} to a lesser extent) omit /s/ and /n/ in different word positions, and equally in words which either do or do not receive inflection. Second, a number of other consonants, not found in inflectional marking, also appear problematic due to articulatory restrictions, especially /ɾ/, /ð/, and /l/, which involve the tip of the tongue.

Phonologically conditioned differences between the CG_{DS} and the CG_{TDC} Grammar result in two major phenomena that involve consonant omissions and substitutions. First, in terms of the phonological environment, consonant clusters appear challenging for CG_{DS}, who often resolve to cluster reduction via consonant omission. Second, the majority of consonant substitutions do not fall under a number of phonologically triggered processes like consonant assimilation, feature spreading, consonant harmony, voicing and devoicing, of which we observe only a few instances. I report that a number of consonants are substituted by another consonant with which

they share the same manner of articulation and voicing. In particular, participants tend to produce [t] instead of /p/ and /k/, or [x] instead of other fricatives like /s/, /f/ and /θ/. It should be noted that these substitutions were observed in many diverse environments: inter-vocalically, in a consonant cluster as first or second consonant, word-initially, word-medially or word-finally.

All aforementioned phonetic and phonological phenomena, regardless of occasional accidental effects on morpho-syntactic features, are systematic within and across participant groups, with the control group CG_{TDC} exhibiting these phenomena at much lower rates. For a more detailed discussion, see *Chapter 5*, *Section 5.5*.

7.2.2 Differences are not Syntactically Conditioned

In order to determine if the residue of the differences between CG_{DS} and the CG_{TDC} (and CG_{TD}) Grammars are morphologically conditioned we need to study the distribution of the differences across the four features, and examine if effects in feature differences are localised (morphological) or present bundling effects with morpho-syntactic features, spreading across different, morpho-syntactically related, features (syntactic).

According to Optional Infinitive Hypothesis (*OI*) and its extended version *EOI* (initially proposed for Eng_{SLI}), underspecification of inflectional features occurs due to the optionality of functional projections. Therefore, underspecification is perceived as a syntactically conditioned phenomenon. Ring and Clahsen (2005) propose that *EOI* can adequately explain not only the Tense differences observed between Eng_{DS} and Eng_{TDC}, but it can be further extended to other functional categories, such as Number and Degree (comparative/superlative), suggesting that these features can also be underspecified. Even though they do not explicitly state the nature

(morphological or syntactic) of the differences between the two groups, with this proposition they are committing to a proposal according to which the differences are syntactically conditioned. However, all evidence points against syntactically conditioned differences between the CG_{DS} and the CG_{TD} Grammar. I first summarise the facts rejecting syntactically conditioned differences. I then discuss each in turn.

The residue of differences between CG_{DS} and the CG_{TD} Grammar that are not phonetically and phonologically conditioned, are also not syntactically conditioned because of the following facts:

(i) Omission of inflectional suffixes is found at percentages lower than 2%
(ii) Tense and Case are fully acquired, and incorrect use of one rarely coincides with incorrect use of the other (less than 5% overlap of incorrect use)
(iii) Tense and *S/V* agreement are rarely used incorrectly independently, and in relation to one another
(iv) Grammatical re-organisation of certain structures implies good command of Grammar
(v) Use of inflectional suffix as an alternative to one which marks neither Tense nor *S/V* agreement (i.e. Gerund)
(vi) Accurate use of the Subjunctive marker *na*
(vii) Absence of bundling effects with inflectional features used inaccurately
(viii) Absence of consistency in inflectional feature change when final /s/ is omitted
(ix) Correct use of the determiner inflection when final /s/ is dropped on nouns
(x) Full-word omissions point towards a problem with vocabulary insertion, occurring after the syntactic derivation is completed.

First, results in *Chapter 6* show that affix drop by CG_{DS}, the major claim used by previous research suggesting syntactically conditioned differences, occurs at very low percentages for both verbs and nouns: 1.9% for verbs and 1.4% for nouns. If the residue of differences between the two groups were syntactically conditioned, we would expect higher percentages of affix drop

because a bundling effect would cause the omission of other features in the bundle. Clearly, this is not the case for CG_{DS}.

Second, it has been argued that for Indo-European languages, Tense and Case are closely related, such that in the absence of Tense inflection, nominal subjects cannot be overt (Vergnaud 1982). Therefore, in the case of an impaired Tense head we might expect problems with Case assignment, and consequently we might expect the absence of a subject inflected with Nominative Case. However, this is not manifested in the CG_{DS} or CG_{TDC} productions. Regardless of whether Tense inflection is produced as targeted, or whether the default value is used instead, CG_{DS} and CG_{TDC} *do* mark Nominative Case on an overt subject successfully, at rates higher than 95%. Crucially, the use of the incorrect Case value does not correlate with the use of the incorrect Tense value. From approximately 28,800 clauses (main or subordinate) I recorded ***8*** instances of incorrect Case and incorrect Tense assignment in the same clause for CG_{DS} and ***4*** for CG_{TDC}. In ***only 2*** out of the ***8*** instances Nominative was targeted and Tense was used incorrectly, CG_{DS} used Accusative instead. Since only 1.1% of incorrect Case productions coincide with incorrect Tense use, this clearly confirms that there is no correlation between the incorrect use of the Tense feature and Nominative Case. Therefore, we can conclude that the assignment of Case by Tense is not affected, and consequently, the functional category Tense is not impaired.

Third, according to standard analyses, Tense is not only associated with Tense inflection but also with *S/V* agreement. For CG_{DS} we observe however, that there is no correlation between the alternative use of Tense and *S/V* agreement. In fact, *S/V* agreement appears to be the least affected domain in CG_{DS}, with the smallest percentages of incorrect use as well as the smallest use of percentage of defaults. Out of approximately 9,200 verbs, copulas and auxiliaries produced, there were ***only 5*** incorrect instances of Person from CG_{DS} and ***only 3*** from CG_{TDC}

that coincided with incorrect Tense productions. Moreover, with regards to Number, there were ***only 7*** incorrect instances of Person from CG_{DS} and ***only 5*** from CG_{TDC} that coincided with incorrect Tense productions. There was ***only 1*** instance for each group where Tense and *S/V* agreement were used incorrectly with the same verb.

Fourth, on the rare occasion where an alternative Person value is used on the verb, participants may alter Person features on other words within and across clauses to avoid ungrammaticality (cf. the re-organization technique observed with Ger_{DS} as well). An example is given below:

(7.1) <u>Change of Agreement Features: Experiment #2 – Task I</u> (Controlled Elicitation)

(a) *Target Stimulus*

E-telio-s-es na ðin-***is*** ta ram-ata...

PAST-finish-PRF-PAST-2SG *SUBJ* *tie-IMPF-PRES-2SG* *DET.NEU-ACC-SG* *shoelace-NEU-ACC-SG*

... ton paputs-io ***su***?

DET.MASC-GEN-SG *shoe-MASC-GEN-SG* *2-GEN-SG*

'Have you finished tying up the shoelaces of your shoes?'

(b) CG_{TDC} *Production (FA)*

∅-telio-s-a ∅a ðin-***o*** ∅ ∅ ∅ paputsio ***mu***?

PAST-finish-PRF-PAST-1SG *SUBJ* *tie-IMPF-PRES-**1SG*** *shoe-MASC-GEN-SG* *1-GEN-SG*

'Have I finished tying up of my shoes?'

The change of Person and Number agreement with verbs and pronoun across the main and subordinate clause merely shows that when the participant hears the speaker producing this imitation production (repetition) stimulus, she interprets the 2nd Person inflection as referring to the listener (her), and therefore, when repeating the production, in order to maintain the reference, alters the agreement inflection to 1st Person. This clearly shows that participants are able to re-structure morphological inflection to achieve (grammatical) agreement, a strategy

observed also with Ger_{DS} (Schaner-Wolles 2004). If CG_{DS} and CG_{TDC} productions were characterised by a syntactic impairment, this would be unexpected. Additional evidence for syntactic re-organization, and therefore, against syntactically conditioned differences comes from instances where the Past Tense inflection on the verb with the Past Tense adverbial are targeted, but instead, CG_{DS} choose to use Present inflection with a demonstrative. Therefore, participants are able to correctly re-organise an utterance in such a way, that the result is grammatical. This is more extensively discussed in *Chapter 6*, *Section 6.3.1*.

The phenomenon of syntactic re-structuring is also observed with Imperatives, where participants from both groups use a Subjunctive clause as an alternative to an Imperative clause, to express a less forceful command.

(7.2) Structural Re-organisation for Imperatives: Experiment #4 – Task II (Free Elicitation)

(a) *Expected Utterance*

anik-s-e	to	paraθir-o.
open-PRF-DEP-2SG	*DET-NEU-ACC-SG*	*window-NEU-ACC-SG*

'Open the window.'

(b) *CG_{TDC} Production (TM)*

∅∅[k]ke-use	***na***	∅***anik-s-is***	to	para[x]ir-i ...
allow-PRF-DEP-2SG	***SUBJ***	***stop-PRF-DEP-2SG***	*DET-NEU-ACC-SG*	*window-NEU-ACC-SG*

... ∅	travi-∅-i∅	ti∅	kurtin-a∅	piso.
	pull-PRF-DEP-2SG	*DET-FEM-ACC-SG*	*curtain-FEM-ACC-SG*	*back*

'You are allowed to open the window, to pull the curtain back.'

Syntactic re-organisation occurs during the syntactic derivation, which suggests that not only do CG_{DS} have fully acquired the inflectional system, but they also have the ability to re-construct and produce a grammatical utterance, based on the targeted structure.

Fifth, as shown in *Chapter 6*, both CG_{DS} and CG_{TDC} participants extensively use a Tense-Person-Number inflectional suffix, instead of the Gerund suffix (lacking Tense marking). More explicitly, on many occasions, participants from both groups resolved to the use of a Present Tense, 3rd Person, Plural suffix (as shown in (7.3) below) instead of the Gerund suffix. Note that the use of Gerund suffix is uncommon in the CG dialect, while suffixes marking Present, Person and Number are much most frequent.

(7.3) Present as Alternative to Gerund: Experiment #2 – Task II (Controlled Elicitation)

(a) *Targeted Utterance*

(Ol-i mazi) kaθo-***nde*** parakoluθ-***ondas*** tileoras-i.

(all-MASC-PL-NOM together) walk.IMPF-PRES.3.PL watch-GER television-FEM.SG.ACC

'They are (all) sitting together **watching** television.'

(b) CG_{DS} *Production* ***(SS)***

en ol-i mazi tze [x]or-un eryγ-o.

be.IMPF.PRES.3.SG/PL all-MASC-PL-NOM together and watch.IMPF-PRES.3.PL film-NEU.SG.ACC

'They are all together and they are watching a film.'

In (7.3), the participant used two conjoined clauses, where verbs in both clauses are inflected with Tense, Person and Number features. Such cases consist of yet another instance of structural re-organization. What is striking for these cases, however, is that in contexts where the target is non-inflectional, CG_{DS} use an inflected form, marking Present, Tense and *S/V* agreement as an alternative. A preference to a suffix marking both Tense and *S/V* agreement over a suffix lacking inflectional value contradicts what has been reported for Eng_{DS}. This alone shows that the minor problems observed with CG_{DS} cannot be syntactically conditioned and that the *IIH* reducing to *EOI* cannot account for the differences between the CG_{DS}, CG_{TDC} and CG_{TD} Grammar. If (i) there was an overall inability to use the Gerund suffix and (ii) participants used a suffix formed by all the default values inflected on a verb (i.e., Present, 3rd Person and Singular, as discussed in

Section 7.3 below) due to a bundling effect, we could then perhaps argue that the combination of the two factors, points towards a problem during the syntactic derivation. This would in turn, suggest syntactically conditioned difficulties. However, we observe that the alternative inflectional suffix used by participants agrees with the targeted subject. The choice of Present, 3rd Person, Plural suffix shows that the form was derived to agree in Person and Number with the subject. Therefore, syntactic re-structuring, i.e. use of an inflectional suffix, with a conjunction, creating two conjoined main clauses instead of a main clause + a Gerund, shows that CG_{DS} are able to perform complex syntactic operations to accommodate their production.

Sixth, further evidence against syntactically conditioned differences between the CG_{DS} and the CG_{TD} Grammar comes from the participants' use of the Subjunctive marker *na*, which has been argued to be associated with T (Malagardi 1994).[92] Assuming *na* is an inflectional marker, if the inflectional head it resides under is impaired, we would expect that CG_{DS} participants would either omit *na* or else use an alternative to Subjunctive. Both participant groups however, use the Subjunctive marker correctly, in both free and controlled elicitation. Nevertheless, CG_{DS} (CG_{TDC}, to a lesser extent) do sometimes show preference towards a grammatical alternative in one of the controlled elicitation tasks, namely a relative clause construction. Since *na* is used accurately, we can therefore conclude that the syntactic operations associated with the surfacing of *na* are intact.

Seventh, if differences between the CG_{DS} and the CG_{TD} Grammar were syntactically conditioned we would expect the entire bundle of features resulting from the syntactic derivation to be affected. More specifically, the Greek inflectional system is mostly fusional. Therefore, if

[92]Roussou (1999) analyzes the Subjunctive marker as an Infinitival marker, while Terzi (1997) analyzes it as an inflectional particle associated with a Mood head (M^0). For an alternative analysis treating *na* as a Mood marker situated under a Mood head see Giannakidou (1995), Philippaki-Warburton and Spyropoulos (1998), Philippaki-Warburton (1994a), Philippaki-Warburton (1994b), Philippaki-Warburton (1985), Philippaki-Warburton and Veloudis (1984) and Tsimpli (1990).

differences were syntactically conditioned, we would expect an evident effect on the bundle of all nominal or verbal features. This would be expected since a syntactically conditioned impairment would have affected a feature before fusion, and if the feature, i.e. Case, resides under a functional head, i.e. D, everything else below it would also be affected. In other words, if the features in a portmanteau morpheme form a bundle and are co-dependent, changes, i.e. use of an underspecified Case feature, would result to the use of underspecified feature values for all other features in the bundle. Results from this study however, do not support such a prediction. We very rarely find a change of more than one feature to their default within the same production. Over 99% of the time there is ***only one individual*** feature altering to its default out of the three (for nominals) or four (for verbs) features in a bundle.

Eighth, in *Chapter 5, Section 5.5* I presented an extensive discussion on the nature of /s/ omission, especially word-final /s/ omission, where I provide a long list of evidence establishing that omission of /s/ only superficially resembles inflectional errors. If /s/ omission was syntactically conditioned, caused by a problem with *S/V* agreement or Case assignment, as it was perceived by *IIH* studies (e.g. for the omission of the 3rd Person Singular and noun Plural inflection), we would, for example, expect to see consistent pattern with Case assignment problems. That is, we would expect either (i) consistent affix drop caused by a bundling effect, or (ii) use of an (random) affix to serve phonological purposes (i.e., the ban against word-final consonants other than /n/ and /s/), or (iii) a consistent change from one Case value to another. However, the most consistent characteristic of Case inconsistencies in the data presented in this dissertation is the omission of /s/. In sum, /s/ omission is not syntactically conditioned and does not result in random use of Case values by CG_{DS}. For a more extensive discussion and examples I refer the reader to *Chapter 5*, *Section 5.5.2.2*.

Ninth, further evidence, that excludes Case differences between CG_{DS} and CG_{TDC} Grammar being syntactically conditioned, comes from the use of the determiner which accompanies nouns exhibiting /s/ omission. In the vast majority of tokens (94% (732) for CG_{DS} and 96.6% (57) for CG_{TDC}) where there is a word-final /s/ omission on nominals the determiner is used with the target or expected Case (when not involving /s/ word-finally itself). More explicitly, if /s/ omission causes the targeted phonological exponent (henceforth, P-EX) for Nominative-Singular to be of the same form as the P-EX for Accusative-Singular or the P-EX for Accusative-Plural to be of the same form as the P-EX for Genitive-Singular, the determiner in such cases is omitted only 46 out of the 778 times. Moreover, 34/46 determiner omissions are observed with the same DP (*o Nik-os*)[93], with a single participant, who does not produce determiners in numerous environments. Hence, excluding this participant, there were only 12/778 (1.5%) cases where final /s/ omission on nominals coincides with determiner omission (with the same DP as above). Further examination of such cases revealed no consistent effects as described by Kupisch (2006). This is crucial for answering my research question, because omission or an alternative use of the Nominative determiner to Accusative, would suggest that (i) the alternative Case value used for the determiner occurs due to problematic Case assignment, and therefore, if syntactic, the Tense head is also affected, and (ii) the omission of final /s/ on nominals will no longer be phonetically conditioned, since the Case inflected on the nominal reflects the Case value carried by the head D. In all remaining cases, the determiner, when not including an /s/ itself, remains in the target or expected Case. In more than 8,500 Nominative productions by the two groups, there are ***only five*** cases where the determiner does not match the Case of the accompanying noun.

[93] Based on Kupisch, (2006) this DP falls under the category of naming function, used to refer to the main character of *Experiment #1, Videos I* and *II*. This category is one of the first acquired by *TDC*, before their 2nd birthday.

(7.4) Example of Case Assignment Relative to the Determiner

	Target Utterance			*CG_{DS} Production*	
(a)	o	aθ∅op-***os***	➡	o	aθ∅op-***os***
	DET.MASC.NOM.SG	*man-MASC.NOM.SG*		*DET.MASC.NOM.SG*	*man-MASC.NOM.SG*
(b)	i	ðor-a	➡	i	ðor-a
	DET.FEM.SG.NOM	*Dora-FEM.SG.NOM*		*DET.FEM.SG.NOM*	*Dora-FEM.SG.NOM*
(c)	o	andr-***as***	➡	o	andr-a[x]
	DET.MASC.SG.NOM	*man-MASC.SG.NOM*		*DET.MASC.SG.NOM*	*man-MASC.SG.NOM*
(d)	o	Nik-***os***	➡	o	Nik-***o∅***
	DET.MASC.SG.NOM	*Nikos-MASC.SG.NOM*		*DET.MASC.SG.NOM*	*Nikos-MASC.SG.**NOM-PH$_I$***
(e)	***ton***	kosm-***o***	➡	∅	kosm-***os***[94]
	DET.MASC.ACC.SG	*people-MASC.SG.**ACC***		~~*DET*~~	*people-MASC.SG.**NOM***
(f)	***i***	ʃokolat-a	➡	***ti***	ʃokolat-a
	DET-FEM.SG.NOM	*chocolate-FEM.SG.NOM*		*DET-FEM.SG.ACC*	*chocolate-FEM.SG.ACC*

The set of examples presented in (7.4) clearly shows that Nominative Case is assigned accurately on all nominal phrases carrying Masculine and Feminine Gender. In (7.4d), as argued in *Chapter 5*, despite the fact that the final /s/ is missing, Nominative Case is assigned as targeted on both the determiner and the nominal. (7.4c) shows that Case is assigned as targeted for both the determiner and the noun, but something else happens following the assignment of Case, which causes the final /s/ to be pronounced as [x]. (7.4e) and (7.4f) show discrepancies with Case assignment. More explicitly, in (7.6e) the determiner is missing and instead of the noun being marked with the targeted Accusative Case, it is inflected with Nominative instead. In (7.4f), the CG_{DS} participant inflected the determiner phrase with Accusative instead of the targeted Nominative. The inflectional paradigm for this nominal is syncretic, so the Case on the noun could be either Nominative or Accusative. However, as already clarified above there was only a

[94] Note that a verb is available in this structure to assign the appropriate *ϑ*–role, therefore the use of an alternative Case value cannot be syntactic here. For the full example see Chapter 6, p.275.

handful of such instances, and if CG_{DS} presented of syntactically conditioned Case problems, we would expect productions inflected with Case to be in their majority more like (7.4e) and (7.4f), than (7.4a) – (7.4d). In the case of syntactically conditioned restrictions with Case assignment, we would either (i) expect a discrepancy between Case features marked on the determiner and the noun, or (ii) the Case value marked on both the noun and the determiner not being used as targeted. Further support comes from the phonetic and phonological results and analysis in *Chapter 5*, where I show that sounds are affected regardless of whether they occur in an inflectional affix or elsewhere, but also regardless of the surrounding phonological environment.

Tenth, the parallel percentages of entire word omission, for words, which either do or do not receive inflection, point in a different direction. A breakdown during the syntactic derivation stage can explain neither the omission of words that do not receive inflection, nor the omission of words that are not affected by syntactic processes. Therefore, I propose that full word omissions are pointing towards an issue with the vocabulary insertion stage, and not one related to the syntactic derivation stage. This proposal is additionally supported by the fact that despite the omission of a verb, (i) Nominative Case is still assigned, and (ii) ϑ-roles are assigned, since we commonly find both a subject and an object in the structure.

Based on these facts, I conclude that the differences observed between the CG_{DS} and the CG_{TD} (and CG_{TDC}) Grammar are not syntactically conditioned (except for the rare cases of syntactic reorganisation), unlike those observed for Eng_{SLI}, where evidence for syntactically conditioned differences (and consequently, difficulties) is found. Therefore, it is clear that CG_{DS} and CG_{TDC} do recognise the feature bundle, based on the nature of the differences observed and lack of random choice of alternative features within and across lexical categories.

7.2.3 Differences are partly Morphologically Conditioned

In *Section 7.2.*2, I established that the remnant differences between the two groups that are not classified as phonetically and phonologically conditioned, cannot be classified as syntactically conditioned differences. In this section, I provide evidence that the remnant differences between the two groups are morphologically conditioned.

This dissertation studies four inflectional features marked on verbs and nominal expressions: Tense, Person, Number (*S/V* agreement) for verbs and Case for nominal expressions. These are considered to hold close syntactic relations, such that when one of these is impaired, the other features will also present problems (see *Chapter 1*, *Section 1.3*). Results in *Chapter 5* and *6* exhibit only localised effects. The evidence in favour of this hypothesis are:

(i) Localised effects, but no bundling effects
(ii) Omission of full words points towards problems with vocabulary insertion.

Evidence in favour of morphologically conditioned differences between the CG_{DS} and the CG_{TDC} and CG_{TD} Grammar comes from the fact that features are affected on an individual basis, not as a bundle. More explicitly, if a feature value is not used as targeted or expected, independent of the other features syntactically associated with it, I conclude that this feature is changed after the syntactic derivation has been completed. More explicitly, fusion occurs during the syntactic derivation, before features are sent to *Spell Out.* Therefore, if the head of a phrase (e.g. Tense) is affected in any way, any features (Case) or combination of features (*S/V* agreement) controlled by this head will also present problems. In other words, the close syntactic relations between these features will create a "snowball effect", where the entire feature bundle will present a number of interrelated differences with the target. On the contrary, if features are affected after the syntactic derivation stage is completed, like the data and results in *Chapter 5* and *6* show,

problems with an individual feature, whether Tense or Case, can no longer affect other features. Though there is a clear tendency to use inflectional features as targeted (on average, in 95% of tokens), we observe that participants may use alternative forms, correctly (see *Table 6.29 and 6.31*), in a variety of syntactic environments. There is clearly something regulating the favoured alternative, and since data shows that this could not be located during the syntactic derivation[95], or is related to the phonetic and phonological system, the factor regulating the choice of alternative forms must be sought elsewhere.

The second set of evidence in favour of morphologically conditioned differences between CG_{DS} and adult CG_{TD} Grammar concerns full-word omission. This is supported by two facts. First, we observe omission of words, which receive inflectional marking, and words which, do not receive inflection. In fact, omission percentages for the latter are higher than those for the former. Second, full-word omission suggests problems with vocabulary insertion (i.e. the process of selecting a phonological representation for a root+bundle of inflectional features (if any)) i.e. vocabulary insertion, not with the process which derives them, i.e. syntax.

In conclusion, evidence discussed in *Section 7.2*, based on the results presented in *Chapters 5* and *6*, support that differences between the CG_{DS}, CG_{TDC} and CG_{TD} Grammars result from a combination of factors. More explicitly, the majority of the differences are phonetically and phonologically conditioned. I propose that the residue of differences not categorised under phonetic/phonological difficulties, can only be perceived as morphologically conditioned.

[95] Absence of bundling effects along with numerous other evidence verifies this.

7.3 TOWARDS A UNIFIED ANALYSIS

A question arising from the current results is whether an analysis is necessary at all, given the miniscule number of incorrect productions. One could rightfully not pursue an analysis, considering these differences as either falling under the 90% cut-off point set by Brown (1973), or evaluating them as performance errors, similar to the ones observed with adults. However, the systematicity observed across the various productions where an alternative morphological or phonological feature value is used (especially with morpho-syntactic features), or where words or sounds are omitted, suggests that the differences between the two groups and adult CG_{TD} Grammar cannot be viewed as performance errors. For example, in adult speech we often observe metathesis, exchange or addition phonological errors like *pus bass* for *bus pass*. Such errors are rarely observed with this study's participants. Instead, when a sound is changed it's usually a result of a phonological feature change, like a dorsal stop changing to a coronal stop. In adult speech, we do find narrative Present, but we rarely see extensive use of default values, while morpho-syntactic information is available. Therefore, based on this evidence, as well as the systematicity in which participants use alternative feature values, it was decided that these differences could neither be considered part of the 90% cut-off point nor be perceived as performance errors, parallel to those observed in adult speech.

Therefore, it was decided that an analysis was in place to conclude what the nature of these differences is, as the systematicity across these was quite evident from the results presented in *Chapter 5* and *6*. This analysis also gives us a window to future research for younger ages for both groups, since it seems to be suggesting that these differences may not be limited to the tested age for each group, and therefore, the systematicity cannot be accidental.

Why do participants choose to use an alternative feature value when not producing inflection as targeted or expected? The existing analyses suggest either (i) a syntactically conditioned overall inflectional impairment under which inflectional features are underspecified (*IIH* reducing to *EOI*), or (ii) a morphologically conditioned overall inflectional impairment under which all inflectional features are affected (*IIH*), resulting in problems with the production of all features. Results from this research support neither hypothesis. In this section, I show that Ring and Clahsen's (2005) original intuition, that participants alternate between a targeted or expected form and a less specified form (like for example the infinitive in English) is on the right track. However, I will show that this second option (i.e. using an alternative value) does not become available due to a breakdown during the syntactic derivation, which causes underspecification of inflectional features. Instead, I argue that we are dealing with problems at the *Spell Out* level (i.e. morphological effect). As such, the inflectional differences between CG_{DS} and CG_{TDC}, however minimal, are morphologically conditioned. In order to show this, I first examine, for each feature, the alternative values participants have chosen. I then introduce the theoretical background. Finally, I provide a unified analysis under which all morphological differences observed between the CG_{DS} and CG_{TD} Grammar can be accounted for. I show that independent evidence from phonological features support the proposed analysis. Finally, full-word omission appears to be a difficulty resulting from the same kind of issues causing the use of an alternative value; namely, vocabulary insertion. Naturally, the possibility remains that the similarities between these three phenomena may be accidental.

7.3.1 Alternatives and the Role of Default Feature Values

As summarised in *Section 6.6*, each feature has a value that is most commonly used as an alternative when participants fail to produce the targeted or expected form. For example, when a

target stimulus or spontaneous construction requires the use of a certain Tense value, participants tend to use Present as an alternative to a targeted Past, Dependent or Imperative form.[96] I propose that the favoured alternative feature value functions as default, i.e. the underspecified feature value (e.g Present) for a specific feature (e.g Tense), which serves as the alternative almost every time an expected feature value is subject to substitution. This was shown in *Chapter 6*, *Table 6.31*. Below, I summarise this consistent pattern that CG_{DS} and CG_{TDC} exhibit across all features.

In *Chapter 6*, I observed that there is a feature value that is more frequently used as an alternative to other feature values of the same feature. Of over 200,000 morpho-syntactic feature values reported, there are only two or three cases where a noun or verb suffix is inflected with a suffix from a different inflectional paradigm. Moreover, a verbal suffix was never used for a noun. A nominal suffix was used for a verb only once. I summarise results in *Table 7.1* below.

	CG_{DS}	**CG_{TDC}**
Tense	PRESENT	PRESENT
Person	3rd PERSON	3rd PERSON
Number	SINGULAR	SINGULAR
Case	NOMINATIVE	NOMINATIVE

TABLE 7.1: SUMMARY OF MOST FREQUENT ALTERNATIVE VALUE PRODUCTIONS BY CG_{DS} AND CG_{TDC}

Table 7.1 illustrates the values most frequently used as alternatives.[97] For Tense, both participant groups use Present as an alternative at a much higher rate than any other Tense feature value. Concerning Person, CG_{DS} and CG_{TDC} produce the 3rd Person value as an alternative to 1st and 2nd Person at a much higher percentage than either of the other values. Singular is used as an alternative more often than Plural, by both participant groups. Finally, Nominative is the most common value used as an alternative to the other Case values by CG_{DS} and CG_{TDC}. Finding what

[96] We do find features other than the default one used as alternatives to targeted/expected values, but the percentage of their use is much lower. Moreover, some of these substitutions are due to other reasons.
[97] A detailed presentation of numbers and percentages of alternative use, can be found in *Section 6.6*, *Table 6.31*.

these four values have in common can provide an explanation as to how and why CG_{DS} Grammar differs from adult CG_{TD} Grammar.

The two groups show a similar pattern in their use of inflectional marking. However, the two groups differ in three respects: (i) CG_{DS} use defaults at a higher rate, (ii) CG_{TDC} lack the articulatory restrictions observed with CG_{DS}, and (iii) CG_{DS} omit full words and affixes more frequently than CG_{TDC}. This pattern is seen with all verbal and nominal features. Therefore, we would expect the same phenomenon (i) to apply to *DS* in other languages, (ii) to surface at the majority of the times an expected or targeted form is altered, and (iii) to find evidence for this consistent default feature use in features like Gender, Number, and Person (for pronouns), i.e. each feature has a default value used as an alternative when the targeted form is not used.

I acknowledge that there might be other theories that could be used to account for the three aforementioned phenomena separately, especially an OT analysis for the phonologically conditioned differences. However, I perceive the three differences between the two groups and CG_{TD} adults as a unified phenomenon. Therefore, the only analysis, which allows me to account for all three, is one based on the Blocking mechanism, and its more refined version, the *Subset Principle*, which is used to draw parallels. Therefore, what I put forward is a proposal, and further research on *DS* across languages will help verify or disprove the proposed analysis, presented in this section. First, I examine the theoretical background that would give me grounds to argue that these are indeed such.

7.3.2 Theoretial Background

While it has been argued that some morpho-syntactic default features are universal, i.e. they are found to function in the same way cross-linguistically, other default features have been found to

be language specific. In this section, I discuss the four features examined in this dissertation and show that while some feature values fall under universal defaults, others are language-specific. What is interesting, is that the four values for Tense, Number, Person and Case are not only observed with CG_{DS} and CG_{TDC} but also with adult CG_{TD} Grammar as well as other languages.

7.3.2.1 Universal and Language Specific Defaults

In this section, I provide independent evidence showing that the universal default value for Number is Singular, and for Person is the 3rd Person value. Concerning the features of Case and Tense, we observe language-specific default values. The Greek default value for Case is Nominative, and the default Tense value is Present. Evidence comes from universal defaults for Number and Person features, and Greek-specific defaults for Tense and Case. These defaults are observed with CG_{DS} and CG_{TDC} but also with adult CG_{TD} as well as other languages. Default values are determined on the basis of several different parameters, like order of acquisition, and frequency of use by adult speakers of a language. I first discuss universal defaults.

7.3.2.1.1 Universal Defaults: Number and Person

For Person and Number, Harley and Ritter (2002) have shown, on the basis of a large number of languages, that 3rd Person is the default Person value, and Singular is the default Number value. Their claim is based on evidence from (i) the order these feature values are acquired by children cross-linguistically and (ii) frequency rates and inflectional patterns these values are used by *TD* adults of different languages. In order to fully account for certain restrictions observed on pronoun paradigms across a number of languages, they develop a feature geometric account for morpho-syntactic features capturing the empirical patterns. Consider the feature geometry below.

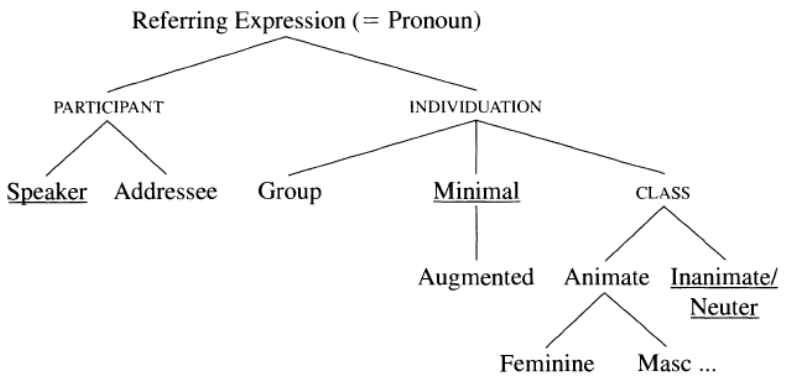


FIGURE 7.1: MORPHO-SYNTACTIC FEATURE GEOMETRY (HARLEY AND RITTER 2002)

In *Figure 7.1*, the PARTICIPANT node includes 1st and 2nd Person. The 3rd Person value is unmarked. INDIVIDUATION includes the Number system (*Group* stands for Plural while *Minimal* represents Singular) as well as the Class system. The underlined features are the default features. According to their analysis, "organizing nodes with no dependents receive a default interpretation, usually treated as underspecification: one of the daughter nodes is identified as representing the default interpretation of a bare organizing node" (Harley and Ritter (2002: 486). Accordingly, the underlined nodes are terminal and give a default interpretation to unmarked organising nodes. While 1st and 2nd Person pronouns require the activation of both the INDIVIDUATION and PARTICIPANT nodes, the 3rd Person pronouns require only the activation of the INDIVIDUATION node. Moreover, the absence of a feature (e.g. 3rd Person) implies that the feature value being used is the default feature (Benveniste 1966, Cysouw 2003, Forchheimer 1953, Harley and Ritter 2002, Ritter 1995 *inter alia*).[98] Harley and Ritter (2002) argue that these facts motivate universal defaults for major organizing nodes with additional evidence from a large number of languages where defaults are acquired first (initial pronoun acquired is either 1st Singular or 3rd Singular inanimate). However, they do acknowledge that an extra organising node representing CASE needs to be added to their morpho-syntactic feature geometry (p.507).

[98] Some languages do not have a 3rd Person pronoun and use the demonstrative, instead (Harley and Ritter 2002).

Harley and Ritter (2002: 515) provide a similar analysis for Singular Number. According to their analysis, "the representation of Singular pronouns (*Minimal*) includes a *Class* node dependent on INDIVIDUATION but no *Group* node; that of the Plural pronouns includes a *Group* node dependent on INDIVIDUATION, but no *Class* node". Language acquisition studies show that Singular is acquired before Plural, and this supports the view that defaults are acquired first. Summarising, they give the proposed UG-supplied defaults: ***1st Person*** (1st Person value is the default value of the PARTICIPANT node, while 3rd Person arises through absence of Person value), ***Singular*** for Number and ***Inanimate/Neuter*** for the Class/Gender feature (Harley and Ritter 2002: 501).

Empirical evidence from Greek child language acquisition is in line with Harley and Ritter (2002). More explicitly, during the initial child language acquisition stages, Standard Greek *TDC* overuse the 3rd Person and Singular values, compared to the other feature values (Katis 1984, Stephany 1981, 1997, Tsimpli 1992, 1996), Varlokosta et al. 1996, Varlokosta et al. 1998).

Though there is currently no independent evidence that these are indeed universal defaults, apart from the Harley and Ritter (2002) study, these do appear to be the defaults for Person and Number in Greek. There still remains a possibility that these may not be universal defaults and default values across languages, which have been claimed to be universal, may still be subject to variation. Independent evidence and additional diagnostic testing on these defaults for (Cypriot) Greek as well as other languages, concerning such an argument is left for future research.

7.3.2.1.2 Language Specific Defaults: Case

Concerning Case, evidence from previous work on various languages and *TD* language acquisition is in agreement with results from this study. Schutze (2001) has shown that while the

default Case for English is Accusative, this is not the case across all languages. For example, the default Case for German is Nominative (Schütze 2001). Adopting the five diagnostic tools proposed by Schutze (2001), I propose that the default Case for (Cypriot) Greek is Nominative. This is not surprising, given that Nominaive is the default Case in Indo-European (Kiparsky 1968). Examples for each of these diagnostic tools for both Greek and English can be found in *Appendix E*. *Table 7.2* below summarises the results on Schütze's diagnostic tools for English, SG_{TD}, CG_{TD} and CG_{DS}. The results for the five diagnostics, summarised in *Table 7.2*, show that the default Case for SG_{TD} is Nominative. The same is also true for CG_{TD}. Similar examples in this study's database show that the default Case for CG_{DS} and CG_{TDC} is also Nominative.

Diagnostic Tool	Eng_{TD}	SG_{TD}	CG_{TD}	CG_{TDC}/CG_{DS}
Left Dislocation & App.	ACC/*NOM	NOM / *ACC	NOM / *ACC	NOM / *ACC
Ellipsis	ACC/*NOM	NOM / *ACC	NOM / *ACC	NOM / *ACC
Gapping	ACC/?NOM	NOM / *ACC	NOM / *ACC	NOM / *ACC
Coordination	ACC/*NOM	NOM / *ACC	NOM / *ACC	NOM / *ACC
Modified Pronouns	ACC/?NOM *Some env.	NOM / *ACC	NOM / *ACC	----------
Post copular DPs	ACC/*NOM	NOM / *ACC	NOM / *ACC	NOM / *ACC

TABLE 7.2: DEFAULT CASE ENVIRONMENTS FOR ENGLISH, SG, CG AND CG_{DS}

Table 7.2 shows that SG_{TD}, CG_{TDC} and CG_{DS} use Nominative as the default Case in all of the tested environments.[99] Below, I provide as evidence two additional criteria, which helped determine that Nominative is the default Case in Greek, apart from (i) Schütze's diagnostic tools and (ii) the fact that it is the default Case value of Indo-European. First, independent support comes from the fact that Nominative is the default Case in discourse in Greek. For example, while to a question like "Who wants ice-cream?" in English we would respond "me", in Greek, we would respond with Nominative *Εγο* 'I' instead of Accusative *Emena* 'me'. For a full example see *Appendix E*. Second, as evident from multiple testing stimuli, as well as in adult

[99] Studies on child language acquisition of SG (Stephany 1997, Tsimpli 2001) argue that Accusative is the unmarked Case in Greek. However, these studies present a number of problems. A discussion on the problems these studies present is available in *Appendix E*.

CG_{TD} speech, Nominative is the Case value used with nominal and adjectival predicates (see *Chapter 3* pp.89-90 for an example).

Evidence from child language acquisition studies on English and German is consistent with Schütze (2001) and Schütze and Wexler (1996), who show that English-speaking children use Accusative as their default Case. In addition, there are also numerous studies showing that English children acquire Accusative earlier than Nominative (Klima et al. 1966, Schütze and Wexler 1996) among others). Child language acquisition studies on German show that Nominative is the default Case for German, as it is acquired earlier than any other Case value (Clahsen, et al. 1994, Mills 1985, Schütze 1997).

7.3.2.1.3 Morpho-syntactic Feature Geometry for Greek Nominal Phrases

Before I move on to an analysis of the morpho-syntactic properties of the CG_{DS} and CG_{TDC} Grammar, I present a feature geometric account for the morpho-syntactic features of nominal phrases in Greek. Below, I present a feature geometry account parallel to (Harley and Ritter 2002) with the addition of a CASE organising node.

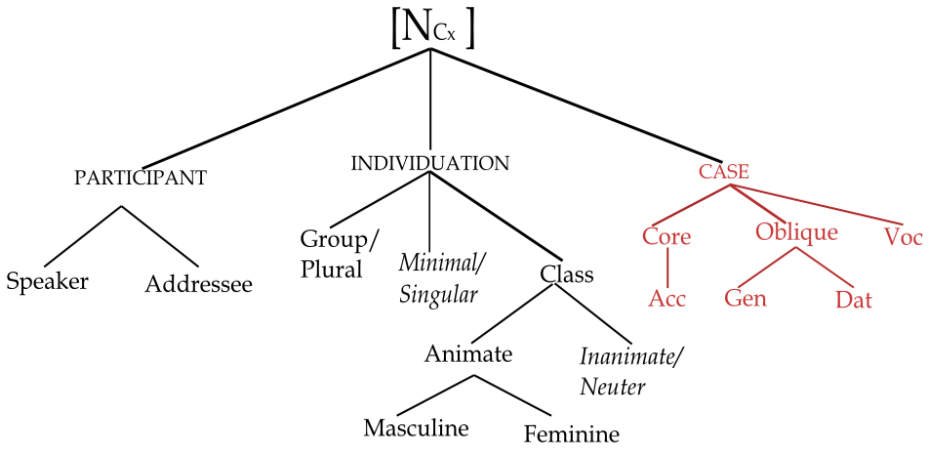


FIGURE 7.2: MORPHO-SYNTACTIC FEATURE GEOMETRY FOR GREEK NOMINALS

As seen in *Figure 7.2*, some adjustments have been made to the original feature geometry representation proposed by (Harley and Ritter 2002). First, instead of referring expressions, I use **N** for Nominal phrases, to include nouns, determiners, adjectives, pronouns etc., for consistency with the preceding discussion. The N is accompanied by a subscript specification N_{CX}, which indicates the inflectional paradigm a noun or adjective belongs to. This is particularly important, as absence of such a specification results to ambiguity. Second, a third organising node for Case has been added. In Harley and Ritter's (2002) geometry, default features are signified by their absence. That is, the absence of the PARTICIPANT node results in the 3rd Person default. Based on this logic, when CASE is used without any dependent nodes, it represents the default Case, i.e., Nominative. Moreover, *Core* Case represents Accusative and *Oblique* represents object Cases like Genitive and Dative. In the case of English, under *Core* Case we would find Nominative, while absence of Case specification automatically implies Accusative, while German would have the same representation as Greek.[100] Vocative falls under neither of the two categories, since it does not mark a dependency of the noun to the governing expression. Instead, it is used to address the listener. Italics indicate defaults, when those are not absent (Neuter and 3rd Person).

7.3.2.1.4 Language Specific Defaults: Tense

As with Case, Tense does not have a universal value across all languages. We find that in many languages, like English, German, Dutch, and Swedish, the infinitive is more likely the default verbal form. This can be deduced from the fact that in child language acquisition of English and German for example, the infinitive (without *to* for English but with the infinitival suffix *–en* for German) is used in most environments where in adult *TD* we would expect the use of a finite

[100] Note that this classification works also for some Slavic languages that have been argued to have Genitive as their default Case (Pesetsky 2007, 2010).

verb (Poeppel and Wexler 1993, Rice and Wexler 1996, Rice et al. 1999, Wexler 1994). Moreover, Wexler (1994) notes that the phenomenon of root infinitives is observed in a number of languages where overt phonological forms for infinitives allow them to surface as bare verbs.

Varlokosta et al. (1996) have argued that Greek children use the verbal suffix *–i*, corresponding to the 3rd Person Singular of Present (when inflected onto an Imperfective root) or Dependent (when inflected onto a Perfective root). However, inspection of their data suggests that children are making more use of the Imperfective Present Tense rather than the Perfective Dependent verbal construction. In addition, children are more successful when using the Imperfective rather than the Perfective (see *Chapter 2, Section 2.6.1.2*). In sum, (Varlokosta et al. 1996) argue that Imperfective is the default Aspect and Present is the default Tense value in Greek.

Moreover, in theoretical terms, (Warburton 1973) suggests that in Greek the Imperfective verbal root is the unmarked verbal root. Since it is the only possible with Present Tense, we would expect the Present Tense value to be more widely used as the default choice than the Dependent. In sum, based on results from Greek child language acquisition, as well as the results from this study, where both groups show a preference to the Present Tense value as an alternative to the targeted Tense value, I assume that Present Tense is the default Tense value for CG_{TD}.

7.3.3 Optionality Derives from Failure of the Subset Principle to Fully Apply

Despite the fact that an overall inflectional impairment cannot account for the data presented in this dissertation by adult CG_{DS} and 7- to 8-year old CG_{TDC}, there is one central observation in these studies that remains accurate: the intuition that there is variability between the target form and a "designated alternative", a default which surfaces much more commonly than any other form. Where does this optionality originate from and what determines the default value? In what

follows, I argue that the observed optionality in CG_{DS} as well as CG_{TDC} derives from a failure of the ***Subset Principle*** to fully apply at the *Spell Out* level.

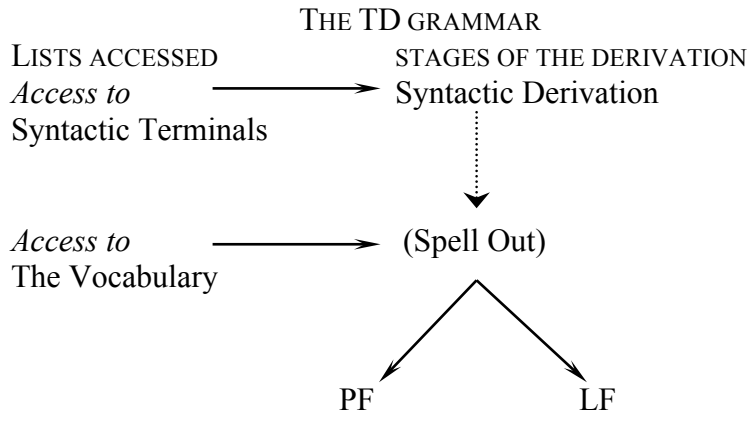
I first show how the *Subset Principle* can account for morpho-syntactic features. I later suggest that the analysis can be extended to account for the participants' use of underspecified phonological features. I use the same analysis to draw parallels, since my observation is that morpho-syntactic and phonological alternatives (i.e. defaults) seem to occur in a similar manner. There is, of course, a possibility that the current observation is accidental. An alternative analysis for the phonological features would be one under the *Optimality Theory* (henceforth, OT), where constraint ranking would drive the choice of (i) the targeted or expected consonant but also (ii) the default consonant [t] for voiceless stops and [x] for voiceless fricatives.

7.3.3.1 Morpho-syntactic Features

In order to fully account for this optionality, I develop an analysis based on the output of the generative system. That is, I argue that CG_{DS} and CG_{TDC} do not differ from CG_{TD} in the way complex expressions are derived, but rather in the way these complex expressions are spelled out. It is often assumed that syntax manipulates abstract features only (usually referred to as 'syntactic terminals') (Halle and Marantz 1993). These features are not yet associated with phonological content. In other words, syntax does not manipulate words or morphemes. Instead, phonological exponents (henceforth, P-EX) are associated with information about where they get inserted. This information comprises the vocabulary that is accessed only after the syntactic derivation. In particular, after *Spell Out* the outcome of the syntactic derivation is transferred to PF and LF respectively, and the vocabulary is accessed between *Spell Out* and PF. This is illustrated in (7.5). Note that the functionally important parts of the following representation of

the Grammar are standardly agreed on by all approaches, linguistic or psycholinguistic. Therefore, I am adopting this model for concreteness.

(7.5)



adapted by (Embick and Noyer 2007)

I argue that, concerning inflectional features, CG_{DS} differ from CG_{TD} only in the way the vocabulary is accessed. According to Embick and Noyer (2007), the output of a syntactic derivation for Plural nouns contains a Number head, which is specified as Plural [PL]. After *Spell Out*, an appropriate P-EX has to be found in the list of vocabulary items. In the case at hand, the regular P-EX for [PL] in English is /z/.

The relation between the syntactic derivation and the vocabulary is regulated by the ***Subset Principle*** (i.e. a more refined version of the ***Blocking*** mechanism). In particular, we observe that when several vocabulary items are compatible with a complex syntactic expression, it is the most specified one that is inserted. All other forms, which may be compatible, are blocked. Within the framework of distributed morphology, this principle is known as the *Subset Principle.*[101]

[101] The ***Subset Principle*** does not resolve all cases of potential conflict. Specifically, where two Vocabulary Items are both applicable and both contain the same number of features some additional criterion must resolve the competition. Explicit stipulation of ordering are two possible solutions (Halle and Marantz 1993) or appeal to a hierarchy of morpho-syntactic features (Noyer 1997).

(7.6) ***Subset Principle***

> The P-EX of a vocabulary item is inserted into a position if the item matches all OR a subset of the features specified in that position. Insertion does not take place if the Vocabulary Item contains features not present in the morpheme. Where several Vocabulary Items meet the conditions for insertion, the item matching the greatest number of features specified in the terminal morpheme must be chosen.
>
> (Halle 1997, in Embick and Noyer 2007: 297). Emphasis: CC

An application of how the *Subset Principle* functions is exemplified by the following schematic representation for Masculine nominals, found in the first inflectional class for (Cypriot and Standard) Greek. Since there are different inflectional classes for nominals in Greek there should be an additional feature determining the nominal class (c.f. Alexiadou and Müller 2005). For expository purposes, I include the inflectional class to avoid ambiguities. In (7.7), I list the inflectional paradigm for Masculine nouns, Class_{I}.

(7.7)

C_I	SG/CG	PL
NOM	-os	-i
ACC	-o	-us
GEN	-u	-on
VOC	-e	-i

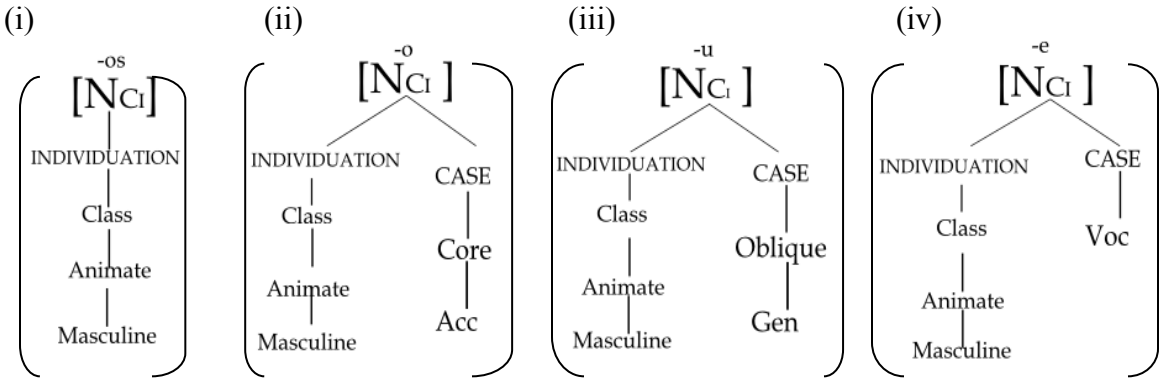
Observe that in the Singular, all Case features are associated with a unique P-EX. This contrasts with Plural, where Nominative and Vocative P-EX are identical (i.e. exhibit a form of syncretism). The absence of syncretic forms in the Singular suggests that all P-EX are indeed associated with a complete feature specification, as illustrated in (7.8). Moreover, in the absence of a determiner, this is the only paradigm with which we can be sure of the inflected Case value.

(7.8) POSSIBLE FEATURE BUNDLES RESULTING FROM SYNTACTIC DERIVATION (MASCULINE)

a. $\begin{bmatrix} +N_{CI} \\ +\text{MASC} \\ +\text{SG} \\ +\text{NOM} \end{bmatrix}$ b. $\begin{bmatrix} +N_{CI} \\ +\text{MASC} \\ +\text{SG} \\ +\text{ACC} \end{bmatrix}$ c. $\begin{bmatrix} +N_{CI} \\ +\text{MASC} \\ +\text{SG} \\ +\text{GEN} \end{bmatrix}$ d. $\begin{bmatrix} +N_{CI} \\ +\text{MASC} \\ +\text{SG} \\ +\text{VOC} \end{bmatrix}$

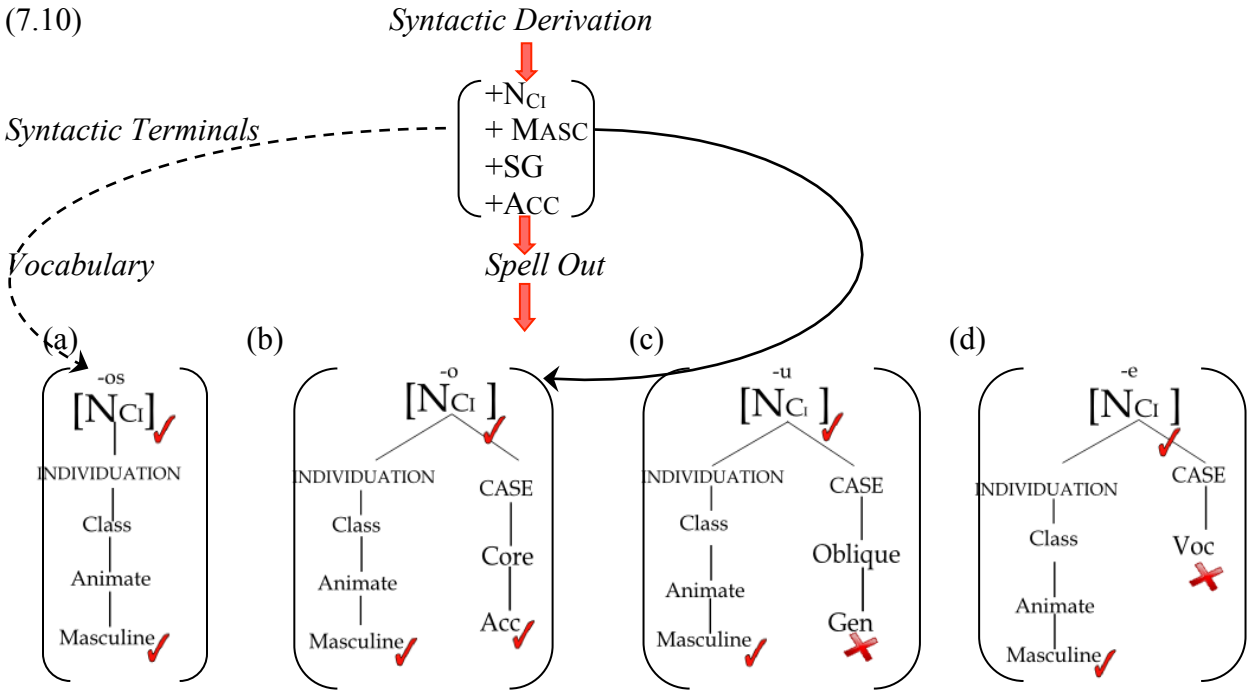
Based on the feature geometry structure proposed by Harley and Ritter (2002) I now illustrate how the features relevant to my study, resulting from the syntactic derivation as shown in (7.8), are represented in the Vocabulary Items. In (7.9) I give the final form of the *Vocabulary Items* for the four-feautre bundles in (7.8), with underspecified features already excluded from the representation. For a step-by-step discussion on how underspecification of features triggers the Vocabulary Items in (7.9), as well as an example where all nominal features in a Vocabulary Item are underspecified, see *Appendix E*.

(7.9) PHONOLOGICAL EXPONENT AND VOCABULARY ITEMS FOR FEATURE BUNDLES



On this analysis, default forms arise in the absence of a specific feature specification (c.f. Caha 2009, Harley and Ritter 2002). That is, Nominative is Nominative because it is not Accusative, Dative, or Genitive. Singular is Singular because it is not marked as Plural, etc. In Greek, there are many syncretic forms (especially with Neuter nominal paradigms), which are always homophonous. In cases where there are syncretic forms in the paradigm, they are captured by a single P-EX (see *Appendix E*). However, in many cases, the under-representation of a default form based on the *Subset Principle* can create an apparent competition between different vocabulary items. In such cases the *Subset Principle* may fail to restrict the choice to the most appropriate vocabulary item. Consider the representation below:

(7.10)



The most appropriate P-EX is (7.10b): [+N-$_{CI}$ +Masc +Acc] ↔ -o. This is exhibited by the continuous black arrow. It matches all features drawn from the syntactic terminals list accessed during the syntactic derivation given in (7.10). However, the vocabulary item in (7.10a) can also be considered an appropriate choice (illustrated by the broken arrow) based on the *Subset Principle*, due to the fact that it includes: (i) a subset of the features coming from the syntactic derivation, and (ii) no contrasting features, as opposed to (7.10c) and (7.10d). Due to the fact that at least one P-EX lacks feature specification for default features, a stronger competition is created between (7.10b), the P-EX matching all the features resulting from the syntactic derivation, and (7.10a), the P-EX matching a subset of the features resulting from the syntactic derivation, than other vocabulary items with contrasting feature values. Therefore, the selection of the vocabulary item under (7.10a) shows that the *Subset Principle* failed to resolve the competition between (7.10b) and (7.10a). Notice that if underspecified features were to be included in the P-EX under (7.10a), then (7.10a), (7.10c) and (7.10d) would be equally unavailable. When the competition between the two P-EX is resolved with the choice of option (7.10a), the product of this selection

is a form containing lacking specification for two default features (Singular for Number and Nominative for Case), but does not include the targeted feature Accusative, contrary to (7.10b).

When the *Subset Principle* fails to apply, the competition between (i) the P-EX matching the entire feature bundle resulting from the syntactic derivation and (ii) the P-EX matching a subset of the features with one or more default features, and no contrasting features, sometimes fails to settle in favour of the most specified form. In that case, the P-EX with a subset of the targeted features is chosen. This could be due to the fact that the *Economy* constraint is ranked higher than the *Expressiveness* one (Kiparsky 2004). Whenever CG_{DS} fail to use the expected form, they use an alternative, that is, a universal default (Number and Person) and/or a language-specific default (Case and Tense).[102] In sum, based on these results, I propose that when blocking fails, participants result in using the least specified form, one that fails to satisfy the *Subset Principle*.

This analysis predicts that if the aforementioned feature values are indeed the default value for each feature, we should expect CG_{DS} to have the fewest problems with these values. This prediction is borne out. *Table 7.3* below gives the participants' performance with all feature values examined in this dissertation research. The designated default features exhibit the lowest number of substitutions, compared to the other feature values. That is, participants tend to substitute these forms with another feature value at a much lower rate than they do for all other values. *Table 7.3* below summarises the participants' use of match and non-match instances for each feature value, giving details on the overall number of instances a feature is targeted or expected (TARGET), the Number where a feature does not match the expected value (NM) and the

[102] In *Chapter 6* I showed that each of the feature values I assume to be the default for a specific feature are in fact the favoured values, most frequently used as alternatives. Results are summarised in *Section 6.5, Table 6.26*, showing all alternative uses to and from all Case feature values, and *6.6*, *Table 6.31*, showing how each default feature value is used relevant to the entire feature production.

proportion of the non-match instances (NM %). Instances involving /s/ omission are categorised under match instances, since we have already determined that the feature changes caused by /s/ omission are accidental. Non-match includes instances of alternative use **and** affix drop.

	CG_{DS}			CG_{TDC}		
Tense	TARGET	**NM**	**NM %**	TARGET	**NM**	**NM %**
Present	2,259	73	3.3%	2,089	20	0.96%
Past	1,197	369	30.8%	1,496	207	13.84%
Dependent	466	19	4.1%	392	23	5.87%
Imperative	174	27	15.5%	251	22	8.76%
Total	4,096	489	11.9%	4,228	272	6.43%
Person						
1st Person	1,157	70	6.1%	1,043	21	2%
2nd Person	459	36	7.8%	713	12	1.7%
3rd Person	2,480	76	3.1%	2,472	25	1%
Total	4,096	182	4.4%	4,228	58	1.4%
Number						
SG Number	3,194	78	2.4%	3,089	31	1%
PL Number	902	63	7%	1,138	31	2.7%
Total	4,096	141	3.4%	4,227	62	1.5%
Case						
Nominative	4,435	68	1.5%	4,596	17	0.4%
Accusative	5,312	234	4.4%	6,974	56	0.8%
Genitive	1,087	21	1.9%	1,620	8	0.5%
Vocative	112	9	%	59	0	0%
Total	10,946	332	3%	13,249	81	0.6%

TABLE 7.3: NON-MATCH PRODUCTIONS BASED ON TARGET/EXPECTED FORMS

Table 7.3 shows that for all inflectional features tested in this research study, the default value is the value with the lowest percentage of substitution and affix drop, i.e. the highest percentage of match with the target/expected value, for each feature. Notice that the results on *Table 7.3* show that the phenomenon observed is ***not*** driven by frequencies. This is especially noticeable with the use of Nominative and the Dependent. Hence, the *Subset Principle* is still available to adult CG_{DS} and CG_{TDC} at the ages of 7- to 8-years old, and the P-EX with all features specified in the bundle of features resulting from the syntactic derivation is selected at rates over 95%, at times.

The only difference observed between the two groups and adult CG_{TD} is that, on some occasions, where the *Subset Principle* is not applied, CG_{DS} (and CG_{TDC}) participants resolve to the least specified P-EX, matching a subset of the features included in the feature bundle more frequently.

The choice of the most appropriate P-EX, which resolves the competition, is governed by the *Subset Principle*. Note that the choice of the least specified P-EX does not include any contrasting features. It is far less common to find cases where participants prefer to use a P-EX with contrasting features. Such cases may result from either a syntactic re-organization of the structure to accommodate the production of the targeted feature (something we have seen with 1st and 2nd Person as alternative, or the Plural when used to substitute for the Gerund suffix), or they could simply be performance errors. Based on *Table 7.3* and results seen in *Chapter 6*, the *Subset Principle* (i.e. the ***Blocking*** Mechanism) is successful since it is fully satisfied over 90% of the time. That is, CG_{DS} and CG_{TDC} the appropriate targeted or expected form form matching the syntactic derivation(seen in *Table 7.3*), based on the inflectional environment the targeted production surfaces (seen in *Table 6.29*, *Chapter 6*), at rates over 90%.[103]

As shown in this *section*, all four features exhibit the same pattern: a clear preference to the target or expected form and a clear alternative, which functions as a default. An analysis based on the *Subset Principle* can provide a unified account on the availability of a favourable alternative (due to absence of feature specification for defaults) for all four verbal and nominal features examined in this dissertation (and potentially the remaining nominal and verbal features not studied here). This analysis can also justify the choice of an Infinitival form by Eng_{TDC} and Ger_{TDC}, since the Infinitival form is the default Tense form in English and German.

[103] The remaining 10% falls under the three categories discussed in *Chapter 6*: (i) omission of the inflectional suffix, (ii) use of alternative values and (iii) omission of entire words.

7.3.3.2 Phonological Features

The goal of *Section 7.3* is to provide a unified analysis under which the choice of (i) morpho-syntactic and (ii) phonological features can be accounted for. As a first step, I observed that morpho-syntactic features and phonological features present the same phenomenon. Namely, underspecified sounds replace specified sounds. However, this phenomenon does not apply to all consonants; it is restricted to voiceless stops and voiceless fricatives. The next step is to test whether we can use the same mechanism, i.e., the implementation of default features due to failure of the *Subset Principle*, to account for the phonological substitutions. I suggest that this is in fact the case and a unified analysis, can account for the phenomena found with substitution of consonants, and the alternative use of morpho-syntactic feature values.

This provides independent evidence that the differences between adult CG_{DS}, and CG_{TDC} and CG_{TD} are not syntactically conditioned, but rather morphologically (and phonologically, for the cases described below) conditioned, namely the failure of the *Subset Principle* to apply on some occasions. Specifically, when the *Subset Principle* fails, the competition between two forms: (i) a fully specified Phonological Segment (henceforth, P-SEG) matching all phonological features in a bundle of features resulting from the phonological derivation, and (ii) an underspecified P-SEG matching a subset of features cannot be resolved. I suggest that this competition is a result of the underspecification of phonological features, such that underspecified features are absent in the phonological representation found in the *Phone Inventory*. To support my proposal I draw from past literature on acquisition of *TDC* phonology.

In *Chapter 5*, apart from presenting results, we saw that participants (i) omit phonemes to avoid consonant clusters (cluster simplification), or (ii) substitute phonemes by means of regular phonological processes, such as post nasal voicing, devoicing/voicing and assimilation/

dissimilation (feature spreading), etc. However, there are many consonant substitutions that cannot be categorised under any of the two common strategies. I propose that these consonant substitutions occur due to a consonant functioning as the default within a group of consonants sharing manner of articulation and voicing (e.g. voiceless stops).

It was observed that participants have a clear preference for the stop /t/ and the fricative /x/ when not producing the expected stop or fricative found in the adult CG_{TD} production. Participants tend to use [t] as the underspecified stop mainly in the place of /k/ and /p/[104] whenever they do not produce the expected adult CG_{TD} form. For fricatives, it was observed that participants use [x] as a default in the place of other voiceless fricatives. The consistency of these substitutions suggests a systematic underlying pattern. Comparing the phonological data to the morpho-syntactic data showed a previously undetected relation between the two. Further analysis shows that the systematic phonological changes indeed exhibit a pattern parallel to the one observed for morphological features. Below, I discuss how [t] is indeed viewed as the universal default sound in child phonology, and how this relates to the analysis presented in *Section 7.3.1* above.

According to (Kiparsky 1982, Kiparsky 1985), phonological segments in a language entry do not need to be fully specified. Hence, some phonological features can be underspecified. In fact, Archangeli (1988), Archangeli and Pulleyblank (1989), Pulleyblank (1986), and Pulleyblank (1988) not only argue for underspecification of predictable features, they also suggest that *one* value *of every* feature is underspecified. This, in turn, results in underspecified phonemes, where some of their features are specified for a phonological value. Moreover, Kiparsky (1982: 82) suggests that universal phonological rules are part of the phonology of every language and specify unmarked feature values. Phonemes are left unspecified, for certain feature values in

[104] On rare occasions [t] is also used to substitute fricatives.

lexical entries, and phonological rules "fill in" feature specifications. When a phoneme is marked for a specific feature value the phonological rule is blocked from applying by the *Elsewhere Condition*. There are also language-specific phonological rules specifying marked values.

Several studies on child phonology examining underspecification are available. Stoel-Gammon and Stemberger (1994) and Stemberger and Stoel-Gammon (1991) investigate the acquisition of consonant features in child phonology. In a study on underspecification of coronals, Stemberger and Stoel-Gammon (1991) argue that anterior coronals are not specified for ***place*** of articulation in underlying forms. They argue that underspecification of phonological features is regulated by language-specific frequencies, rather than being a language universal property. Since languages have different phoneme frequencies, we should expect languages to sometimes have distinct underspecified feature values for phonological features. Underspecification of coronals predicts their tendency to assimilate with adjacent consonants, due to lack of feature specification. For Greek, Nicolaidis et al. (2003) argue that /k/ is more frequent than /t/ in Greek and is used more accurately by young children aged 2- to 5-years old. Theodorou (2007) concludes that CG_{TDC} produce dental consonants early but percentages of correct use remain low.

Stoel-Gammon and Stemberger (1994:65-66) give "the most common view" of universally specified features for place and manner specifications for some obstruents, proposed by Kiparsky (1985)[105], in a table (cited here as *Table 7.4*),[106] and test the specifications with 51 children acquiring English. Based on this table presented below, /t/ is the least specified obstruent: it is underspecified, in terms of both place and manner of articulation.

[105] In subsequent work, Kiparsky (1995) discusses three types of underspecification: (i) *Restricted Underspecification*, where redundant features are lexically unspecified, (ii) *Radical Underspecification*, where a feature is only specified if the absence of specification will cause an illegitimate value assignment and (iii) features are primitive (one-valued/monovalent), thus the unmarked value is never introduced.

[106] Place of articulation features are based on proposals by Sagey (1986).

	/p,b/	/f/	/m/	/t,d/	/s/	/n/	/k,g/	/ŋ/
Continuant		+			+			
Nasal			+			+		+
Coronal								
Labial	+	+	+					
Dorsal							+	+

Table 7.4: PLACE AND MANNER SPECIFICATIONS OF SELECTED OBSTRUENTS

(STOEL-GAMMON AND STEMBERGER 1994: 66)

In *Table 7.4* all phonemes apart from /t/[107] are marked with either one or two features. In their study when looking at the children's use of obstruents (in terms of place of articulation), Stoel-Gammon and Stemberger (1994) found a statistically significant difference with regards to the children's use of alveolars in the place of velars in non-assimilatory contexts. That is, children exhibited a preference for the alveolar [t] in the place of the velar /k/ reflected in the order of acquisition of the developing phonological system, i.e. /t/ and /d/ are acquired early. Moreover, they suggest that underspecified segments play the role of "substitutes" for consonants that develop at a later stage. Bernhardt and Stemberger (1998) provide an OT analysis, discussing the children's preference for default forms. They conclude that all children possibly start with a universal set of underspecified values, but they suggest that a small percentage of children might have unexpected defaults. During different stages of language acquisition, based on the feedback children receive while using the universal defaults, they replace these defaults with language-specific default values. High input- and output-word frequencies drive the choice of the underspecified form.

In *Table 7.5*, I provide a confusion matrix table for each group, summarising all consonants tested in this study. Light green cells forming a diagonal line give the number of consonant productions that were used as targeted. The combination of consonants in the first column and

[107] CG is reported to lack underlying voiced stops (Arvaniti 1999). The production of voiced stops occurs through phonological processes such as post nasal-voicing.

second row show the number of instances a consonant was produced (found vertical) in the place of another (i.e. substituted) consonant (found horizontal). Columns highlighted in blue show the sounds that are most commonly used to substitute for other sounds. More explicitly, it shows how for CG_{DS}, [t] functions as the default for voiceless stops, and [x] functions as the default for voiceless fricatives. In *Table 7.5* I also give the number of omissions for the tested consonants, for convenience, since these were extensively discussed in *Chapter 5*.

Table 7.5 below shows that /p/ (2.4%) and /k/ (7.2%) are substituted by [t] in a number of environments, whereas the reverse case **is** possible (/t/ to [k]), as expected,[108] but presents a much lower substitution rate: 0.8% for CG_{DS}. We do find [t] substituting for other obstruents, especially non-labial fricatives and velars, as predicted by the Stoel-Gammon and Stemberger (1994) analysis. This would, of course, suggest that the manner (pharyngeal) features of [t] are also underspecified, which is what Stoel-Gammon and Stemberger (1994) propose on the basis of consonant harmony, cluster reduction data from much younger Eng_{TDC}, and data from substitutions. Furthermore, Stoel-Gammon and Stemberger (1994) predict that [t] might substitute for /s/, but [p] for /f/, etc. However, the percentages of [t] substituting fricatives, nasals etc. are quite small for adult CG_{DS} and 7-8-year-old CG_{TDC}[109]. Parallel results are also observed for CG_{TDC} but the percentages of substitution are much lower, as discussed in *Chapter 5*.

[108] /t/ to [k] substitution is possible because, according to Stoel-Gammon and Stemberger (1994: 67), it is easier to "convert an unspecified segment such as /t/ to a specified one such as /k/". This is, of course, more plausible in non-assimilatory environments.

[109] In theory, given that /t/ is completely underspecified and that it is quite simple to have either assimilate manner features from adjacent phonemes and change into a new phoneme or geminate the adjacent phoneme "by putting the features into a blank spot", as Stoel-Gammon and Stemberger (1994: 57) note, because there are no features associated with it. But this is not what we observe with the CG data. Instead of a high rate of /t/ assimilation and "transformation" into a different phoneme, we see [t] functioning as the substituting phoneme to other voiceless stops, and at a much lower rate to consonants other than stops.

CGDS																			
	Voiceless Stops			Voiceless Fricatives						Voiced Fricatives				flap	Lat app	Nasal		omission	
Target	p	t	k	f	θ	s	ʃ	ɬ	x	v	ð	z	γ	ɾ	l	n	m	∅	
p	3650	99		1	3				10	1				1	1	4	17	147	p
t		5552	51						1									332	t
k	1	317	3481						23		1		8	1		1	3	170	k
f	12			823	7	1			33	65	1				1			118	f
θ	9	7	1	12	457	23	5		232	1	3	1	3			1		92	θ
s		6		3	77	3739	15	51	115		10	8		2		14	8	2057	s
ʃ			6		3	38	147		3			3						32	ʃ
ɬ								∅										∅	ɬ
x						32			1246							5		175	x
v	54	8	1	12						797	4		5	1	1	2	7	255	v
ð	3	11	5		1	4			4	15	592	18	21	6	16	8	1	147	ð
z					3	28			8		11	586						59	z
γ	4		4						9	1			593		3	7	2	112	γ
ɾ		4	1	3	2	2			13	3	6	1	13	2288	60	19	1	883	ɾ
l		1	1	1						1	4		4	18	2424	12	1	223	l
n		16													73	4812	17	835	n
m	19	2				19				8						9	3033	67	m

TABLE 7.5: CONFUSION MATRIX FOR CONSONANT SUBSTITUTIONS AND OMISSIONS BY CG_{DS}

Next, I provide a confusion matrix for CG_{TDC}. In *Table 7.6*, cells forming a diagonal line (light green) give the number of consonant productions that were used as targeted. The combination of consonants in the first column and second row show the number of instances a consonant is produced (vertical) in the place of another (substituted) consonant (horizontal). Columns highlighted in blue show the sounds that are most commonly used to substitute for other sounds. We observe similarities in the performance of the two groups. For example, [t] and [x] are the sounds found to function as the consonants most frequently substituting for other consonants.

In *Tables 7.6*, we observe that CG_{TDC} produce consonants as targeted far more frequently than CG_{DS}, and consequently cases where a consonant is substituted or is used to substitute for another consonant are far less. A striking difference between the two groups is that while CG_{DS} use [t] to substitute for sounds other than voiceless stops, CG_{TDC} restrict their use of [t] as default to only /p/ and /k/. Next, I show how the analysis used in *Section 7.3.2.1* for morpho-syntactic features can also be used with phonological features to account for the differences found between the two groups.

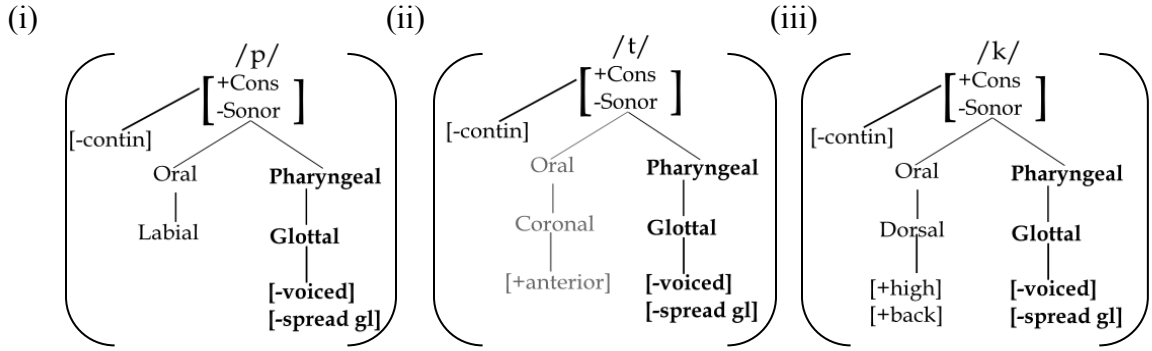
CG$_{TDC}$																			
	Voiceless Stops			Voiceless Fricatives						Voiced Fricatives				flap	Lat app	Nasal		omission	
Target	p	t	k	f	θ	s	ʃ	ɬ	x	v	ð	z	γ	ɾ	l	n	m	∅	
p	4158	3	6	2					2	1						1	3	21	p
t		6496	65															54	t
k		33	4459						3									27	k
f				1522					6	11								5	f
θ				2	953	2			28									3	θ
s					3	7777			3			7		1		5		199	s
ʃ						2	159		1									0	ʃ
ɬ								∅										∅	ɬ
x			7	1					1328		2							17	x
v	1			5					1	1592								49	v
ð				1	1				4	1	1502	1						14	ð
z						4						614						6	z
γ			2						2				974					8	γ
ɾ											1	1		3635	9	1		65	ɾ
l				5									1		3047	2		14	l
n						2					3			2	2	7272	3	256	n
m			1			4										4	3381	39	m

* /m/ Gemination: 16

TABLE 7.6: CONFUSION MATRIX FOR CONSONANT SUBSTITUTIONS AND OMISSIONS BY CG$_{TDC}$

Based on the information in *Table 7.4*, the phoneme /t/ has (at least) no specified (Oral/Place) features. Therefore, I propose a feature geometric representation of the consonants [p], [t] and [k] for Greek. The representation is reminiscent of an approach used by Avery and Rice (1991), used to talk about the representation of underspecified (Coronal) phonological features.

(7.11) FEATURE TREES – PHONOLOGICAL REPRESENTATION OF PHONEMES /t/, /p/ AND /k/



(7.11) illustrates the phoneme representation in the phone inventory. The underspecified features for the phoneme /t/ (in grey) are not represented in the phonological entry. Notice that the highlighted features, under the pharyngeal (Manner) branch, are the same for all stops. What differentiates them is the branch representing information on the Place of articulation (Labial for /p/, Coronal (Alveolar) for /t/ and Dorsal (Velar) for /k/).

If we assume that phonological feature geometry functions just as above for morpho-syntactic features, then we can explain through the *Subset Principle* analysis why it is that [t] can substitute for /p/ and /k/. Therefore, if indeed we have the same system as with morpho-syntactic features (i.e. default features are not specified), we would expect that the *Subset Principle* fails to apply, and the competition between (i) the targeted phoneme with all specified features and (ii) the least specified but also compatible consonant, is not resolved in favour of the former. That is, even though there are no contrasting features in these two phonological representations, the most specified form fails to block the least specified form.

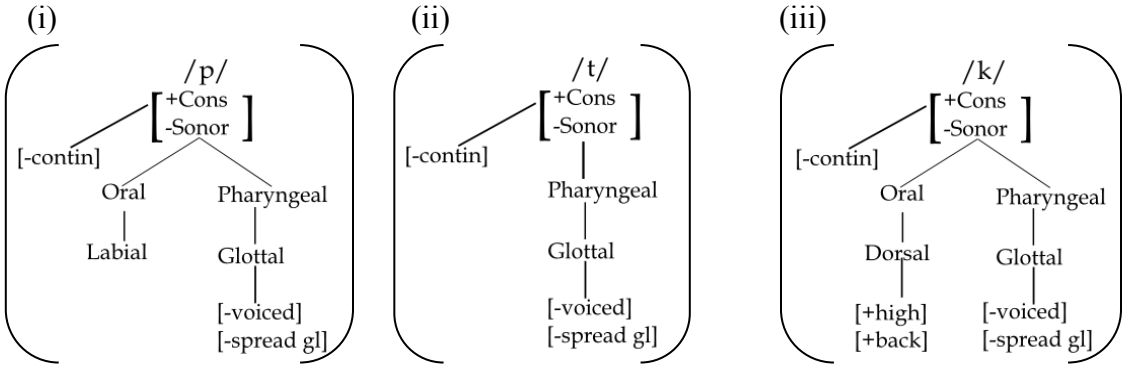
According to Sagey (1986) and Stoel-Gammon and Stemberger (1994) /t/ is not specified for the Oral features (i.e. Coronal for /t/), or is completely underspecified, while /p/ and /k/ are specified at least for Place of articulation features (referred to as Oral in phonological representations, and hereafter). As stated above, the expected analysis framework would be OT. [110] However, though not typical, this type of representation does exist in phonology, and it is related to some proposed mechanisms (c.f. Avery and Rice 1991). I decided that the use of this mechanism would allow me to draw a parallel with the morpho-syntactic analysis, and illustrate how structured the CG_{DS} grammatical system is. Thus, features come from the phonological derivation[111] as follows:

(7.12) POSSIBLE FEATURE BUNDLES RESULTING FROM PHONOLOGICAL DERIVATION

a. (-contin, Labial, Glottal, -voiced, -spread gl) b. (-contin, Coronal, Glottal, -voiced, -spread gl) c. (-contin, Dorsal, Glottal, -voiced, -spread gl)

With underspecified Oral features for /t/, the P-SEG for the three stops should have the following representation in the phonological items list:

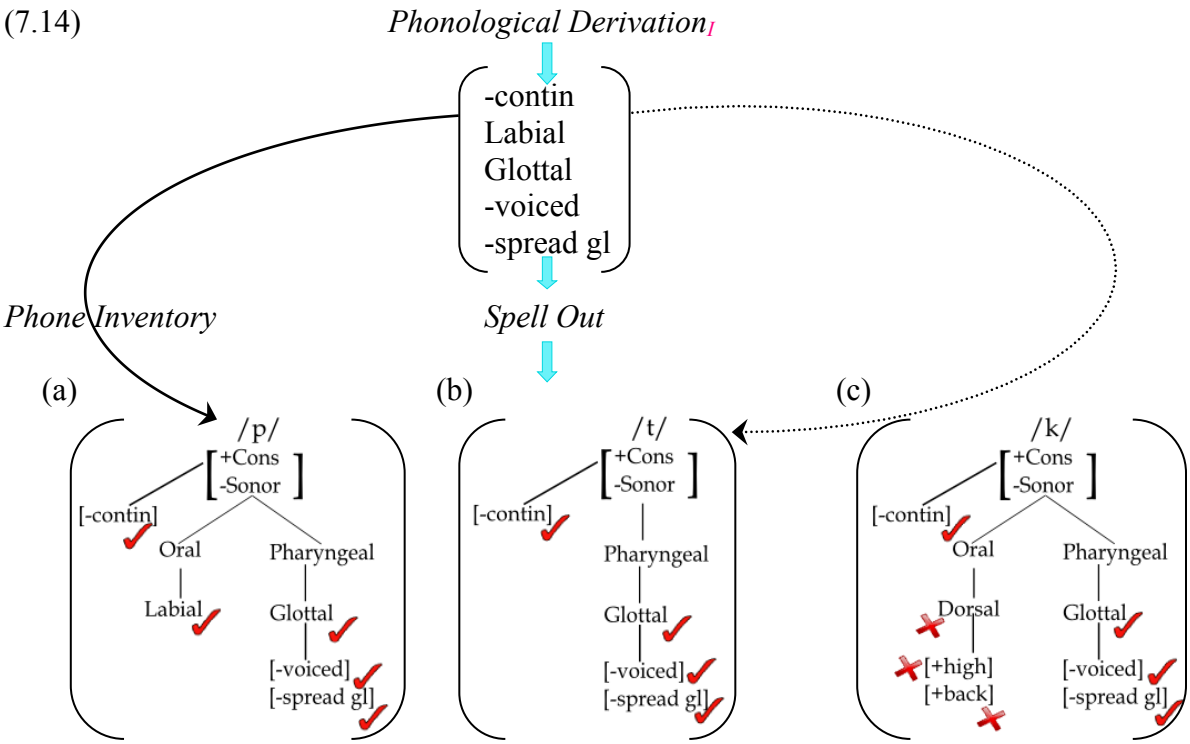
(7.13) PHONOLOGICAL ITEMS FOR FEATURE BUNDLES



[110] For an Optimality Theory analysis see (Bernhardt and Stemberger 1998).
[111] Terminology adapted from (Kiparsky 1995).

The phonological derivation produces the set of features at the top of the representation in (7.14). The *Phone Inventory* is accessed to select the most appropriate P-SEG matching the features resulting from the phonological derivation.

(7.14)



Note that what I am proposing above is not the equivalent of the typical phonological derivation occurring to e.g. decide between allophones (i.e. optimal candidates). I propose that this may be an additional step, which occurs between morpho-syntactic derivation shown in *Section 7.3.2.1* and the phonological derivation, just before the production is sent to PF. The most appropriate P-SEG is (7.14a). It matches exactly all the features resulting from the phonological derivation. In the case of *Subset Principle* failure, even though no contrasting features are found in the phonological items (7.14a) and (7.14b) (as opposed to (7.14c)), the competition between the two compatible forms is not resolved in favour of the more specified one. Therefore, this is an additional step that takes place ***after*** a bundle of syntactic features has resulted through a syntactic derivation, and moved to *Spell Out*, where a P-EX from the Vocabulary Items list is

assigned to it. Later, before the form is sent to LF and PF, a second type of derivation, a phonological one takes place. The bundle of features resulting from this phonological derivation, go through phonological *Spell Out*. The Phone Inventory is accessed and they are assigned appropriate P-SEG, before they reach PF where the typical phonological derivation takes place.

Breaking it down into a two-step process, we can explain how the bundle of features resulting from the morpho-syntactic derivation is still possible to change, even after the appropriate P-EX has been assigned. As seen in *Chapter 5*, a suffix like /os/ may surface as [ox]. I propose that the change of /s/ to [x] occurs after the appropriate P-EX has been assigned. I further propose that the phonological derivation stage happens after the *Spell Out* of morpho-syntactic features and the assignment of the appropriate P-EX. Otherwise, how can a sound change occur before the P-EX, capturing the bundle of features resulting from the syntactic derivation, is assigned to it? Results do show that the CG_{DS} and CG_{TDC} and CG_{TD} Grammars, with regards to inflectional features, are syntactically and morphologically identical at a percentage higher than 90%, excluding phonological and articulation issues. An alternative would be to propose that the two-step process is in fact a one-step process. More explicitly, we could argue that multiple phonetic exponents exist for the same bundle of features like [os], [ox], [oθ] etc., and during the vocabulary insertion stage the most prominent one is selected. However, multiple problems arise with such a proposal. First, such a system would be computationally costly. Therefore, with the evident problems individuals with *DS* face with their verbal and phonological short-term memory, such a system would cause great confusion. Second, what would govern the choices of the different phonological representations? That is, how do we select which ones would correspond to which bundle of features? Would it be based on problematic phonemes, or all possible vowel-consonant combinations? Third, what would be the motivation of having

different phonological representations for the same phonetic exponent? If the motivation is articulation difficulties, then in such a case, every lexical root and every inflectional suffix would have multiple phonological representations, something we do not observe. The substitutions observed with CG_{DS} are quite systematic. Thus, I conclude that, based on the results presented in this dissertation, a two-step process appears to be a more plausible explanation.

Furthermore, during the phonetic and phonological analysis, what we also see very clearly is that a number of fricatives are substituted by the velar fricative [x] that consistently functioned as the default for fricatives (see *Tables 7.5* and *7.6*). Below, I show the consistency with voiceless fricative substitutions is similar to the one observed with the stops. Below, I illustrate how the observed pattern can be accounted for by the general idea of feature geometry and underspecification of default features under the *Subset Principle*, or rather the lack thereof. Based on cross-linguistic data as well as the frequency of occurrence for voiceless fricatives, we would expect the Coronal /s/ to function as the default for voiceless fricatives. However, in *Chapter 5*, I established that that the equivalent voiceless fricative expected to play the same role, namely /s/, is problematic, due to articulatory restrictions. Though unusual, results show that /x/ assumes the role of the most favoured alternative for voiceless fricatives, as a secondary default fricative.[112] Moreover, though no such study is available, it seems that the use of [x] as a default could also be dialect-specific. More explicitly, in many varieties of the CG dialect, especially the ones spoken in the provinces of Paphos and Ammochostos, adult speakers

[112] At first glance, this effect could potentially parallel the results with Person; while 3rd Person appears to represent absence of a Person value, between 1st and 2nd Person, and1st Person is the underspecified value out of the two (i.e. under the *Participant* note) (Harley and Ritter 2002). However, the unexpected percentage of alternative use observed with 1st Person, could also be credited to an experimental stimuli/methodology effect, where participants exhibited some difficulty in repeating experimental stimuli where 1st and 2nd Person was used, i.e. they would alter the 1st Person as 2nd making it refer to the speaker, and 2nd as 1st, considering that the experimental stimulus was referring to them. Hence, at this point it's inconclusive as to which is the most plausible explanation, or whether in fact both played a role in the use of the 1st Person value as an alternative.

frequently substitute voiceless fricatives with [x] as in: /**θ**e.lo/ → [**x**e.lo] 'want', /ka.**θ**a.ri.so/ → [ka.**x**a.ri.(s)o] 'clean' , /**f**o.ri/ → [**x**o.ri] 'wear'. These substitutions may result in ambiguity, which is resolved by the surrounding context. Therefore, [x] is the default fricative not only for the CG_{DS} Grammar, but for the CG adult and CG_{TDC} Grammar (as seen in *Table 7.6*).

I assume that, just like /t/, the Oral features for /x/are underspecified. Thus, we can deduce that [x] functions as a default for fricatives, in the same way [t] does for stops. Hence, the representation for features for /f/, /θ/, /s/ and /x/ resulting from the phonological derivation and P-SEG representation in the Phone Inventory is as follows:

(7.15) POSSIBLE FEATURE BUNDLES RESULTING FROM PHONOLOGICAL DERIVATION

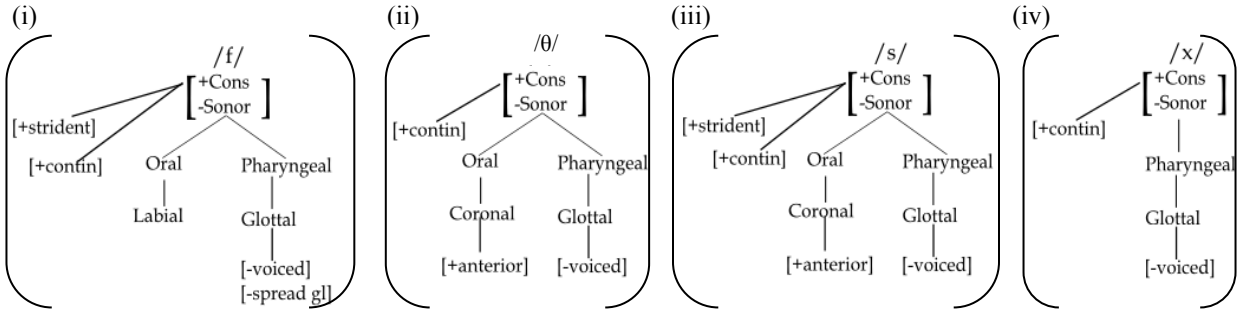
a. (+contin, +strident, Labial, Glottal, -voiced, spread gl)

b. (+contin, Coronal, +anterior, Glottal, -voiced)

c. (+contin, +strident, Coronal, +anterior, Glottal, -voiced)

d. (+contin, Dorsal, +high, +back, Glottal, -voiced)

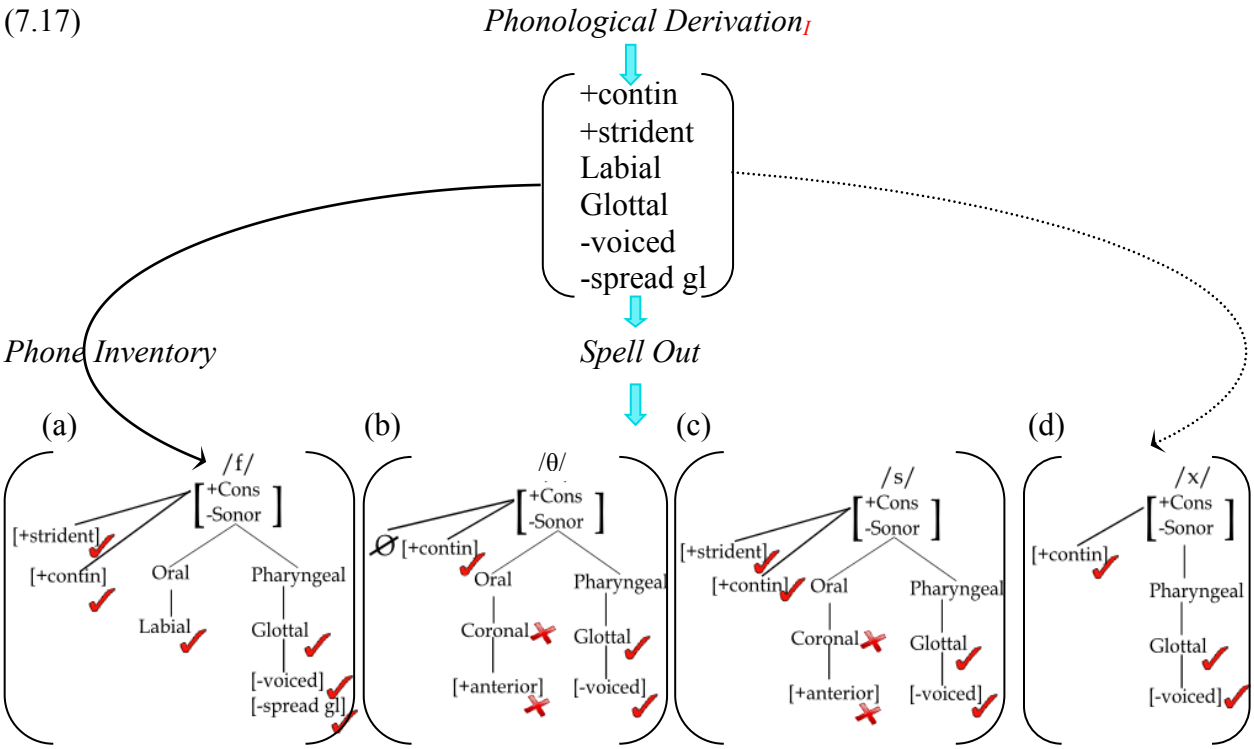
(7.16) PHONOLOGICAL ITEMS FOR FEATURE BUNDLES



The phonological derivation produces the set of features seen in (7.15).Tthe matching P-SEG are found in (7.16). Notice that, all four voiceless fricatives have the same features under the Pharyngeal note (apart from the additional feature [-spread gl] under /f/) and all four are associated with the feature [+continuant]. The selection of the most appropriate P-SEG is done in

the following way. The phonological derivation produces the feature bundle found at the top in (7.17). The phonological items include the relevant choices seen in (7.17a) through (7.17d).

(7.17)



While the full black arrow shows how the P-SEG in (7.17a) includes all six features resulting from the phonological derivation and should be the optimal choice, the broken arrow shows that the P-SEG in (7.17d) is also a possible choice since all of its features are a subset of the bundle of features resulting from the phonological derivation. Moreover, it includes no contrasting features or absence of a feature as opposed to the items in (7.17b) and (7.17c).[113] The underspecification of the Oral node makes (7.17d) available. Two out of the four choices exhibit a stronger competition: one matches all features (7.17a) and one matches a subset of features (7.17d) resulting from the phonological derivation. In the absence of contrasting features, either of the

[113] Given the similarity of feature specifications for /s/ and [θ] it is not surprising that we sometimes find [θ] substituting for /s/, and /s/ alone, whereas [x] may substitute for any other voiceless fricative. Failure of the *Subset Principle* can account for this result, since [θ] includes a subset of features found in /s/ but lacks the specification [+strident].

two P-SEG under (7.17a) and (7.17d) are compatible. When the *Subset Principle* fails to apply, the competition between the two is not resolved in favour of the more specified one.

The question remains, whether what has been observed for voiceless stops and voiceless fricatives, is also the case with voiced fricatives. *Tables 7.5* and *7.6* above clearly show that we have very few instances of [x] substituting for a voiced fricative. Moreover, though some substitutions across voiced fricatives are recorded, there is not a single voiced fricative, functioning as a default for other voiced fricatives. Results in *Chapter 5* (*Tables 5.1* and *5.12*), show that voiced fricatives mostly exhibit omission. On some occasions we find devoicing of fricatives to their voiceless equivalent, or feature spreading.

Failure of the *Subset Principle* can adequately account for the remnant of phonological differences found between CG_{DS}, CG_{TDC} and CG_{TD}. More explicitly, phonological substitutions not explained through the phonological processes, normally observed during language acquisition and adult speech, can now be accounted for by failure of the *Subset Principle*. The fact that the use of default consonants, and the fact that these do not fall under either of the processes listed above, is perhaps the reason why the phonological changes observed in Eng_{DS} have been characterised as inconsistent (Dodd 1976, Kumin 2006). However, as illustrated in this section, a global overview of consonant use across different phonological environments (i.e. syllable structure and word position) enabled me to uncover a structured system behind the phonological substitutions. With systematic and consistent substitutions, underlying/expected consonants are substituted by a default consonant sharing manner of articulation and voicing.

In sum, alongside with the analysis on the morpho-syntactic features, there are three major points to be made: (i) there is more than a 90% preference towards the expected *TD* adult form; (ii)

there is a strong preference for an alternative form, which includes a subset of the features found in the target form (but no contrasting features); and (iii) there is a structured system that governs the choice of most substitutions, i.e. defaults used as alternatives. Substitutions other than the ones described above may result from a number of phonological processes. This system is based on default consonant choices with underspecified Oral features, within obstruents grouped by manner of articulation; depending on the manner of articulation, [t] for stops, [x] for voiceless fricatives. The alternative choice, the one matching only a subset of the features resulting from the phonological derivation surfaces when the *Subset Principle* fails to resolve the competition between this form, and the one matching all features resulting from the phonological derivation.

Considering the morpho-syntactic and phonetic and phonological results I argue for a unified analysis. In particular, I argue that the Grammar of CG_{DS} is characterized by a failure of the *Subset Principle* to fully apply. This allows us to understand the residue of the morphologically as well as the phonologically conditioned differences. In conclusion, this analysis not only provides a uniform explanation concerning the morpho-syntactic results, but, I propose that, it extends further, beyond the boundaries of morpho-syntax into the field of phonology, to also account, for purely phonological substitutions in a uniform way. The differences observed between CG_{DS} and CG_{TD} are not due to a morphological or syntactic impairment, as suggested in previous work, but to a more general property of the Grammar.[114]

One question remains; how can full-word omission and affix drop be accounted for? Above, I have shown that full-word omissions cannot be syntactically conditioned. These cannot also be accounted for by an explanation based on the failure of the *Subset Principle*. However, in *Section*

[114] An alternative analysis that partially accounts for the morpho-syntactic differences observed between the two groups is found in *Appendix E4*.

7.2.3, I suggested that omission of full-words and affixes involves a stage of the Grammar after features reach *Spell Out*. More explicitly, as with default features, omission of full-words is due to difficulties with *Vocabulary* insertion. I first discuss copulas and auxiliaries, and then the remaining word categories and affix drop.

I propose that auxiliary and copula omissions in adjectival and nominal predicates can also be explained under this system. An explanation can be provided when consulting the general view on the *Blocking* mechanism. Therefore, instead of just the *Subset Principle* being affected, I argue that it is the entire *Blocking* mechanism that sometimes fails to apply. More specifically, according to Kiparsky (2004) *Blocking* results to a competition between the constraints of *Expressiveness* (express meaning) and *Economy* (avoid complexity) and organises expressions into paradigms. It can be assumed that in the case of copula and auxiliary omission, the *Economy* constraint is ranked higher than the *Expressiveness* constraint. Thus, in the case of the auxiliary omission, it can be perceived that the Subjunctive clause for example, is enough to provide all necessary information needed.[115] In the case of copula omission, the information given by the subject phrase, once again shows that the copula is there underlyingly, i.e. its function is present, but lacks phonological content. It seems that the auxiliary in such cases arguably serves a functional role (c.f. English *do* (Chomsky 1991) but lacks content) is added to serve a function. This suggests that a feature bundle for both the copula and the auxiliary has resulted through a syntactic derivation process. When a P-EX needs to be assigned to the bundle of features, and shipped off to PF, the higher ranked constraint of *Economy* (over *Expressiveness*) prevents vocabulary insertion and the bundle of features maintains the function, whithout receiving a

[115] Note that the omission of the auxiliary does not cause a functional difference to the structure, while it only sometimes affects the meaning. However, since it is also commonly dropped in adult CG_{TD}, it can be assumed that it is present underlyingly.

phonological representation (i.e. content). This process is further facilitated by the fact that, though copulas and auxiliaries carry function, they are semantically vacuous. Therefore, high percentages of auxiliary and copula omission present the same phenomenon with the selection of default features, where the difficulty lies at the stage of *Vocabulary Insertion*.

I propose that full-word omission, like auxiliary and copula omission, can also be accounted for in terms of problematic vocabulary insertion, as previously suggested by Sanchez (1997) for agrammatics. I hypothesise that the targeted or expected word fails to appear in the appropriate position because when the (root+)feature bundle reaches the stage where it is assigned phonological content, before it is sent to PF and LF, vocabulary insertion fails to apply. The same can also be hypothesised for consonant omissions, for the relevant stage. As proposed above, the vocabulary insertion stage for morpho-syntactic features occurs after spell out and before the PF level. The stage where the phone inventory is accessed, and P-SEG assignment takes place, may occur just before PF, where the traditional phonological derivation takes place. However, this is a mere speculation; further analysis is needed to determine if this is in fact the case. The same occurs with affix drop, where, while the root is assigned a vocabulary item, the feature bundle is not. I propose that the function of omitted words and suffixes is available, due to the fact that Case assignment and ϑ–role assignment is not affected by the absence of a verb.

In conclusion, the unified analysis presented in *Section 7.3*, sets forward a proposal, rather than a commitment to the specific theory. I use the current proposal because, based on the current results, it allows me to provide a unified analysis. Despite the fact that the three phenomena examined in this Chapter have different surfacing results, I propose a common origin/source triggering (i) default feature use for morpho-syntactic features, (ii) full-word omission and (iii)

affix drop. The same can also be argued for phonological defaults and consonant omission. However, it should be clarified that this is an analysis in progress, to be tested across *DS* in other languages and different ages.

One question remains; why difficulties at the *Vocabulary Insertion* stage appear? One possibility could be that the short-term memory problems that *DS* individuals have may affect the application of vocabulary and phone insertion. More explicitly, the phenomenon observed with phonological features may be due to failure of the phonological short-term memory, while the phenomenon observed with morphological features may be due to occasional failure of the verbal short-term memory. That is, the memory span fails before a P-EX, a root or a P-SEG is assigned to the derived features, and root.

In conclusion, the results presented in this study can be adequately accounted for by a general analysis based on *Blocking* failure. More explicitly, the performance observed with CG_{DS} and CG_{TDC} is a result of how the two constraints of *Expresiveness* versus *Economy* would be ranked. We find this on two levels. First, the *Subset Principle* is satisfied when *Expresiveness* is ranked over *Economy* and the appropriate P-EX, matching all features resulting from the syntactic derivation is selected. When the reverse ranking occurs, potentially due to memory limitations, the participants go for the least specified form, which results in a violation of the *Subset Principle*. Second, as discussed above, omission of entire words, especially auxiliaries and copulas, as well as affix omission, is also credited to the violation of the optimal ranking (i.e. *Expresiveness* over *Economy*). Instead, when *Economy* is ranked over *Expresiveness* we find a violation of the *Blocking* mechanism, which results in the lack of the phonetic realisation of a targeted or expected word. However, the underlying inflectional features of the word are still

present, since syntactic processes associated with the unpronounced words like ϑ–role assignment, Case assignment, *S/V* agreement etc. are still in place. Once again, this could potentially be explained as an instance of memory failure, where after the functional component of the Grammar is completed, the verbal (or phonological) short-term memory fails, and prevents participants from choosing the appropriate P-EX. Therefore, all data presented in this dissertation can be explained based on a *Blocking* mechanism failure (the *Subset Principle* being a more refined version of *Blocking*), where all observed effects occur at the *Vocabulary Insertion* stage.

Before concluding this section, some important disclaimers are in order. First, I would like to make clear that this dissertation focuses on the production of the CG inflectional, phonetic and phonological system of the two participant groups. Hence, based on the presented results, the proposed analysis relates primarily to the participants' productions (i.e. performance). If we assume that, performance reflects the participants' competence with the inflectional system, then we could argue that the observed discrepancies in the performance are a direct effect of the participants' comprehension and competence of their inflectional, phonetic and phonological system. However, existing literature has shown in the past that even though some grammatical phenomena may be produced by participants (especially in imitation production tasks), they do not necessarily capture their underlying grammatical system, and vice versa. That is, participants may be unable to produce certain grammatical elements/structures but those may exist in their grammatical system (as confirmed by comprehension experiments). This issue is also directly related to the ongoing debate on whether controlled elicitation experiments can provide information on both production and comprehension, and whether participants are able to repeat an experimental stimulus, without fully being able to comprehend the grammatical mechanisms at work. Future research with additional testing on comprehension will enable us to draw firm

conclusions on whether the CG_{DS} and CG_{TDC} performance mirrors their competence of the inflectional, phonetic and phonological system of CG.

Second, though we have seen some similar effects with grammatical structures (Subjunctive instead of Imperative and a relative clause instead of Subjunctive), I am making no claims that this analysis extends to any other parts of the grammar other than moprho-syntactic and phonological features, and other than the ages groups tested.

Third, as it was clarified numerous times, findings do not support syntactic underspecification. However, perhaps when this analysis is extended to younger ages for both groups (and potentially other atypical populations, due to a different genetic development), we could either find that what was viewed thus far as underspecification of the syntactic features (Tense in particular), is in fact a case of morphological and phonological restrictions or a broader version of the current analysis which encloses syntactic, morphological and phonological underspecification, due to memory failure or other computational issues. However, once again based on the current data from the two participant groups, such claims cannot be made.

7.3.3.3 Potential Alternative Analyses

As a final step of the analysis, it was considered beneficial to draw from previous analyses on both typical and atypical language development to evaluate whether (i) other analyses may potentially account for the results presented in this dissertation research, and (ii) whether information from the results and analyses of other populations could give a different insight to the performance of CG_{DS}.

With regards to other plausible analyses, note that the language performance of CG_{DS} and agrammatics differs in at least one fundamental property: while *DS* is a genetic disorder and displays an atypical, yet structured development, with systematic differences with *TD* and *TDC* populations, Sanchez (1997) notes that agrammatics exhibit non-systematic differences, where both omissions and substitutions do not follow a particular pattern. Specifically, omissions are not restricted to a specific word carrying certain inflectional features, and substitutions (what I refer to as alternative use) are described as bi-directional (substitutions do not exhibit a specific preference). On the contrary, with *WS* we do not find selective deficits in comparison to the *TD* language development (Karmiloff-Smith 1998, Thomas et al. 2001). Rather, *WS* are characterised by a disordered developmental system that has evolved following a developed trajectory, shaped also by factors other than grammatical development, like neuro-computational impairment, and interaction with the environment. Though the basis of the analysis on agrammatics, proposed by Sanchez (1997), is similar to the one proposed here, namely *Vocabulary Insertion* difficulties, the phenomena observed in her study and the ones reported here, present principal differences. The most essential difference is the lack of systematicity with her results, which we find in the CG_{DS} data, with alternative feature values and default/underspecified phonemes. Further, results presented in this dissertation also show that what characterises the CG_{DS} productions cannot be explained as an impaired or deficient version of CG_{TD} productions; rather, there seems to be a distinct development with regards to certain grammatical properties and the phonetic and phonological system.

An additional alternative analysis is one based on Gopnik (1990). Gopnik (1990) proposes an analysis based on feature blindeness, where she argues that the dysphasic participant in her study lacks syntactico-semantic features in his Grammar and in accordance, morpho-phonemic rules

and rules that match features in the syntax are also not available to him. Though we find some similarities between the results of this study and the data presented in Gopnik (1990) (e.g. intact thematic role assignment), the differences are much greater, and therefore, such an analysis is not a plausible one to account for the performance of CG_{DS} (and CG_{TDC} to a lesser extent). First, she finds problems with determiner-noun agreement. This is limited to less than 1% in the current data. Second, the systematicity of alternative feature use observed by Gopnik is very different from the one observed for the participants of my study; outside of the overwhelming majority of accurate productions that match the target, among the thousands of uses of the feature Tense, we only find 4 instances of Past used as an alternative, whereas Gopnik reports numerous from just one participant. CG_{DS} and CG_{TDC} systematically use Present. Third, Gopnik assumes that features are absent altogether, and along with them the syntactic information they carry; apart from the fact that over 90% of the features are assigned as targeted, additional counter-evidence to such an analysis comes from syntactic reorganisation, especially with features that are in agreement. Specifically, the fact that participants are able to re-produce a structure successfully based on a given stimulus, shows that they are not only able to use syntactico-sematic features grammatically, but they are also aware of what the target features are, and what a grammatical an appropriate alternative is (see change from 1st to 2nd Person examples and alternatives to Gerunds in *Section 7.2.2*). Therefore, participants are not "blind" to or missing inflectional features. Given the evidence provided here, an analysis based on feature blindness cannot explain the differences observed between the two groups and CG_{TD} adult language.

An opposing view would be that the subset is applied in reverse, i.e. with regards to Semantics, children produce the most specified form, since that encloses all other forms, including the underspecified form. Under this analysis we would expect to see the feature values of Genitive

for Case, Plural for Number, 2nd for Person and Past for Tense to be the most frequently alternative values used by the two participant groups, because those are the most specified forms for each inflectional feature. Therefore, the current percentages we find with the proposed default feature values would be observed with these values instead. However, we find that these are in fact the feature values used as alternatives the least. Alternatively, we would then always expect the P-EX for the derived bundle of features with the chosen form, or the most specified form. However, neither of those two predictions is verified by the data presented in this dissertation. Therefore, the fact that they are not, and that the selected alternatives are observed with forms including underspecified features, confirms that an analysis based on the *Subset Principle* and the *Blocking* mechanism failure, in general, is the most appropriate analysis to explain both the morphological and phonological differences between the two groups and CG_{TD}. Further support comes from the differences observed with phonological features, where there is a limited type of substitutions, which present the same pattern as morphological substitutions.

The traditional *Subset Principle* in child language Acquisition literature is based on parameter setting (i.e. a parametric learning system, where the Grammar of children is a subset of the superset target (i.e. adult) Grammar (cf. Manzini and Wexler 1987). Based on the *Subset Condition*, values of a parameter are generated, that are in a subset relation to one another. The *Subset Principle* determines the choice between two or more values of a parameter just in case the languages they generate are ordered by proper inclusion (ensured by the *Subset Condition*). Results from this research study, as well as the proposed analysis do not support such an analysis. First, given the data we cannot conclude that the CG_{DS} Grammar is a subset of the superset CG_{TD} Grammar for numerous reasons laid out in *Chapters 5* though *7*. Second, the traditional *Subset Principle* for language acquisition considers that the proposed subset-superset relation is one found within syntax (i.e. during syntactic derivation). Ample evidence discussed

in this dissertation show that this is in fact not the case with CG_{DS} and CG_{TDC}. That is, for this analysis to be plausible, we would expect that the *"Subset Grammar"* would not apply to only a single individual feature, when at work, but would affect other, syntactically related, features.

Next, an analysis by Musolino (2006) questions the *Semantic Subset Principle*, proposed by Crain and Thornton (1998), as a plausible analysis for the challenges children meet with narrow versus wide scope (subset versus superset) readings. It was argued that children tend to choose the most specific reading of an ambiguous sentence, whereas the most general reading becomes available to them at a later age. However, Musolino (2006) argues that the *Semantic Subset Principle* is not a possible explanation to account for the semantic restrictions observed with children and that, based on empirical data and consideration of language variation, problems in the acquisition of semantics do not even exist in the first place. Though he clearly states that he is in no way arguing that (i) his findings with regards to acquisition of semantics extend to the acquisition of syntax and (ii) the *Subset Principle* is a viable analysis, let us explore the idea that this is also true for morpho-syntactic situations. The *Semantic Subset Principle* would be parallel to my analysis only if I argued that the most specified form is not available to CG_{DS}. However, I am not arguing that CG_{DS} start with the smallest grammar and then build on it. I am proposing that the entire grammatical system is available at this stage (i.e. the superset option is therefore possible), but when the system of selecting the most appropriate P-ex fails, potentially because of memory failure, CG_{DS} go for the computationally least costly option. This can also be verified from the fact that the same is also true for TD adults, who would select the least specified form when no information for the selection of the most specified form is available (c.f. Schütze 2001: absence of syntactic information leads to the choice of default Case).

Finally, there is a similar approach to mine, suggested by Snyder (2007), the *Grammatical Conservatism*, for the spontaneous speech of children when acquiring a language. Snyder (2007) discusses a number of studies on Dutch, English, Korean and Spanish child language acquisition and concludes that when learning a language, children, similarly to the CG_{DS} adults in this study, show an evident preference in the avoidance of producing grammatical stuctures or words they have not acquired, rather than the incorrect production of a structure. Data presented in *Chapters 5* and *6* evidence higher rates of full word and consonant omission than incorrect use for CG_{DS}. He argues that children are conservative by preference, and therefore *Grammatical Conservatism* is not found in elicited productions because the methodology employed to collect such data may guide children to produce certain structures that are part of neither the adult grammatical system, nor the grammatical system children are comfortable using. Hence, children produce very few errors and tend to omit full words instead, or refrain from producing some structures they have not acquired because they are conservative speakers and omission is the best strategy to avoid errors of commission. CG_{DS} exhibit the same type of omission and alternative use in both spontaneous and elicited speech.

Snyder (2007) proposes a parametric approach in explaining the data from the various languages discussed in his book and proposes that the linguistic information may be represented in a form of a "switch-box", where some parameters or ranking of grammatical constraints (i) are set to mark, (ii) some are set to unmarked (i.e. default setting), and (iii) others are simply unset (i.e. some parameters may not have a default setting). However, he stresses that the information the child acquires is more abstract and general, than the information she encounters as her input. Even though Snyder's approach seems appealing as a plausible analysis for the data presented in this dissertation, it lacks an extensive corpus of data on inflectional marking to compare how

children acquiring language under his approach will handle unmarked and unset values. On a final note, a question he raises in *Chapter 8* (p.164) is in fact answered by the data presented in *Chapters 5* and *6* of this Dissertation and is beautifully captured by the *Subset Princile/Blocking* mechanism analysis introduced in this chapter. Snyder wonders whether errors of commission occur in the domain of phonology more than in the domain of syntax. I show that this is in fact not the case, as we have seen that a strikingly similar pattern or omission and substitution of words and sounds is followed with both phonological and morpho-syntactic features.

7.4 CONCLUSIONS, PREDICTIONS AND FURTHER RESEARCH

The goal of this Dissertation research was to study the linguistic performance of CG_{DS}, specifically their use of Tense, *S/V* agreement and Case. Is their performance as well as their competence the equivalent to the CG_{TDC} linguistic performance at the ages of 7- to 8-years old? Three hypotheses were examined.

I. The differences in the production of the inflectional system are morphologically conditioned.
II. The differences in the production of the inflectional system are syntactically conditioned.
III. The differences in the production of the inflectional system are phonetically and phonologically conditioned,

A careful examination of previous work on Down Syndrome and other typical and atypical populations has revealed empirical, methodological, and analytical issues. This may be the reason for why previous results (as well as the conclusions based on these results) sometimes contradict each other. For example, cross-linguistic studies report full acquisition of *S/V* agreement for Ger_{DS} but severe problems for Eng_{DS}.

In this dissertation, I have addressed all empirical, methodological, and analytical issues identified in *Chapter 2*. In *Chapter 3*, I show that empirical issues are addressed with the use of Cypriot Greek. Richer morphological inflection as well as morphology which allows the marking of inflectional features, especially Tense and *S/V* agreement, to surface independently of one another gave valuable information on the study of Tense, *S/V* agreement and Case; information that was not accessible through previous work. Specifically, I was able to determine that the differences between the two Grammars were not syntactically conditioned, since we found no effects of incorrect Case or *S/V* agreement use resulting from incorrect Tense use.

With the methodology developed in *Chapter 4*, I addressed the methodological issues by showing that a large variety of free and controlled elicitation tasks are necessary to gain insight into the characteristics of the Grammar of CG_{DS}. It allowed me to test the three morpho-syntactic domains in diverse environments. This ensured that the environment was eliminated as a contributing factor to the participant's performance. Specifically, while on some occasions a certain domain or feature appeared problematic or absent, on other occasions, when looked at with a different elicitation task, the same feature appeared to be in tact. For example, if we had only looked at the participants' performance with controlled elicitation tasks like stimulus production (especially *Experiment #1*, *Video I*), we would have concluded that CG_{DS} do not make use of the Subjunctive, since they had a tendency to use a relative clause, instead of the targeted Subjunctive clause. However, in the context of free elicitation tasks, participants make frequent and accurate use of Subjunctive clauses. The reverse was true for Imperative, where, in a free elicitation task, participants used Subjunctive clauses, instead of an Imperative ones. This is verified with the participants' use of Subjunctive, as explained in *Section 6.6*, *Chapter 6*.

Some of the analytical shortcomings were addressed by pursuing a detailed phonological analysis of the data. In *Chapter 5*, I show that the residue of differences between the CG_{DS} Grammar and its interfaces (i.e., articulatory restrictions and vocabulary insertion) and CG_{TDC} Grammar are due to differences in their phonological system. Specifically, certain sounds (/t/, /s/, /v/, /n/, /ɾ/, /ð/, etc.) have been reported to be challenging for Eng_{DS} due to different physiology. These sounds were also found problematic for CG_{DS}. In particular, we observe that CG_{DS} frequently omit or substitute these sounds. Based on detailed phonological analysis, I concluded that CG_{DS} have a somewhat different phonological system than CG_{TDC}. Specifically, they do not only omit sounds when adult CG_{TD} are expected to omit them, in specific phonological environments (e.g. hiatus resolution), but also when in adult CG_{TD} no such omissions occur. The same is true for substitution. CG_{DS} not only substitute sounds in the same way and in the same environments as adult CG_{TD} (e.g., feature spreading, consonant harmony, voicing, etc.), but they also substitute difficult sounds, independent of the phonological environment. The phonological analysis was paramount in showing that the majority of problems with inflectional endings is a direct result of their articulatory restrictions. In particular, sounds that are difficult for DS are found in inflectional endings. Moreover, I was able to show that the substitutions found in *DS* are systematic, contrary to previous claims by Dodd (1976) and Kumin (2006). With these invaluable findings, the morpho-syntactic analysis in *Chapter 6* is set onto a different foundation. Another analytical issue that arose from previous research was addressed in *Chapter 6*. In my study I have used a different process to evaluate the collected data. In particular, I took into consideration not only the relation between the production and the expected target (match/non-match) as was done in previous studies, but also the relation between the production and the surrounding structural environment of this production. Based on this evaluation method, I observed that the participants' performance was divided into productions, which match the

target, and non-match productions. The former are always correct. The latter are separated into three sub-categories: (i) alternative use of a feature value, (ii) affix drop, and (iii) full-word omission. Alternative values were then evaluated (i.e. correct or incorrect) based on the structural environment they were produced in. I concluded that inflectional marking with Tense, *S/V* agreement and Case is only very slightly affected, and if it is affected, there does not seem to be a dependency between the three syntactic domains. In other words, problems with one domain do not cause problems with the other. This provides evidence that the differences between CG_{DS} and CG_{TD} are not syntactically conditioned. If they were, we would expect all features associated with the same functional domain (i.e., INFL/Tense) to be simultaneously affected.

The purpose of *Chapter 7* was to consider the differences between CG_{DS} and CG_{TD} that remain after we control for the articulatory restrictions. These differences show a preference for unmarked forms in CG_{DS}. Interestingly, this preference holds for both morphological as well as phonological features. One way to understand this pattern is in terms of the *Subset Principle*. That is, within the framework of distributed morphology the ungrammaticality of an unmarked form, in contexts where a marked form is used, is attributed to the *Subset Principle*, a particular version of *Blocking*. Since the same pattern is found for phonological features, we have been lead to the conclusion that the *Subset Principle* applies to the phonological derivation as well. For concreteness, I have chosen a feature geometric analysis, though the analysis could also be couched within the framework of Optmality Theory in terms of 'emergence of the unmarked'.

There are several important conclusions we can draw on the basis of this study. First and foremost, I conclude that we should not think of CG_{DS} Grammar and its interfaces (i.e, articulatory restrictions and vocabulary insertion) as an impaired version of the CG_{TD} Grammar. Instead we are dealing with differences in a small number of grammatical components. In

particular, the CG_{DS} Grammar differs from the CG_{TD} Grammar in several but systematic ways. It differs phonetically, i.e. problematic production due to articulatory restrictions, that are due to the physiological differences. It differs phonologically, in that functioning of underspecified consonants can function as quasi-"allophones". Finally, it differs morphologically in the same way: underspecified morphemes may function as quasi-allomorphs. I have analyzed the latter two differences as being the result of a failure of the *Subset Principle*.

Second, I also observed that CG_{DS} on occasion re-organise the target utterance in order to accommodate the production of the non-targeted, yet grammatical form (see also Schaner-Wolles (2004) on Ger_{DS}). This strategy was observed with both free and control elicitation by both groups, but mostly by CG_{DS}. Specifically, in *Experiment #1 Video I*, CG_{DS} and CG_{TDC} use a relative clause (in Indicative) instead of a Subjunctive clause. In *Experiment #1 Video III*, participants use Present and a Demonstrative instead of Past Tense marking and a Past adverbial expression. In *Experiment #2 Task II* participants use an infected verb, with Present 3rd Person Plural marking, instead of a verbal root with a Gerund suffix carrying no Tense and no *S/V* agreement. In *Experiment #3 Task I* participants use either narrative Present or switch their story telling from Past to Present treating it as habitual (i.e. happening every summer) to avoid the use of Past Tense. Finally, in *Experiment #4 Task II* participants use a Subjunctive clause instead of an Imperative clause. All these alternatives are perfectly grammatical both in adult CG_{DS} and CG_{TD} Grammar, despite the fact that they deviate from the target.

The ability to re-organise the immediate linguistic environment to allow an alternative form to surface grammatically suggests that the CG_{DS} Grammar is certainly not syntactically impaired. On the contrary, the fact that (i) the alternative forms are used in a re-organised way instead of the targeted forms, and (ii) the grammaticality of the re-organised structures verifies that CG_{DS}

have an excellent command of their Grammar. Furthermore, it shows that they know both what is targeted, and what its grammatical alternative is. Thus, this is another important piece of evidence against a syntactically conditioned impairment.

If the analysis of the differences between CG_{DS}, CG_{TDC} and CG_{TD} Grammar is on the right track, it suggests that phonological features and morpho-syntactic features are both subject to the *Subset Principle*. This provides further evidence supporting an analysis where the difficulty causing differences between the two Grammars occurs after the completion of the syntactic derivation, and before forms reach PF.

In addition, we can also conclude that the CG_{DS} Grammar is not characterized as a delayed stage of child language acquisition that is no longer developing. That is, we cannot argue that the differences between the two groups, and in relation to the CG_{TD} Grammar, are due to a pause in development. What is evident is that at the most part CG_{DS} participants have a Grammar that develops alongside with the *TD* Grammar, but yet exhibits differences, which show that in some aspects of the Grammar, they have developed their own system. First, articulatory restrictions related to the physiology do not exist in the CG_{TDC} Grammar. Second, some sounds and sound changes are not found in the CG_{TDC} process of acquisition or in the environments we find them in CG_{DS} (e.g. /ɬ/ is not found in the CG phonetic alphabet). Third, the use of underspecified forms in unexpected environments is at much higher rates than CG_{TDC}. Fourth, statistical comparison has shown that on many occasions, the two groups do not exhibit parallel performance. Hence, I conclude that the CG_{DS} and CG_{TDC} Grammars show some differing characteristics.

One of the general questions the current research raises is whether there is a clear link between Grammar and some genetic change associated with the genetic malfunction? The answer to such

a question is not so straight-forward, and it can only be addressed indirectly. More explicitly, I start with the phonetic differences found between CG_{DS} and CG_{TDC}, as well as adult CG_{TD}. Since the genetic disorder (i.e. the presence of an extra chromosome 21 in the genes of individuals diagnosed with *DS*) is the cause of a distinctive articulatory physiology (causing difficulties in the pronunciation of certain sounds or strings of sounds), we can then hypothesise that genetics are indeed responsible for the articulatory restrictions evidenced in the results of CG_{DS}. Second, with regards to the morphological differences found between CG_{DS} and CG_{TDC}, one could only assume that if the preference to underspecified forms is linked to a general problem with the language processing system and/or memory limitations, and if we, in turn, assume that those are an outcome of the genetic malfunction observed with individuals diagnosed *DS* regardless of a given language system, then we can also hypothesise that the morphological differences are also an artifact of a genetic defect.

It is possible that as with different languages, different types of *DS* (i.e. translocation or mosaic *DS*) may result to different linguistic development. More specifically, going back to the question raised above on the role of genetics on the outcome of the results, i.e. their involvement with a differentiating linguistic development, we could then assume that different genetic realisation of trisomy 21 (mosaic or translocation) may cause different linguistic development. This mere assumption may be supported by the fact that mosaic *DS* have been argued to present higher IQ and less affected linguistic and developmental difficulties (see *Chapter 2*).

Based on the aforementioned facts and previous work on *DS*, we can make the following predictions. First, if the results from this dissertation reflect the fully acquired CG_{DS} Grammar, we expect that *DS* present several acquisition stages. Second, if morphological inflection in a language has a different phonetic realisation of inflectional morphemes (i.e. avoids the use of the

problematic consonants for *DS* individuals and uses mostly vowels, where *DS* do not exhibit difficulties) then for *DS* we would expect to see no syntactic or morphological impairment, as with current results. For example, if a language lacks word-final consonants in inflectional suffixes, I expect that there will be no ambiguous instances of alternative value use, such those of Singular Accusative or Genitive (pending on the language-specific defaults, of course). It would also verify my analysis of treating changes from Masculine – Nominative to Masculine – Accusative as being phonetic/phonologically conditioned. A language in which, once again, inflectional marking does not include consonants, but non-inflectional words have consonants in word-initial and word final positions, would also provide valuable information in testing the proposed analysis. Third, if a language exhibits higher levels of syncretism than Greek, we would then expect even less incorrect productions by *DS*, given that the syncretic forms, at least for most Indo-European languages do not include problematic sounds for *DS* individuals. Furthermore, given that *DS* individuals exhibit a problem in verbal and phonological short-term memory, it should be easier for them to acquire and use syncretic forms, where one P-EX matches multiple feature bundles. Fourth, in a language with no overt inflectional morphology, like the Chinese languages, or even in languages with non-fusional (agglutinative - synthetic) inflectional morphology, like Finnish, Blackfoot, Inuktitut, Japanese, Korean and Persian among others, we would expect to see entirely different results than what we see for Greek, German or English. Namely, we would expect in the former (Chinese languages) to see no morphological impairment and in the latter (Finnish, and other agglutinative languages) to verify our analysis; namely, there is typically, one default feature value change, per feature bundle, to its default.

There still remains the issue as to why the *Subset Principle* (and *Blocking* in general) applies to most occasions and what causes it to fail on other occasions. At this point it is still not clear what causes the *Subset Principle* to fail. In typically developing Grammars we find that default forms

are used in the absence of syntactic information (see diagnostic tests on default Case for Greek and English in *Appendix E*), i.e. when features cannot be assigned through full application of the Grammar. This cannot be the case with CG_{DS} however, because we find parts of the phrase to be spelled out as targeted (i.e. determiners) while others are spelled out as the default. Moreover, syntactic operations related to these features are also in place (e.g. Case assignment). Therefore, for the reasons outlined in *Section 7.2*, use of alternative feature values is not an outcome of problematic or absent syntactic derivation. It is plausible that short-term memory limitations are responsible for the occasional *Blocking* failure. In particular, the preference towards underspecified phonological features may be due to failure of the phonological short-term memory and similarly, the sporadic preference towards underspecified morphological features maybe lie on a failure of the verbal short-term memory.

This prediction could also potentially explain affix drop and full-word omissions. Earlier, I suggested that full-word omission and affix drop seem to imply a general problem with *Vocabulary Insertion*. I also proposed that the frequent omission of copulas and auxiliaries also show a problem with the *Blocking* mechanism, where *Economy* is marked higher than *Expressiveness*. More explicitly, a word goes through the syntactic derivation, where all relevant functional processes take place. However, by the time it reaches the stage of vocabulary insertion, the *DS* individuals' memory span fails. This results in the completion of the syntactic derivation and access to the function (i.e. features are underlyingly available), but absence of the surfacing content. This is supported by the fact that Case assignment is still possible, despite the absence of a verb). Even though at this point the problem has been identified, there is still not a definite explanation as what is causing the problem. It was hypothesised that verbal and phonological working memory failure could potentially be what is triggering problems at this

stage of language processing. However, until specialised testing on memory failure with the particular or similar stimuli is performed it cannot unquestionably be argued that this is the cause of problematic vocabulary insertion.

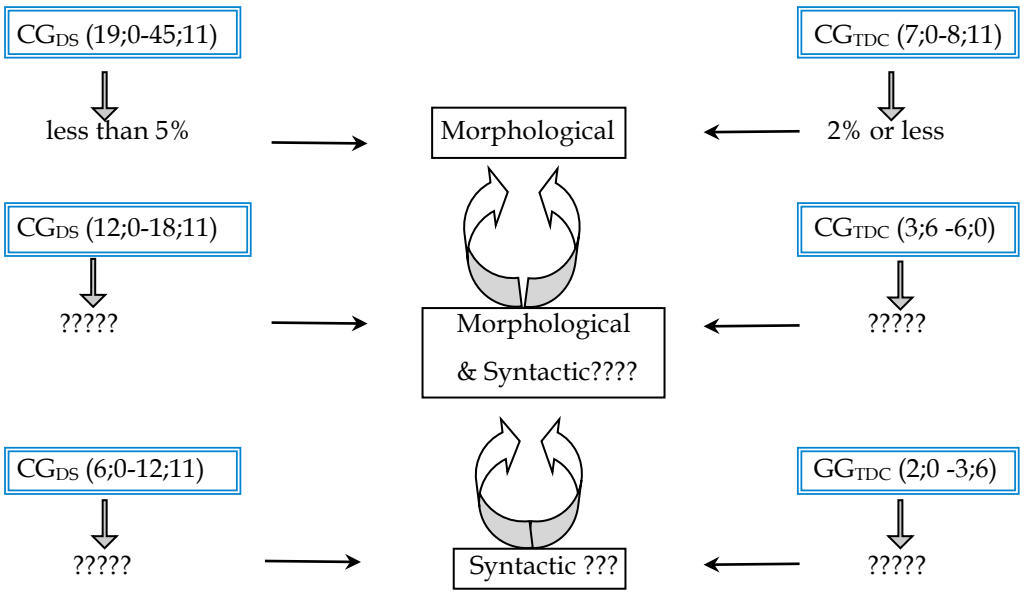
There are several additional implications resulting from the findings of this research that could be addressed in future research. However, at this point results are not entirely conclusive. Concerning *Universal Grammar* and child language acquisition, there are implications made in two ways. First, how much can the study of typically developing language tell us about what is actually happening in language processing and how the language system is formed? This study shows that certain aspects of the *TD* (and *TDC*) Grammar have not been considered in the past, because (i) they do indeed appear at very low percentages at certain ages, (ii) of the nature of languages studied, and (iii) certain linguistic areas cannot be isolated due to the fact that the language system is intact. Therefore, important information on the language system can potentially be missed when only looking at typically developing language and not exploring how this is represented and produced in atypical developmental systems. This is why studying individuals diagnosed with a particular genetic disorder, which normally form a uniform group within a disorder, can give us a window to nature of language and cognition, one that we do not have access to through the study of *TD* language. Second, to the best of my knowledge up until now it was not considered that there might be an additional step in the phonological stage were a phonological segment is first selected through the phonological derivation and it later enters a competition with other allophones and the most optimal phone is selected based on the constraint ranking of a given language. Based on the results and analysis presented in this Dissertation I conclude that the CG_{DS} Grammar is a fully formed and fully functioning Grammar, that of CG_{DS}.

There are also significant implications for the study of Language acquisition. Specifically, the proposed theory for the full acquisition of the CG_{DS} Grammar and ages 7;0 to 8;11 of CG_{TDC} could be extended to include younger ages as well. However, further research is needed to determine: (i) what is underspecified, (ii) at what stage of language processing the underspecification occurs, and (iii) in what way the output is affected. These questions and consequently the extension of the proposed analysis to younger ages and other languages, with the admission that extensive additional work, will be required. At this point however, with data from only these particular ages it is inconclusive whether the proposed analysis, with any necessary adjustments, will be applicable to younger ages.

As such, I present my future research agenda, here. I will pursue the study of younger ages for both CG_{DS} and CG_{TDC} and investigate the process of language acquisition of the two Grammars (one is not yet available for CG_{TDC}). I will examine the various steps each population undergoes until they reach their fully formed Grammar. Further, I will observe and record the similarities the CG_{DS} Grammar bears to the CG_{TDC} Grammar during the various stages of acquisition. This will help identify whether failure of the *Subset Principle* appears in younger ages, where the Grammar is not fully acquired. Consider the diagram below. It should be noted that this is a rough representation and different points of Tense, *S/V* agreement and Case acquisition can be sub-divided further. Currently, we have information on the fully formed CG_{DS} Grammar and the CG_{TD} Grammar at the latest stage of language acquisition for ages 7;0 to 8;11. Based on previous work on Eng_{DS} and $Greek_{TDC}$, we expect that CG_{TDC} at ages 3;6 to 6;0 will exhibit gradual acquisition of the morphological marking and syntactic operations like, question formation, negation, etc. However, multiple differences with morphological marking and syntactic processes with CG_{TD} will be evident. Moreover, at ages 12;0 to 18;11, we expect that CG_{DS} will

exhibit a stage where syntactic and morphological differences with CG_{TDC} and CG_{TD} will be evident, with percentages higher than the ones reported here for adult CG_{DS}. What is crucial at this stage is to determine whether the potential differences between the two groups are syntactically conditioned at higher rates than CG_{DS} adults and the CG_{TDC} matched group. The final stage I plan on testing is CG_{DS} ages 6;0 to 12;11 and CG_{TDC} ages 2;0 to 3;5. These are the reported ages where the two populations exhibit meaningful utterances. Therefore, this research plan will provide an idea of the gradual language acquisition for the two groups, from their first stage of acquisition until they reach full acquisition (the results this dissertation currently offers).

(7.18)



The results of such a study, in combination with the results from the present study on 19- to 45-year old CG_{DS} and 7- to 8-year old CG_{TD} can provide invaluable information and guidelines for practical use. More explicitly, in collaboration with an experienced speech-language pathologist and a clinical paediatrician we can succeed in creating appropriate tests to minimise differences between CG_{DS} and CG_{TD} Grammar, if CG_{DS} choose to do so. Research has already shown that this is possible, at least for articulation purposes (Bacsfalvi 2008).

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Appendices

APPENDIX A

CHAPTER 3 - SPECIFICS ON GREEK MORPHOLOGY AND SYNTAX

In this Appendix I present some background information and inflectional paradigms on Greek verbal and nominal inflection. *A1* presents information on Verbal inflection, *A2* lists inflectional marking on nouns and *A3* gives a list of adjectival inflectional suffixes.

A.1 Verbal Inflection

I. Standard Greek

Standard Greek	*1st Conjugation - Paroxytone*		*2nd Conjugation – Type A - Oxytone*		*2nd Conjugation – Type B - Oxytone*	
Active Voice	SG	PL	SG	PL	SG	PL
Present (Imperfective)	΄-ω ΄-εις ΄-ει	΄-ουμε ΄-ετε ΄-ουν	-ώ -άς -ά	-άμε -άτε -ούν	-ώ -είς -εί	-ούμε -είτε -ούν
Imperfect (Past Progressive: Imperfective)	΄--α ΄--ες ΄--ε	΄-αμε ΄-ατε ΄--αν	-ούσα -ούσες -ούσε	-ούσαμε -ούσατε -ούσαν	-ούσα -ούσες -ούσε	-ούσαμε -ούσατε -ούσαν
Dependent (Perfective)	΄-ω ΄-εις ΄-ει	΄-ουμε ΄-ετε ΄-ουν	΄-ω ΄-εις ΄-ει	΄-ουμε ΄-ετε ΄-ουν	΄-ω ΄-εις ΄-ει	΄-ουμε ΄-ετε ΄-ουν
Past (Perfective)	΄--α ΄--ες ΄--ει	΄-αμε ΄-ατε ΄--αν	΄--α ΄--ες ΄--ει	΄-αμε ΄-ατε ΄--αν	΄--α ΄--ες ΄--ει	΄-αμε ΄-ατε ΄--αν
Imperfective – Imperative	΄--ε/ ΄-ε	΄-ετε	΄-α/΄-ε	-άτε	N/A	-είτε
Perfective – Imperative	΄--ε/ ΄-ε[116]	΄-(ε)τε	΄--ε	΄-τε	΄--ε	΄-τε
Gerund	όντας		ώντας		ώντας	

TABLE A.1: THE STANDARD GREEK INFLECTIONAL PARADIGM FOR THE TWO VERB CONJUGATIONS

Holton et al. (1997/2006: 116)

1st Conjugation – verbs like: kán-o (SG), kámn-o (CG), ðiaváz-o (SG), θkiaváz-o (CG)

2nd Conjugation – Type A - verbs like: aγap-ó, apand-ó, dips-ó, mil-ó

2nd Conjugation – Type B – verbs like: θeor-ó

[116] For Both SG and CG when the verbal root ends in /l/, /r/, /s/, /ks/ or /ps/ for 2nd Person Singular of the Imperative, then the suffix *–e* can be omitted if the verb is followed by a 3rd Person clitic: *tu*, *tis*, *to*. If the verb is in Plural, then the initial *–e* of the Plural suffix *–ete* can be omitted when the root ends in the aforementioned sounds Holton et al. (1997/2006: 122).

II. Cypriot Greek[117]

Cypriot Greek	*1st Conjugation - Paroxytone*		*2nd Conjugation – Type A - Oxytone*		*2nd Conjugation – Type B - Oxytone*	
Active Voice	SG	PL	SG	PL	SG	PL
Present (Imperfective)	΄-ω ΄-εις ΄-ει	΄-ουμε(ν) ΄-ετε ΄-ου(σι)(ν)	-ώ -άς -ά	-ούμε(ν) -άτε -ού(σι)(ν)	-ώ -είς -εί	-ούμε(ν) -είτε -ού(σι)(ν)
Imperfect (Past Progressive: Imperfective)	΄--α ΄--ες ΄--ε(ν)	΄-αμε(ν) **΄-ατε/ετε** ΄--α(ν)	-ούσα -ούσες -ούσε(ν)	-ούσαμε(ν) -ούσ**α/ε**τε -ούσα(σι)(ν)	-ούσα -ούσες -ούσε	-ούσαμε(ν) -ούσ**α/ε**τε -ούσα(σι)(ν)
Dependent (Perfective)	΄-ω ΄-εις ΄-ει	΄-ουμε(ν) ΄-ετε ΄-ου(σι)(ν)	΄-ω ΄-εις ΄-ει	΄-ουμε(ν) ΄-ετε ΄-ου(σι)(ν)	΄-ω ΄-εις ΄-ει	΄-ουμε(ν) ΄-ετε ΄-ου(σι)(ν)
Past (Perfective)	΄--α ΄--ες ΄--ε(ν)	΄-αμε **΄-ατε/ετε** ΄--α(ν)	΄--α ΄--ες ΄--ε(ν)	΄-αμε(ν) **΄-ατε/ετε** ΄--α(σι)(ν)	΄--α ΄--ες ΄--ε	΄-αμε(ν) **΄-ατε/ετε** ΄--α(σι)(ν)
Imperfective – Imperative	΄--ε/΄-ε	΄-ετε	΄-α/΄-ε	-άτε	N/A	-είτε
Perfective – Imperative	΄--/΄-ε	΄-ετε	΄--ε	΄-τε	΄--ε	΄-τε
Gerund	όντας		ώντας		ώντας	

TABLE A.2: THE CYPRIOT GREEK INFLECTIONAL PARADIGM FOR THE TWO VERB CONJUGATIONS

III. Auxiliary and Copula

Standard Greek has an auxiliary (*ex-o* 'have') and a copula ('*ime* 'I am') verb. While Cypriot Greek has the same copula verb, it lacks the auxiliary *ex-o*, which can only be used as a main verb, while in Standard Greek it can be used both as a main verb and an auxiliary. However, Cypriot Greek has the auxiliary *e(n)* 'is', its only form for Present and the form *ita(n)* for Past, to compensate for the lack of the future construction and particle *θa*. Below, I give the inflectional paradigm for the auxiliary and copula.

[117] Since no CG Grammar is available these paradigms were formed from elicitation data collected from adult CG_{TD} speakers.

Have		*Standard Greek*		*Cypriot Greek*	
		SG	PL	SG	PL
Present	1st 2nd 3rd	‘ex-o ‘ex-is ‘ex-i	‘ex-oume ‘ex-ete ‘ex-oun(e)	‘ex-o ‘e -is ‘e -i	‘ex-oume(n) ‘e -ete ‘ex-ou(si)(n)
Past	1st 2nd 3rd	‘ix-a ‘ix-es ‘ix-e	‘ix-a-me(n) ‘ix-a-te ‘ix-an(e)	‘ix-a ‘i -es ‘i -e	‘ix-a-me(n) ‘i -e-te ‘ix-an(e)

TABLE A.3: THE (AUXILIARY) VERB ‘EXO’ FOR SG AND CG

be	*Standard Greek*		*Cypriot Greek*	
	SG	PL	SG	PL
Present	‘ime ‘ise ‘ine	‘imaste ‘iste/isaste ‘ine	‘ime ‘ise ‘ine	‘imaste(n) ‘iste/isaste(n) ‘ine/ e(n)
Past	‘imun(a) ‘isun(a) ‘itan(e)	‘imaste/imastan ‘isaste/isastan ‘itan(e)	‘imu(n) ‘isu(n) ‘ita(n)	‘imaste(n)/imasta(n) ‘isaste(n)/isasta(n) ‘ita(n)

TABLE A.4: THE COPULA VERB ‘IME’ FOR SG AND CG

Present	Past
e(n)	*ita(n)*

TABLE A.5: THE CYPRIOT GREEK AUXILIARY

VI. Irregular Verbal Roots for SG and CG

Phonetic changes in the verbal root distinguish verbal forms inflected with Imperfective and Perfective Aspect. For example, *aniγ-o* ‘I am opening’ *na aniks-o* ‘to open’. However, there are a number of verbal roots that have an entirely different form depending on the Aspect they are inflected with. *Table A.6* below provides examples of Perfective and Imperfective verbal roots.

PERFECTIVE	IMPERFECTIVE	TRANSLATION
fa-o	tro-o	‘I eat’
p-o	le-o/ lal-o (*CG*)	‘I tell/say’
pa-o	piγen-o/ paen-o (*CG*)	‘I go’
par-o	pern-o	‘I take’
pi-o	pin-o	‘I drink’

TABLE A.6: EXAMPLES OF IRREGULAR ROOTS

A.2 Nominal Inflection

I. Masculine

	Case	*2-way Distinction*								*4-way*
SG	NOM	-ας	-ης	-έας	-ας	-ης	-ές	-ούς	-ής	-ος
	ACC	-α	-η	-έα	-α	-η	-έ	-ού	-ής	-ου
	GEN	-α	-η	-έα	-α	-η	-έ	-ού	-ή/ούς	-υ
	VOC [118]	-α	-η	-έα	-α	-η	-έ	-ού	-ής	-ε
PL	NOM	-ες	-ες	-είς	-άδες	-ηδες	-έδες	-ούδες	-είς	-οι
	ACC	-ες	-ες	-είς	-άδες	-ηδες	-έδες	-ούδες	-είς	-ους
	GEN	-ων	-ών	-έων	-άδων	-ηδων	-έδων	-ούδων	-ών	-ων

TABLE A.7: MOST COMMON NOUN ENDINGS – MASCULINE

II. Feminine

	Case	*2-way Distinction*						*3-way*
SG	NOM	-α	-η	-ά	-η	-ού	-ω	-ος
	ACC	-α	-η	-ά	-η	-ού	-ω	-ο
	GEN	-ας	-ης	-άς	-ης/εως	-ούς	-ως	-ου
PL	NOM	-ες	-ες	-άδες	-είς	-ούδες	--	-οι
	ACC	-ες	-ες	-άδες	-είς	-ούδες	--	-ους
	GEN	-ων	-ών	-άδων	-εων	-ούδων	--	-ων

TABLE A.8: MOST COMMON NOUN ENDINGS -FEMININE

III. Neuter

	Case	*2-way Distinction*					
SG	NOM	-ί	-ι	-μα	-ιμο	-ο	-ος
	ACC	-ί	-ι	-μα	-ιμο	-ο	-ος
	GEN	-ίου	-ιού	-ματος	-ίματος	- ου	-ους
PL	NOM	-ιά	-ια	-ματα	-ίματα	-α	-η
	ACC	-ιά	-ια	-ματα	-ίματα	-α	-η
	GEN	-ιών	-ιών	-μάτων	(-ίματων)	-ων	-ών

TABLE A.9: MOST COMMON NOUN ENDINGS -NEUTER

[118] Holton *et al*. (1997/2006) do not provide Vocative Case for the Plural Number but it does exist for most paradigms. The same applies for the Feminine and Neuter paradigms.

A.3 Adjectival Inflection

Masculine	Feminine	Neuter
-ος	-η	-ο
-ος	-α	-ο
-ος	-ια	-ο
-ύς	-ιά	-ύ
-ύς	-εία	-ύ
-ής	-ιά	-ί
Πολ(λ)ύς	πολλή	Πολ(λ)ύ
-ης	-ης	-ες
-ης	-α	-ικο
-άς/-ής	-ού	-άδικο/-ούδικο/-ήδικο
-ων	-ουσα	-ον
-ων/-ονας	-ων/-ονας	-ον
Indeclinable Adjectives		
Comparison Adjectives		

TABLE A.10: INFLECTIONAL ENDINGS FOR ADJECTIVES – ALL GENDERS

A.4 Phonetic Changes and Phonological Rules

A.4.1 The Case of Final /n/

In this section, I provide information on a phonological rule that is found in both the SG and CG dialect but with some differences. Concerning nouns, determiners, adjectives and pronouns, there are certain phonological restrictions as to how the *–n* in Accusative-Singular can surface.

In *Standard Greek* if a nominal is marked with Accusative-Singular (for Masculine and Feminine) and Genitive-Plural, and the word following the form inflected with the aforementioned values starts with a vowel or the voiceless stops /p/, /t/ and /k/, then the nominal expression can end in /n/. This is also the case for verbs marked with 3rd Person Plural.[119]

In *Cypriot Greek*, the same rule applies, with the specific value combinations mentioned above. However, on many occasions, CG_{TD} have the tendency to over-apply the rule and add /n/ at the

[119] This also applies to some word categories which do not receive inflection like the negative markers ðe(n)/ mi(n).

end of other value combinations like 1st Person-Plural on verbs or even Singular-Nominative or Accusative with Neuter Gender, if a noun ends in a vowel and the following word begins with a vowel or /p/, /t/, and /k/. A second difference found between the two dialects is that in CG the rule applies to all environments we find a final /n/. For example, if, based on the inflectional paradigm, a verb ends in *–n* and the following word does not start with a vowel or phonemes /p/, /t/, and /k/, the *–n* gets deleted. This does not happen in SG. A third difference between the two dialects is that, even though a final *–n* might be part of an inflectional suffix, it is not pronounced in utterance-final positions in CG.

(A.1)

SG		*CG*	
ton	Andrea	ton	Andrea
DET.MASC.SG.ACC	*Andreas-MASC.SG.ACC*	*DET.MASC.SG.ACC*	*Andreas-MASC.SG.ACC*
ton	γiorγo	to	γiorγo
DET.MASC.SG.NOM	*Giorgo-MASC.SG.NOM*	*DET.MASC.SG.NOM*	*Giorgo-MASC.SG.NOM*

A.4.2 The Case of the Past Prefix e-

The Past augment *e-* does not surface for verbs inflected with 1st and 2nd Person Plural. According to Holton et al. (1997/2006), this is phonologically conditioned (i.e., due to an increase in syllables number). I propose the drop of *e-* may instead be morpho-syntactically conditioned. When *e-* is not present, perhaps there is no need for a distinct Tense prefix, since Tense and *S/V* agreement surface as two separate morphemes. It seems that *e-* expresses Past inflection overtly, when Tense and *S/V* agreement are found in a portmanteau morpheme. Further evidence comes from the fact that *e-* in CG is optionally present for all Person-Number combinations in Past, regardless of word length. Moreover, in CG, *e-* could be dropped or included for any Person-Number combination. However, we observe that the Past Prefix *e-* is

obligatory (i.e. its omission surfaces an ungrammatical result) when the inflectional suffix used for Past Tense is ambiguous, such that when the form (root + suffix) used for Past is identical to the one used for Present. In such cases in CG the affix *e-* is absolutely necessary to mark Past. Also, this explains why for some forms like *pir-a* 'I take' in SG, *e-* is not obligatory, despite the fact that it conforms to the 'syllable length' rule. Finally, in Ancient Greek the Past prefix was obligatory for all Person-Number combinations and all Past Tenses (Holton et al. 1997/2006:159), regardless of the syllable number.

APPENDIX B

CHAPTER 4 - METHODOLOGY

This appendix includes information related to Methodology, such as the results for the participants' IQ testing, the Experimental procedure, and the experimental tasks.

B.1 Participants

B.1.1 Down Syndrome Participants – Group A

- Highest and lowest age highlighted
- Highest IQ score highlighted

N=16	Participant Id	Age	Gender	IQ Score
1	AI	43;4	Male	30
2	DK	19;8	Male	31
3	EA	38;0	Female	32
4	EK	37;7	Female	30
5	ES	43;8	Female	33
6	ED	44;7	Male	30
7	FA	45;5	Female	30
8	FM	23;7	Female	32
9	MH	42;6	Female	34
10	NS	45;11	Male	30
11	PP	34;6	Female	30
12	SoS	45;8	Male	31
13	SI	35;7	Male	33
14	SC	26;1	Female	30
15	SS	42;1	Female	30
16	TM	44;8	Male	30
	Mean	38;4		31

TABLE B.1: DOWN SYNDROME PARTICIPANTS

B.1.2 Typically Developing Participants – Group B

- Highest and lowest age highlighted
- Highest and lowest IQ score highlighted

N=17	Participant Id	Age	Gender	IQ Score
1	MS	8;5	Male	78
2	NN	8;5	Male	120
3	SS	8;4	Male	88
4	SO	7;2	Female	130
5	SD	8;3	Female	110
6	AA	7;3	Male	108
7	AK	7;3	Male	101
8	AC	7;8	Male	128
9	AS	7;0	Female	106
10	CP	8;4	Male	111
11	DS	8;3	Male	112
12	DK	7;1	Female	124
13	EF	7;6	Female	97
14	EN	7;9	Female	89
15	IP	8;11	Female	106
16	LA	8;4	Male	117
17	MT	8;8	Female	80
	Mean	7;9		106

TABLE B.2: TYPICALLY DEVELOPING CHILDREN PARTICIPANTS

B.2 Experimental Stimuli

B.2.1 Experiment #1 – Visual Stimuli: Video I – Video Clips Used as Stimuli

I. Examples – Figures 1 – 2 (Video Clip 1-2)

FIGURE B.1: VIDEO CLIP 1: EXAMPLE A

FIGURE B.2: VIDEO CLIP 2: EXAMPLE B

II. Introducing the Characters - Figures 3 – 6 (Video Clips 3-6)

FIGURE B.3: VIDEO CLIP 3 - INTRODUCTIONS

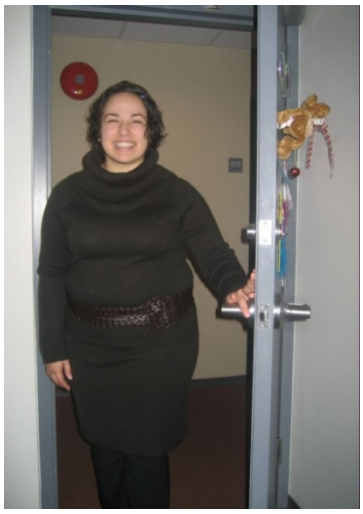


FIGURE B.4: VIDEO CLIP 4 - INTRODUCTIONS

FIGURE B.5: VIDEO CLIP 5 - INTRODUCTIONS

FIGURE B.6: VIDEO CLIP 6 - INTRODUCTIONS

III. Experimental Stimuli - Figures 7 – 19 (Video Clips 7-20)

FIGURE B.7: VIDEO CLIP 7 – EXPERIMENTAL STIMULUS 1

FIGURE B.8: VIDEO CLIP 8 – EXP. STIMULUS 2

FIGURE B.9: VIDEO CLIP 9 – EXP. STIMULUS 3

FIGURE B.10: VIDEO CLIP 10 – EXP. STIMULUS 4

FIGURE B.11: VIDEO CLIP 11 – EXP. STIMULUS 5

FIGURE B.12: VIDEO CLIP 12 – EXP. STIMULUS 6

FIGURE B.13: VIDEO CLIP 13 – EXP. STIMULUS 7

FIGURE B.14: VIDEO CLIP 14 – EXP. STIMULUS 8

FIGURE B.15: VIDEO CLIP 15 – EXP. STIMULUS 9

FIGURE B.16: VIDEO CLIP 16 – EXP. STIMULUS 10

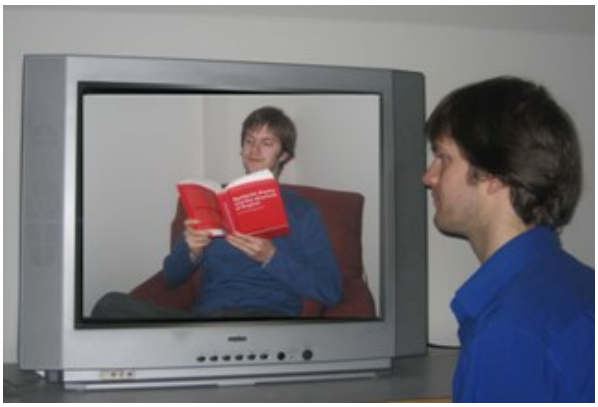


FIGURE B.17: VIDEO CLIP 17 – EXP. STIMULUS 11

FIGURE B.18: VIDEO CLIP 18 – EXP. STIMULUS 12

FIGURE B.19: VIDEO CLIP 19 – EXP. STIMULUS 13

B.3 Column Contents – Example (a Set of Three Columns)

Here, I give an example on the contents of the columns used to record and evaluate the participants' performance. Each column is dedicated to a particular feature or syntactic, morphological, phonetic, phonological or any other relevant information regarding the tested utterance. Each column has a list of tags to choose from. The choices concerned feature values or any relevant grammatical or phonetic process observed with the participants' productions. When a feature/grammatical characterization is non-applicable the tag *N/A* is used.

Column One: Targeted Case

One of the domains/features this dissertation is concerned with is Case. The first column of the set provided information on the Case value ***targeted*** on nominal expressions by the numerous tasks. I included four tags for the four Greek values marking Case: *Nominative, Accusative, Genitive,* and *Vocative*.

Column Two: Case Production

In the second column of the set, I included tags where the four values for Case are matching the targeted Case value: *Nominative Match, Accusative Match, Genitive Match,* and *Vocative Match.* In addition, I included a tag to record the alternative value use for all Case values: *Nominative Alternative, Accusative Alternative, Genitive Alternative,* and *Vocative*. For example, if the Genitive Case value is targeted, and Nominative Case is used in its place, then the label *Nominative Alternative* is used. This enables us to note when a value matches the target or when it is used as an alternative to another Case value. Furthermore, there were separate labels for productions which involved the omission of /s/ and accidentally appear to be of the same form as another Case value. These were: *NOM with /s/ omission*, *ACC with /s/ Omission* and *GEN with /s/ Omission*.

Column Three: Case Evaluation

In the third column of the set I evaluated the participants' performance on their use of Case. Three tags were available: *Correct, Incorrect* and *N/A*. Evaluation was based on the comparison between what was produced, also considering (i) what was targeted, and (ii) the structural environment an utterance occurred.

B.4 Overall Evaluation of Productions (Entire Word)

The tags listed in this section served to evaluate the nature of a potential change in the participants' production of the entire word - while what was discussed above serves to evaluate the participants' use of each individual feature within a word as well as provide some general - background information concerning the structural environment. Tags inform as to whether a word has undergone any alternations, or whether no change between target and produced form was recorded.

B.4.1 No Change

The label *No Change* is used when a word has all the appropriate inflectional features (if any) needed for the position it occurs, i.e. matches the target or expected word in every aspect. It also means that there are no phonetic or phonological changes. For example, (1a) below is the target sentence for the description of a video clip from *Experiment #1, Video I.* The agent of the action is a young male called *Nikos.* The nominal phrase in question is the subject of a clause. Given the information above we know that in CG_{TD} speech the nominal must be inflected with Masculine Gender, Singular Number and Nominative Case, as shown in the gloss line in (B.1a). (B.1b) shows the CG_{DS} participant's description of the video clip.

(B.1) <u>Example of a Production with No Change</u>

(a) *Target Utterance*

O	***Nikos***	vlep-i	ton ...
DET.MASC.SG.NOM	***Nikos-MASC.SG.NOM***	*see.IMPF-PRES.3.SG*	*DET.MACS.SG.ACC*

... eaft-on	tu	pu /	na	tro-i	sokolat-a.
self-MASC.SG.ACC	*3.MASC.SG.GEN*	*that*	*SUBJ*	*eat.IMPF-PRES.3.SG*	*chocolate-FEM.SG.ACC*

'Nikos is looking at himself eating chocolate.'

(b) *CG_{DS} Utterance (SC)*

O	***Nikos***	vlep-i	to∅ ...
DET.MASC.SG.NOM	*Nikos-MASC.SG.NOM*	*see.IMPF-PRES.3.SG*	*DET.MACS.SG.ACC*

... eaft-on	tu	pu	t∅o-i	[θ]okolat-a.
self-MASC.SG.ACC	*3.MASC.SG.GEN*	*that*	*eat.IMPF-PRES.3.SG*	*chocolate-FEM.SG.ACC*

'Nikos is looking at himself eating chocolate.'

Comparing (B.1b) to (B.1a) we see that *SC* inflected the nominal phrase with all the targeted features: Masculine, Singular and Nominative. Therefore, in this case, the nominal *Nik-os* is tagged with the tag *No Change* because *SC* uses all the targeted inflectional features, based on the stimulus provided, in the appropriate environment (i.e. subject position of the produced utterance).

B.4.2 Phonetic or Phonological Change

When a surfacing form undergoes a sound change and the change either occurs in the root or an affix, I evaluate the word as undergoing a *Phonetic or Phonological Change.* However, this label presupposes that the sound change does not affect any of the features inflected in a word, even if the change occurs in an inflectional affix. In the case of the nominal *Nik-o[θ]* in example (B.2b) below, the phonological representation of the suffix differs from the typical pronunciation of the word in adult CG_{TD} speech (B.2a). Nevertheless, the change has not affected any of the inflectional features the word carries.

(B.2) <u>Example of a Production with Phonological Change I: Substitution</u>

(a) *Target Utterance*

o	*Nik-os*
DET.MASC.SG.NOM	*Nikos-MASC.SG.NOM*

(b) *CG_{DS} Production (SC)*

o	*Nik-o[θ]*
DET.MASC.SG.NOM	*Nikos-MASC.SG.NOM*

Instead of using a final /s/ for the inflectional suffix, the participant *SC* produces [θ] in the noun *Nik-o[θ]*. Even though the sound change involves part of the inflectional suffix, it does not affect the grammaticality of the noun. Furthermore, the sound change is phonetically conditioned: *DS* consistently have difficulties with pronouncing the sound /s/. Evidence for this is outlined in *Chapter 5*. Apart from phonological substitutions, I also listed cases where one sound or more were omitted (based on the comparison of the target and produced word) under *Phonetic or Phonological Change*. In the following example I give an initial /ð/ omission with a demonstrative, that does not receive inflection.

(B.3) Example of a Production with Phonological Change II: Omission

(a)	*Target Utterance*	(b)	*CG_{DS} Production (AI)*
	ðame		∅ame
	here		here

B.4.3 Morpho-syntactic Change

There are a number of occasions where phonetic and phonological changes occur in inflectional affixes and do have an effect on the *Morpho-syntactic* properties of the word such that, there appears to be a change in the surfacing inflectional features marked on the word. This type of change is tagged as *Morpho-syntactic Change*. For example, if for a word like *mil-a* 'apples' the Plural Number is targeted, as shown in (B.4a), and the participant uses Singular instead, as shown in (B.4b), then the participant is "changing" one of the morpho-syntactic features of the word, namely Number, i.e. s/he is using Singular Number as an alternative to Plural.

(B.4) Example of Production with Morpho-Syntactic Change

(a) *Target Utterance*

Ta	***mil-a***	ke	i	banan-es ...
DET.NEU.PL.NOM	***apple-NEU.PL.NOM***	*and*	*DET.FEM.PL.NOM*	*banana-FEM.PL.NOM*

...ine	γlik-a	frut-a
be.IMPF.PRES.3SG/PL	*sweet-NEU.PL.NOM*	*fruit-NEU.PL.NOM*

'Apples and bananas are sweet fruit.'

(b) *CG_{DS} Production*

T[o]	***mil-[o]***	∅	∅	[p]anan-[o] ...
DET.NEU.PL.NOM	***apple-NEU.PL.NOM***			*banana-NEU.SG.NOM*

... @ sik-a	@to	@ ∅∅[x]ukk-o.
fig-NEU.PL.NOM	*DET.MASC.SG.ACC*	*fruit.snack-MASC.MASC.ACC*

'Apple, banana, figs, the fruit snack.'

We know this is not a strictly phonetic or phonological change like the one illustrated in (B.2) and (B.3) above. First, vowels are generally not problematic for CG_{DS}. Second, there is an obvious change of an inflectional feature from Plural to Singular. In other words, this type of change is not the result of word-final sound omission. Third, the change is applied to both the determiner and the noun. Finally, this type of change is only found in verbs, nouns, adjectives, strong pronouns etc., that can be marked with inflectional features but alternative use of the Number value is achieved by different, unrelated sounds across the different word categories.

B.4.4 Morpho-syntactic and/or Phonetic Change

There are three different situations in which this label is used, hence "*and/or*". This label can be used only for words (verbs and nominal phrases) that receive inflection. First, this tag is used when there are two phonetic or phonological changes in a word: one change is in the suffix and

affects the features inflected on the verb or nominal expression in the same way as explained for the *Morpho-syntactic Change* label, ***and*** the other change is in the root and has only a phonetic or phonological effect on the word production, such that inflectional features are not affected. Second, this tag is used where one (or more) sound changes affect an inflectional affix and it is not clear whether the change is phonetically, phonologically, ***or*** morpho-syntactically conditioned. This, of course, becomes clear after the extensive phonetic and phonological analysis found in *Chapter 5*. An example for each situation is given in (B.5) and (B.6), respectively.

(B.5) Example of Production with Morpho-syntactic AND Phonetic or Phonological Change

(a) *Target Utterance*	(b) *CG_{DS} Production (SS)*
aɾe***s***k-***u***	a∅e∅k-***i***
like.IMPF-PRES.3.PL	*like*.IMPF-PRES.3.SG

(B.6) Example of Production with Morpho-syntactic OR Phonetic or Phonological Change

(a) *Target Utterance*		(b) *CG_{DS}Production (SS)*	
o	Nik-***os***	o	Nik-***o∅***
DET.MASC.SG.NOM	*Nikos*-MASC.SG.NOM	DET.MASC.SG.NOM	*Nikos*-MASC.SG.***ACC?***

In (B.5b) the participant altered the inflectional suffix attached to the verb, from Plural to Singular, (morpho-syntactic) AND omitted the phonemes /ɾ/ and /s/ included in the root (phonetic). In this case, the omission of /ɾ/ and /s/, as part of the root do not affect inflectional features. In (B.6b) the same participant omits only the final sound /s/. In the absence of a detailed analysis of the phonetic and phonologically changes it is not clear whether this omission is phonetically, phonologically or morpho-syntactically conditioned. Such cases however, were later determined to be phonetically conditioned, due to a general problem with the sound /s/ regardless of the environment it occurred.

Third, this label is also used when there is a combination of the two situations described above, i.e. when there is an ambiguous phonetic/phonological process happening with an affix, PLUS a phonetic/phonological change in the root of the word, as shown in example (B.6):

(B.7) Example of production with Morpho-syntactic AND/OR Phonetic/Phonological Change

(a) *Target Utterance*	(b) *CG_{DS}Production (ED)*
ɪɾt-***es***	i∅t-***e∅***
come.PRF-PAST.2.SG	*come.PRF-PAST.3.SG*
'You came.'	'S/he came.'

In (B.7b) the participant omitted both the sound /ɾ/ from the root of the verb (phonetic or phonological change) in addition to the /s/ omission in the inflectional suffix. The /s/ omission is ambiguous at this stage, as shown in example (B.6) above. Nevertheless, the final /s/ omission, as part of the suffix, causes the surfacing form to be of the same form as a word with different inflectional features: the *S/V* agreement inflected on the verb is 3rd Person - Singular in the CG_{DS} production while the target is 2nd Person Singular in the target production (B.7a).

B.4.5 Affix Drop

When a word that normally receives inflection (verb, or nominal phrases) is stripped off the inflectional affix and what remains is the root, I tag this production with the tag *Affix Drop*. Such an example is given in (B.8) below:

(B.8) Example of a Production with Affix Drop

(a) *Target Utterance*	(b) *CG_{DS}Production (FA)*
vlep-***o***	vlep-∅
see.IMPF-PRES.1.SG	*see.IMPF-∅*

In (B.8b) the only feature available in the CG_{DS} production is the Imperfective value for Aspect that is included in the verbal root. If CG_{DS} participants were producing a bare root with no inflection, something that is particularly hard to examine in English, we would expect productions like the one in (B.8) to constitute most if not all of their alternative, to the target, use.

In summary, in this section I illustrated how I tagged the participants' performance of their overall production of a word.

APPENDIX C

CHAPTER 5 - PHONETICS AND PHONOLOGY RESULTS

In this section, I provide results on the statistical comparison between omitted and substituted phonemes, within and across Groups. Generally, results between the two groups mostly reveal statistically significant differences. Comparisons include: across and within group comparisons for /s/ and /n/ on overall means (corresponding to *Sections 5.2* and *5.3*), and within and across group comparisons for /s/ and /n/ for both specific and overall means for the discussion in Section 5.5 (*Potential Morpho-syntactic Effects* and *Purely Phonetic/Phonological Effects*).

C.1 Overall Means - Across Group Comparisions for /s/ and /n/

(Based on overall Production-Omission-Substitution)

STATISTICAL COMPARISON ACROSS GROUPS - OMISSION									
	CG_{DS}			CG_{TDC}					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /s/	.246	.163	.041	.004	.007	.002	6.12	31	<.001
Medial /s/	.140	.096	.024	.017	.015	.004	5.22	31	<.001
Final /s/	.589	.316	.079	.037	.034	.006	7.18	31	<.001

TABLE C.1: STATISTICAL COMPARISON -/S/ OMISSION ACROSS GROUPS (OVERALL MEANS)

STATISTICAL COMPARISON ACROSS GROUPS - SUBSTITUTION									
	CG_{DS}			CG_{TDC}					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /s/	.062	.059	.015	.000	.000	.000	4.34	31	<.001
Medial /s/	.043	.041	.010	.006	.005	.001	3.67	31	.001
Final /s/	.050	.079	.020	.004	.003	.001	2.44	31	.012

TABLE C.2: STATISTICAL COMPARISON - /S/ SUBSTITUTION ACROSS GROUPS (OVERALL MEANS)

STATISTICAL COMPARISON ACROSS GROUPS - OMISSION									
	CG_{DS}			CG_{TDC}					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /n/	.052	.035	.009	.013	.016	.004	4.05	31	<.001
Medial /n/	.118	.079	.020	.017	.017	.004	5.17	31	<.001
Final /n/	.402	.156	.039	.076	.056	.013	8.08	31	<.001

TABLE C.3: STATISTICAL COMPARISON -/N/ OMISSION ACROSS GROUPS (OVERALL MEANS)

STATISTICAL COMPARISON ACROSS GROUPS - SUBSTITUTION									
	CG_{DS}			CG_{TDC}					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /n/	.053	.104	.026	.001	.003	.001	2.05	31	.049
Medial /n/	.013	.010	.003	.002	.004	.001	4.14	31	<.001
Final /n/	.009	.015	.004	.002	.005	.001	1.80	31	.082

TABLE C.4: STATISTICAL COMPARISON -/N/ SUBSTITUTION ACROSS GROUPS (OVERALL MEANS)

C.2 Overall Means – Within Group Comparisions for /s/ and /n/

(Based on Production-Omission-Substitution in both *CCV* and *CV*)

STATISTICAL COMPARISON WITHIN GROUPS – OMISSION									
CG_{DS}	**CCV**			**CV**					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /s/	.220	.135	.034	.039	.074	.018	5.61	15	<.001
Medial /s/	.122	.085	.021	.017	.021	.005	5.38	15	<.001
Final /s/	------	------	------	------	------	------	------	-----	------

TABLE C.5: CCV VS. CV STATISTICAL COMPARISON -/S/ OMISSION: CG_{DS} (OVERALL MEANS)

STATISTICAL COMPARISON WITHIN GROUPS – OMISSION									
CG_{TDC}	**CCV**			**CV**					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /s/	.003	.005	.001	.002	.004	.001	0.63	16	.537
Medial /s/	.009	.011	.003	.007	.009	.002	0.65	16	.528
Final /s/	------	------	------	------	------	------	------	----	------

TABLE C.6: CCV VS. CV STATISTICAL COMPARISON - /S/ OMISSION: CG_{TDC} (OVERALL MEANS)

STATISTICAL COMPARISON WITHIN GROUPS – OMISSION									
CG_{DS}	**CCV**			**CV**					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /n/	.004	.005	.001	.048	.035	.009	-5.07	15	<.001
Medial /n/	.044	.033	.008	.074	.076	.019	-1.36	15	.194
Final /n/	------	------	------	------	------	------	------	----	------

TABLE C.7: CCV VS. CV STATISTICAL COMPARISON - /N/ OMISSION: CG_{DS} (OVERALL MEANS)

STATISTICAL COMPARISON WITHIN GROUPS – OMISSION									
CG_{TDC}	CCV			CV					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /n/	.000	.000	.000	.014	.016	.004	-3.47	16	.003
Medial /n/	.010	.015	.004	.007	.009	.002	0.79	16	.439
Final /n/	------	------	------	------	------	------	------	----	------

TABLE C.8: CCV VS. CV STATISTICAL COMPARISON - /N/ OMISSION: CG_{TDC} (OVERALL MEANS)

STATISTICAL COMPARISON WITHIN GROUPS – SUBSTITUTION									
CG_{DS}	CCV			CV					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /s/	.020	.034	.009	.044	.044	.011	-1.84	15	.085
Medial /s/	.017	.022	.006	.026	.027	.007	-1.33	15	.203
Final /s/	------	------	------	------	------	------	------	----	-----

TABLE C.9: CCV VS. CV STATISTICAL COMPARISON -/S/ SUBSTITUTION: CG_{DS} (OVERALL MEANS)

STATISTICAL COMPARISON WITHIN GROUPS – SUBSTITUTION									
CG_{TDC}	CCV			CV					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /s/	.000	.000	.000	.000	.000	.000	------	-----	------
Medial /s/	.006	.005	.001	.001	.002	.001	3.54	16	.003
Final /s/	------	------	------	------	------	------	------	-----	------

TABLE C.10: CCV VS. CV STATISTICAL COMPARISON - /S/ SUBSTITUTION: CG_{TDC} (OVERALL MEANS)

STATISTICAL COMPARISON WITHIN GROUPS – SUBSTITUTION									
CG_{DS}	CCV			CV					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /n/	.000	.000	.000	.053	.104	.026	-2.04	15	.059
Medial /n/	.002	.004	.001	.011	.010	.002	-3.21	15	.006
Final /n/	------	------	------	------	------	------	------	----	------

TABLE C.11: CCV VS. CV STATISTICAL COMPARISON - /N/ SUBSTITUTION: CG_{DS} (OVERALL MEANS)

STATISTICAL COMPARISON WITHIN GROUPS – SUBSTITUTION									
CG_{TDC}	CCV			CV					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /n/	.000	.000	.000	.001	.003	.001	-1.84	16	.085
Medial /n/	.001	.003	.001	.001	.002	.001	-0.44	16	.667
Final /n/	------	------	------	------	------	------	------	-----	------

TABLE C.12: CCV VS. CV STATISTICAL COMPARISON - /N/ SUBSTITUTION: CG_{TDC} (OVERALL MEANS)

C.3. Across Groups Comparisons for Potential Morpho-syntactic Effects

(based on Production-Omission or Production-Substitution)

STATISTICAL COMPARISON FOR POTENTIAL MORPHO-SYNTACTIC EFFECTS - OMISSION									
	CG_{DS}			CG_{TDC}					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /s/	------	------	------	------	------	------	------	-----	------
Medial /s/	.114	.110	.028	.017	.028	.007	3.94	31	.001
Final /s/	.611	.325	.081	.040	.029	.007	7.23	31	<.001

TABLE C.13: POTENTIAL MORPHO-SYNTACTIC EFFECTS - /S/ OMISSION (PRODUCTION-OMISSION)

STATISTICAL COMPARISON FOR POTENTIAL MORPHO-SYNTACTIC EFFECTS - SUBSTITUTION									
	CG_{DS}			CG_{TDC}					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /s/	.094	.188	.047	.000	.000	.000	2.07	31	.046
Medial /s/	.059	.069	.017	.014	.015	.004	2.65	31	.013
Final /s/	.007	.016	.004	.002	.003	.001	1.25	31	.221

TABLE C.14: POTENTIAL MORPHO-SYNTACTIC EFFECTS -/S/ SUBSTITUTION (PRODUCTION-SUBSTITUTION)

STATISTICAL COMPARISON FOR POTENTIAL MORPHO-SYNTACTIC EFFECTS - OMISSION									
	CG_{DS}			CG_{TDC}					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /n/	------	------	------	------	------	------	------	---	-----
Medial /n/	.119	.128	.032	.022	.043	.010	2.93	31	.006
Final /n/	.738	.343	.086	.065	.079	.019	7.88	31	<.001

TABLE C.15: POTENTIAL MORPHO-SYNTACTIC EFFECTS - /N/ OMISSION (PRODUCTION-OMISSION)

STATISTICAL COMPARISON FOR POTENTIAL MORPHO-SYNTACTIC EFFECTS - SUBSTITUTION									
	CG_{DS}			CG_{TDC}					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /n/	------	------	------	------	------	------	------	----	------
Medial /n/	.019	.044	.010	.000	.000	.000	1.84	31	.076
Final /n/	.135	.280	.070	.008	.025	.006	1.86	31	.073

TABLE C.16: POTENTIAL MORPHO-SYNTACTIC EFFECTS -/N/ SUBSTITUTION (PRODUCTION-SUBSTITUTION)

C.4. Across Groups Comparisons for Purely Phonetic/Phonological Effects

(based on Production-Omission or Production-Substitution)

STATISTICAL COMPARISON FOR PURELY PHONETIC/PHONOLOGICAL EFFECTS - OMISSION									
	CG_{DS}			CG_{TDC}					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /s/	.281	.174	.043	.006	.008	.002	6.53	31	<.001
Medial /s/	.158	.110	.027	.018	.016	.004	5.24	31	<.001
Final /s/	.603	.303	.076	.034	.024	.006	7.74	31	<.001

TABLE C.17: PURELY PHONETIC/PHONOLOGICAL EFFECTS - /S/ OMISSION (PRODUCTION-OMISSION)

STATISTICAL COMPARISON FOR PURELY PHONETIC/PHONOLOGICAL EFFECTS - SUBSTITUTION									
	CG_{DS}			CG_{TDC}					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /s/	.090	.090	.022	.003	.007	.002	4.01	31	<.001
Medial /s/	.046	.046	.012	.008	.014	.003	3.24	31	.003
Final /s/	.225	.234	.059	.021	.025	.006	3.59	31	.001

TABLE C.18: PURELY PHONETIC/PHONOLOGICAL EFFECTS - /S/ SUBSTITUTION (PRODUCTION-SUBSTITUTION)

STATISTICAL COMPARISON FOR PURELY PHONETIC/PHONOLOGICAL EFFECTS - OMISSION									
	CG_{DS}			CG_{TDC}					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /n/	.056	.039	.010	.014	.016	.004	4.14	31	<.001
Medial /n/	.119	.081	.020	.017	.016	.004	5.10	31	<.001
Final /n/	.376	.142	.036	.077	.060	.015	7.94	31	<.001

TABLE C.19: PURELY PHONETIC/PHONOLOGICAL EFFECTS - /N/ OMISSION (PRODUCTION-OMISSION)

STATISTICAL COMPARISON FOR PURELY PHONETIC/PHONOLOGICAL EFFECTS - SUBSTITUTION									
	CG_{DS}			CG_{TDC}					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /n/	.056	.109	.027	.006	.008	.002	1.92	31	.064
Medial /n/	.015	.011	.003	.002	.004	.001	4.38	31	<.001
Final /n/	.009	.016	.004	.002	.004	.001	1.82	31	.079

TABLE C.20: PURELY PHONETIC/PHONOLOGICAL EFFECTS - /N/ SUBSTITUTION (PRODUCTION-SUBSTITUTION)

C.5. Overall - within Groups Comparisons for Potential Morpho-syntactic Effects

Overall Means (includes all means for Production, Omission, and Substitution)

STATISTICAL COMPARISON WITHIN GROUPS – OMISSION									
CG_{DS}	Potential Morpho-Syntactic			Phonetic/Phonological					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /s/	.000	.000	.000	.261	.163	.041	-6.37	15	<.001
Medial /s/	.108	.108	.027	.151	.104	.026	-1.88	15	.080
Final /s/	.610	.326	.081	.552	.310	.077	1.69	15	.112

TABLE C.21: STATISTICAL COMPARISON - /S/ OMISSIONS WITHIN GROUPS: CG_{DS} (OVERALL MEANS)

STATISTICAL COMPARISON WITHIN GROUPS – OMISSION									
CG_{TDC}	Potential Morpho-Syntactic			Phonetic/Phonological					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /s/	.000	.000	.000	.006	.008	.002	-3.64	16	.007
Medial /s/	.017	.027	.007	.017	.015	.004	0.01	16	.991
Final /s/	.040	.029	.007	.034	.023	.006	0.90	16	.383

TABLE C.22: STATISTICAL COMPARISON - /S/ OMISSIONS WITHIN GROUPS: CG_{TDC} (OVERALL MEANS)

STATISTICAL COMPARISON WITHIN GROUPS – SUBSTITUTION									
CG_{DS}	Potential Morpho-Syntactic			Phonetic/Phonological					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /s/	.094	.188	.047	.090	.089	.022	0.76	15	.941
Medial /s/	.054	.063	.157	.038	.040	.010	1.23	15	.238
Final /s/	.004	.010	.003	.006	.145	.036	-2.87	15	.012

TABLE C.23: STATISTICAL COMPARISON - /S/ SUBSTITUTIONS WITHIN GROUPS: CG_{DS} (OVERALL MEANS)

STATISTICAL COMPARISON WITHIN GROUPS – SUBSTITUTION									
CG_{TDC}	Potential Morpho-Syntactic			Phonetic/Phonological					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /s/	.000	.000	.000	.003	.001	.002	-1.76	16	.098
Medial /s/	.014	.015	.004	.007	.012	.003	1.13	16	.277
Final /s/	.002	.003	.001	.023	.029	.007	-3.03	16	.008

TABLE C.24: STATISTICAL COMPARISON - /S/ SUBSTITUTIONS WITHIN GROUPS: CG_{TDC} (OVERALL MEANS)

STATISTICAL COMPARISON WITHIN GROUPS – OMISSION									
CG_{DS}	Potential Morpho-Syntactic			Phonetic/Phonological					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /n/	.000	.000	.000	.052	.035	.009	-5.94	15	<.001
Medial /n/	.117	.126	.032	.117	.079	.020	-0.01	15	.996
Final /n/	.678	.356	.089	.374	.141	.035	4.44	15	<.001

TABLE C.25: STATISTICAL COMPARISON - /N/ OMISSIONS WITHIN GROUPS: CG_{DS} (OVERALL MEANS)

STATISTICAL COMPARISON WITHIN GROUPS – OMISSION									
CG_{TDC}	Potential Morpho-Syntactic			Phonetic/Phonological					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /n/	.000	.000	.000	.014	.016	.004	-3.47	16	.003
Medial /n/	.023	.029	.007	.017	.016	.004	0.66	16	.516
Final /n/	.064	.774	.019	.077	.060	.015	0.59	16	.565

TABLE C.26: STATISTICAL COMPARISON - /N/ OMISSIONS WITHIN GROUPS: CG_{TDC} (OVERALL MEANS)

STATISTICAL COMPARISON WITHIN GROUPS – SUBSTITUTION									
CG_{DS}	Potential Morpho-Syntactic			Phonetic/Phonological					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /n/	.000	.000	.000	.053	.103	.026	-2.04	15	.059
Medial /n/	.017	.038	.010	.013	.009	.002	0.45	15	.656
Final /n/	.073	.180	.045	.005	.008	.002	1.54	15	.143

TABLE C.27: STATISTICAL COMPARISON - /N/ SUBSTITUTIONS WITHIN GROUPS: CG_{DS} (OVERALL MEANS)

STATISTICAL COMPARISON WITHIN GROUPS – SUBSTITUTION									
CG_{TDC}	Potential Morpho-Syntactic			Phonetic/Phonological					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /n/	.000	.000	.000	.005	.008	.002	-2.75	16	.014
Medial /n/	.000	.000	.000	.022	.004	.001	-2.42	16	.028
Final /n/	.008	.024	.006	.001	.003	.001	1.49	16	.267

TABLE C.28: STATISTICAL COMPARISON - /N/ SUBSTITUTIONS WITHIN GROUPS: CG_{TDC} (OVERALL MEANS)

C.6. Overall - Across Groups Comparisons for Potential Morpho-syntactic Effects

Overall Means (includes all means for Production, Omission, and Substitution)

STATISTICAL COMPARISON FOR POTENTIAL MORPHO-SYNTACTIC EFFECTS - OMISSION									
	CG_{DS}			CG_{TDC}					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /s/	------	------	------	------	------	------	------	-----	------
Medial /s/	.108	.108	.027	.017	.027	.007	3.37	31	.002
Final /s/	.610	.326	.081	.040	.029	.007	7.20	31	<.001

TABLE C.29: POTENTIAL MORPHO-SYNTACTIC EFFECTS - /S/ OMISSION (OVERALL MEANS)

STATISTICAL COMPARISON FOR POTENTIAL MORPHO-SYNTACTIC EFFECTS - SUBSTITUTION									
	CG_{DS}			CG_{TDC}					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /s/	.094	.188	.047	.000	.000	.000	2.07	31	.046
Medial /s/	.054	.063	.016	.014	.015	.004	2.53	31	.015
Final /s/	.003	.010	.003	.002	.003	.001	0.53	31	.526

TABLE C.30: POTENTIAL MORPHO-SYNTACTIC EFFECTS - /S/ SUBSTITUTION (OVERALL MEANS)

STATISTICAL COMPARISON FOR POTENTIAL MORPHO-SYNTACTIC EFFECTS - OMISSION									
	CG_{DS}			CG_{TDC}					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /n/	------	------	------	------	------	------	------	---	-----
Medial /n/	.117	.126	.032	.023	.043	.010	2.89	31	.007
Final /n/	.678	.356	.089	.064	.077	.019	6.93	31	<.001

TABLE C.31: POTENTIAL MORPHO-SYNTACTIC EFFECTS - /N/ OMISSION (OVERALL MEANS)

STATISTICAL COMPARISON FOR POTENTIAL MORPHO-SYNTACTIC EFFECTS - SUBSTITUTION									
	CG_{DS}			**CG_{TDC}**					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /n/	------	------	------	------	------	------	------	----	------
Medial /n/	.017	.038	.010	.000	.000	.000	1.83	31	.077
Final /n/	.073	.180	.045	.008	.024	.006	1.48	31	.150

TABLE C.32: POTENTIAL MORPHO-SYNTACTIC EFFECTS -/N/ SUBSTITUTION (OVERALL MEANS)

C.7. Overall - across Groups Comparisons for Purely Phonetic/Phonological Effects

Overall Means (includes all means for Production, Omission, and Substitution)

STATISTICAL COMPARISON FOR PURELY PHONETIC/PHONOLOGICAL EFFECTS - OMISSION									
	CG_{DS}			CG_{TDC}					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /s/	.261	.164	.041	.006	.008	.002	6.45	31	<.001
Medial /s/	.151	.104	.026	.017	.015	.004	5.28	31	<.001
Final /s/	.552	.310	.077	.034	.023	.006	6.88	31	<.001

TABLE C.33: PURELY PHONETIC/PHONOLOGICAL EFFECTS - /S/ OMISSION (OVERALL MEANS)

STATISTICAL COMPARISON FOR PURELY PHONETIC/PHONOLOGICAL EFFECTS - SUBSTITUTION									
	CG_{DS}			CG_{TDC}					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /s/	.090	.090	.022	.003	.006	.001	4.03	31	<.001
Medial /s/	.038	.040	.010	.008	.012	.003	3.05	31	.005
Final /s/	.105	.145	.036	.023	.029	.007	2.31	31	.028

TABLE C.34: PURELY PHONETIC/PHONOLOGICAL EFFECTS - /S/ SUBSTITUTION (OVERALL MEANS)

STATISTICAL COMPARISON FOR PURELY PHONETIC/PHONOLOGICAL EFFECTS - OMISSION									
	CG_{DS}			CG_{TDC}					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /n/	.052	.035	.009	.014	.016	.004	4.05	31	<.001
Medial /n/	.117	.079	.020	.017	.016	.004	5.13	31	<.001
Final /n/	.334	.141	.035	.078	.060	.015	7.97	31	<.001

TABLE C.35: PURELY PHONETIC/PHONOLOGICAL EFFECTS - /N/ OMISSION (OVERALL MEANS)

STATISTICAL COMPARISON FOR PURELY PHONETIC/PHONOLOGICAL EFFECTS - SUBSTITUTION									
	CG_{DS}			CG_{TDC}					
C	*M*	*SD*	*Std.Error*	*M*	*SD*	*Std.Error*	*t*	*df*	*p*
Initial /n/	.053	.104	.026	.005	.008	.002	1.89	31	.068
Medial /n/	.013	.009	.002	.002	.004	.001	4.40	31	<.001
Final /n/	.005	.008	.002	.001	.003	.001	1.75	31	.090

TABLE C.36: PURELY PHONETIC/PHONOLOGICAL EFFECTS - /N/ SUBSTITUTION (OVERALL MEANS)

APPENDIX D

CHAPTER 6 - MORPHO-SYNTAX RESULTS

D1. Examples for Extra Evaluation Labels used for Data Evaluation

Below, I provide a set of examples to illustrate additional labels (other than *Correct* and *Incorrect*) used to evaluate the participants' overall performance with a word. I start with cases where a word is unexpectedly added to what was targeted by a stimulus or expected in a *Free Elicitation* task.

(D.1) Unexpected Addition

(a) *Targeted Utterance*

Pien-e-te	***s***pit-i	sas!	E-ni***x***to-***s***-e.
go.PRF-IMP-2.PL	*house-NEU.ACC.SG*	*2.ACC.PL*	*PAST-get.dark-PRF-PAST.3.SG*

'Go to your house! It's dark (outside).'

(b) *CG_{DS} Production (TM)*

pa-me	∅pit-i	mas!	E-ni[t]to-[t]-e, ...
go.IMRF-PRES.1.PL	*house-NEU.ACC.SG*	*1.ACC.PL*	*PAST-get.dark-PRF-PAST.3SG*

... ***@na*** ***@ppe-s-u-me***.

SUBJ ***lie.down-PRF-DEP-1.SG.***

'Let's go to our house! It's dark. (It's time) to lie down.'

The clause *na ppes-ume* 'to lie down' produced by *EA* in (D.1b) is not part of the target stimulus, as shown in (D.1a), and therefore, the participant was not required to use it. These type of additions were considered unexpected. With example (D.2), I show how the participant *EA* omits the root of the verb *šeret-is-o* 'greed' in the targeted stimulus.

(D.2) Root Omission

(a) *Target Utterance*

e na sas ***ʃeret-is-o*** pri fi-o.

be.IMPF.PRES.3.SG/PL SUBJ 2.ACC.PL ***greed-PRF-DEP.3SG*** *before* ***leave.PRF-DEP.3.SG***

'I (m going) to greed you before I leave.'

(b) *DS Production (EA)*

∅ na sa∅ ***∅-is-o*** @meta @pu @na fi-o.

∅ *SUBJ* ***2.ACC.PL*** ***∅-PRF-DEP.3.SG*** *after that SUBJ* ***leave.PRF-DEP.3.SG***

'I (am going) to greed you after I leave.'

In example (D.2b), the participant omitted the root of the verb *šeret-is-o* 'greed' leaving only the two targeted inflectional suffixes: Aspect (-*is*-) and Tense/*S/V* agreement (-*o*). In the CG_{DS} production in (D.2b) we also see a number of unexpected additions: *meta* 'after', *pu* 'that' and the Subjunctive marker *na*. Next, in example (D.3), I show what I evaluated as *Root Change*. Comparing the target and produced sentences we see that while the CG_{TDC} participant was required to use the root *iaskedaz*- 'have fun', instead, he used the root *xorev*- 'dance'.

(D.3) Root Change

(a) *Targeted Utterance*

ðiaskedaz-u xorevondas

have.fun-IMPF-PRES-3PL dance-GER

'They are having fun by dancing.'

(b) *CG_{TDC} Production (AK)*

xorev-u xorevondas

dance-IMPF-PRES-3PL dance- GER

'They are dancing by dancing.'

Despite the root change in example (D.3b), we nevertheless see that the participant used the correct verbal suffix for Tense and *S/V* agreement. A possible explanation for this change is the participant's confusion such that, the *Root Change* was a product of a copying speech error. Though this structure is pragramatically odd, it is still syntactically grammatical.

D.2 Statistical Comparisions with Participants' Means with only Alternative Use

STATISTICAL COMPARISON ACROSS GROUPS– ALTERNATIVE USE OF OVERALL FEATURES									
	CG_{DS}			CG_{TDC}					
	M	*SD*	*Std. Error*	*M*	*SD*	*Std. Error*	*t*	*df*	*p*
Verbs									
Tense	.585	.260	.065	.734	.223	.054	-1.77	31	**.087**
Person	.638	.203	.052	.731	.348	.090	-0.89	28	**.379**
Number	.618	294	.073	.664	.322	.081	-0.42	30	**.678**
Case	.127	.108	.027	.280	.384	.099	-1.53	29	**.136**
Copula									
Tense	.857	.378	.143	.841	.358	.108	0.90	16	**.928**
Person	.500	.707	.500	------	------	------	------	------	-----
Number	------	------	------	------	------	------	------	-----	-----

TABLE D.1: STATISTICAL COMPARISON: ALTERNATIVE USE ONLY ON OVERALL INFLECTIONAL FEATURES

STATISTICAL COMPARISON ACROSS GROUPS – ALTERNATIVE USE									
	CG_{DS}			CG_{TDC}					
TENSE	*M*	*SD*	*Std. Error*	*M*	*SD*	*Std. Error*	*t*	*df*	*p*
Verb									
Present	.623	.235	.061	.731	.223	.054	-1.34	30	**.189**
Past	.500	.577	.289	.000	------	------	0.775	3	**.495**
Dependent	.583	.354	.095	.861	.332	.096	-2.05	24	.051
Imperative	------	------	------	------	------	------	------	------	-----
Copula									
Present	.857	.378	.143	.825	.374	.118	0.174	15	**.864**
Past	------	------	------	------	------	------	------	------	-----

TABLE D.2: STATISTICAL COMPARISON OF TENSE: ALTERNATIVE USE ONLY

STATISTICAL COMPARISON ACROSS GROUPS – ALTERNATIVE USE									
	CG_{DS}			CG_{TDC}					
PERSON	*M*	*SD*	*Std. Error*	*M*	*SD*	*Std. Error*	*t*	*df*	*p*
Verbs									
1st Person	.672	.374	.108	.083	.204	.083	3.56	16	.003
2nd Person	.188	.372	.132	.000	.000	.000	0.84	9	**.420**
3rd Person	.659	.268	.069	.895	.274	.073	-2.34	27	.027

TABLE D.3: STATISTICAL COMPARISON OF PERSON: ALTERNATIVE USE ONLY

STATISTICAL COMPARISON ACROSS GROUPS – ALTERNATIVE USE									
NUMBER	CG_{DS}			CG_{TDC}					
Verbs	*M*	*SD*	*Std. Error*	*M*	*SD*	*Std. Error*	*t*	*df*	*p*
Singular	.488	.353	.091	.417	.318	.096	0.53	24	**.599**
Plural	.787	.368	.098	.798	.358	.096	-0.08	26	**.941**

TABLE D.4: STATISTICAL COMPARISON OF NUMBER: ALTERNATIVE USE ONLY

STATISTICAL COMPARISON ACROSS GROUPS – ALTERNATIVE USE									
	CG_{DS}			CG_{TDC}					
CASE	*M*	*SD*	*Std. Error*	*M*	*SD*	*Std. Error*	*t*	*df*	*p*
Nominative	.044	.063	.016	.207	.341	.114	-1.83	22	**.080**
Accusative	.544	.383	.106	.393	.497	.188	0.76	18	**.456**
Genitive	.056	.167	.056	.000	.000	.000	0.732	12	**.478**
Vocative	------	------	------	------	------	------	------	------	-----

TABLE D.5: STATISTICAL COMPARISON OF CASE: ALTERNATIVE USE ONLY

D.3 Statistical Comparisions on Participants' Omission: Overall Features

STATISTICAL COMPARISON ACROSS GROUPS - OMISSION									
	CG_{DS}			CG_{TDC}					
	M	*SD*	*Std. Error*	*M*	*SD*	*Std. Error*	*t*	*df*	*p*
Verb									
Tense	.965	.025	.006	.995	.006	.001	-4.88	31	<.001
Person	.965	.025	.006	.995	.006	.001	-4.88	31	<.001
Number	.946	.033	.008	.994	.006	.001	-4.88	31	<.001
Case	.930	.053	.013	.989	.009	.002	-4.55	31	<.001
Copula									
Tense	.798	.116	.029	.989	.017	.004	-6.76	31	<.001
Person	.798	.116	.029	.989	.017	.004	-6.76	31	<.001
Number	.798	.116	.029	.989	.017	.004	-6.76	31	<.001

TABLE D.6: STATISTICAL COMPARISON: OMISSION ON OVERALL INFLECTIONAL FEATURES

D.4 Inflectional Feature Values as Alternatives (with Gerund)

		N of default/overall use of alt		N of default / φ use		Overall φ use	
Feature	**Default**	CG_{DS}	CG_{TDC}	CG_{DS}	CG_{TDC}	CG_{DS}	CG_{TDC}
TENSE	PRESENT	381/474	253/284	381/2,448	253/2,299	3,848	4,158
		80.2%	88.8%	15.6%	11%		
V. PERSON	3RD	90/146	45/5,6	90/2,371	45/2,466	3,856	4,176
		61.2%	80.4%	3.8%	1.8%		
V. NUMBER	SG	60/111	24/62	60/3,020	23/3,000	3,841	4,125
		53.6%	36.5%	2.0%	0.8%		
CASE	NOM	190/256	20/38	190/3,439	20/4,428	9,972	12,983
		73.9%	51.3%	5.5%	0.5%		

TABLE D.7: DEFAULT USE OF VERBAL TENSE, *S/V* AGREEMENT AND CASE (INCLUDES GERUND)

D5. Results on Inflectional Features, based on Experimental Tasks

Tables D.8 through *D.16* below chart the distribution of all feature value productions for the four features produced by CG_{DS} and CG_{TDC}, examined in the dissertation. In particular, it includes the number of instances each feature value is used as targeted/expected (Match - COR). It also includes the overall number of instances of Tense values when used as an alternative correctly (*Alternative – COR*) and incorrectly (*Alternative – INC*). It also charts the proportion of *incorrect uses* of a particular feature value (INC %), based only on the instances where a value is *used as an alternative* within the specific task, based on the overall production of the feature in the specific experimental task. For example, in the *Dependent* row of *Table D.8* we see that CG_{DS} produce 32 uses of Dependent, out which 12 are used as an alternative to another feature value, and 9 of 32 (28%)were used incorrectly. Finally, *Tables D.8* through *D.16* give the proportion of incorrect uses of all feature values when used incorrectly (*INC% Overall*), *based on the overall* use of each feature value (Match + Alternative) in total, throughout all nine experimental tasks. The purpose of the last percentage calculation helps to observe the distribution of incorrect use for each feature value, based on the percentages we have seen throughout *Chapter 6*. In particular, we saw that the overall incorrect use of Dependent was 5.1%, out of which 1.8% was recorded with data collected with *Experiment #1*, *Video I*.

Experiment 1 – Video I												
	CG_{DS}						CG_{TDC}					
	N	Match	Alternative		Task	overall	N	Match	Alternative		Task	overall
		COR	COR	INC	INC%	INC%		COR	COR	INC	INC%	INC%
PRES	2,448	601	0	0	0%	0%	2,299	598	0	1	0.2%	0.04%
PAST	744	12	0	0	0%	0%	1,246	9	0	0	0%	0%
DEP	512	20	3	9	28%	1.8%	383	5	2	0	0%	0%
IMP	144	1	0	2	66.7%	1.4%	230	0	0	2	100%	0.9%
1ST	1,081	37	0	1	2.6%	0.1%	1,011	17	0	0	0%	0%
2ND	404	4	0	1	20%	0.25%	699	22	0	2	8.3%	0.3%
2ND PhI		8										
3RD	2,371	597	0	0	0%	0%	2,466	569	0	0	0%	0%
SG	3,020	603	0	0	0%	0%	3,000	596	0	0	0%	0%
PL	821	45	0	1	2.2%	0.1%	1,125	23	0	0	0%	0%
NOM	4,079	631	6	33	4.9%	0.8%	4,473	639	2	1	0.2%	0.02%
NOMPhI		198						0				
ACC	4,845	735	0	1	0.1%	0.02%	6,859	987	2	0	0%	0%
ACCPhI		6						0				
GEN	947	39	0	3	7.1%	0.3%	1,592	95	0	0	0%	0%
GENPhI		0						0				
VOC	101	10	0	0	0%	0%	59	0	0	0	0%	0%

TABLE D.8: TENSE, *S/V* AGREEMENT AND CASE PERFORMANCE FOR EXPERIMENT #1 – VIDEO I

Experiment 1 – Video II												
	CG_{DS}						CG_{TDC}					
	N	Match	Alternative		Task	overall	N	Match	Alternative		Task	overall
		COR	COR	INC	INC%	INC%		COR	COR	INC	INC%	INC%
PRES	2,448	540	2	0	0%	0%	2,299	456	6	0	0%	0%
PAST	744	31	1	1	3%	0.13%	1,246	12	0	0	0%	0%
DEP	512	14	7	1	4.5%	0.2%	383	6	1	1	12.5%	0.26%
IMP	144	0	0	1	100%	0.7%	230	1	0	0	0%	0%
1ST	1,081	54	1	2	3.5%	0.2%	1,011	10	0	0	0%	0%
2ND	404	4	0	2	33%	0.5%	699	2	0	0	0%	0%
2ND PhI		4						0				
3RD	2,371	526	4	1	0.2%	0.04%	2,466	469	0	1	0.2%	0.04%
SG	3,020	471	4	7	1.5%	0.23%	3,000	397	0	0	0%	0%
PL	821	113	1	2	1.7%	0.24%	1,125	85	0	0	0%	0%
NOM	4,079	491	0	35	6.7%	0.86%	4,473	463	0	1	0.2%	0.02%
NOMPhI		174						9				
ACC	4,845	664	1	0	0%	0%	6,859	913	1	1	0.1%	0.01%
ACCPhI		7						3				
GEN	947	26	0	1	3.7%	0.1%	1,592	55	0	0	0%	0%
GENPhI		0						0				
VOC	101	13	0	0	0%	0%	59	0	0	0	0%	0%

TABLE D.9: TENSE, *S/V* AGREEMENT AND CASE PERFORMANCE FOR EXPERIMENT #1 – VIDEO II

Experiment 1 – Video III												
	CG_{DS}						CG_{TDC}					
	N	Match	Alternative		Task	overall	N	Match	Alternative		Task	overall
		COR	COR	INC	INC%	INC%		COR	COR	INC	INC%	INC%
PRES	2,448	545	196	118	13.7%	4.82%	2,299	21	101	86	41.3%	3.74%
PAST	744	91	0	0	%	0%	1,246	540	0	0	0%	0%
DEP	512	28	7	8	18.6%	1.56%	383	15	1	1	5.9%	0.26%
IMP	144	4	0	0	%	0%	230	0	0	0	0%	0%
1ST	1,081	58	1	3	4.8%	0.3%	1,011	42	1	2	4.4%	0.2%
2ND	404	15	0	1	6.3%	0.25%	699	157	0	1	0.6%	0.14%
2ND PhI		12						4				
3RD	2,371	675	4	2	0.3%	0.08%	2,466	554	1	0	0%	0%
SG	3,020	650	7	2	0.3%	0.07%	3,000	541	0	2	0.4%	0.07%
PL	821	108	1	0	0%	0%	1,125	220	0	0	0%	0%
NOM	4,079	691	2	24	3.3%	0.6%	4,473	858	1	5	0.6%	0.1%
NOMPhI		223						8				
ACC	4,845	904	3	8	0.9%	0.8%	6,859	2144	3	4	0.2%	0.06%
ACCPhI		9						3				
GEN	947	75	0	5	6.3%	0.53%	1,592	506	0	4	0.8%	0.25%
GENPhI		8						10				
VOC	101	14	0	0	0%	0%	59	0	0	0	0%	0%

TABLE D.10: TENSE, *S/V* AGREEMENT AND CASE PERFORMANCE FOR EXPERIMENT #1 – VIDEO III

Experiment 2 – Task I												
	CG_{DS}						CG_{TDC}					
	N	Match	Alternative		Task	overall	N	Match	Alternative		Task	overall
		COR	COR	INC	INC%	INC%		COR	COR	INC	INC%	INC%
PRES	2,448	288	17	8	2.6%	0.3%	2,299	395	14	4	1%	0.2%
PAST	744	206	1	1	0.5%	0.1%	1,246	355	0	1	0.3%	0.1%
DEP	512	165	13	7	3.8%	1.4%	383	194	3	0	0%	0%
IMP	144	82	0	2	2.4%	1.4%	230	128	0	0	0%	0%
1ST	1,081	238	23	5	1.9%	0.5%	1,011	319	0	3	1%	0.3%
2ND	404	130	2	5	3.6%	1.2%	699	244	0	0	0%	0%
2ND PhI		32						5				
3RD	2,371	325	14	12	3.4%	0.5%	2,466	514	7	1	0.2%	0%
SG	3,020	527	19	14	2.5%	0.5%	3,000	718	7	9	1.2%	0.3%
PL	821	220	4	1	0.4%	0.1%	1,125	351	3	3	0.8%	0.3%
NOM	4,079	1060	4	36	3.3%	0.9%	4,473	1956	2	4	0.2%	0.1%
NOMPhI		182						16				
ACC	4,845	710	14	13	1.8%	0.3%	6,859	1058	0	0	0%	0%
ACCPhI		19						1				
GEN	947	302	0	6	1.9%	0.63%	1,592	523	1	2	0.4%	0.13%
GENPhI		46						3				
VOC	101	35	0	1	2.8%	1%	59	58	0	0	0%	0%

TABLE D.11: TENSE, *S/V* AGREEMENT AND CASE PERFORMANCE FOR EXPERIMENT #2 – TASK I

Experiment 2 – Task II												
	CG_{DS}						CG_{TDC}					
	N	Match	Alternative		Task	overall	N	Match	Alternative		Task	overall
		COR	COR	INC	INC%	INC%		COR	COR	INC	INC%	INC%
PRES	2,448	41	33	2	2.6%	0.1%	2,299	96	36	0	0%	0%
PAST	744	3	0	0	0%	0%	1,246	2	0	0	0%	0%
DEP	512	1	3	1	20%	0.2%	383	0	0	0	0%	0%
IMP	144	3	0	0	0%	0%	230	2	0	0	0%	0%
1ST	1,081	11	2	2	13.3%	0.2%	1,011	6	0	2	25%	0.2%
2ND	404	1	0	2	66.7%	0.5%	699	3	0	0	0%	0%
2ND PhI		1						0				
3RD	2,371	36	32	1	1.4%	0%	2,466	91	34	0	0%	0%
SG	3,020	27	5	3	8.6%	0.1%	3,000	23	3	1	3.7%	0.03%
PL	821	21	32	0	0%	0%	1,125	75	33	0	0%	0%
NOM	4,079	47	0	0	0%	0%	4,473	79	0	0	0%	0%
NOMPhI		8						1				
ACC	4,845	54	0	0	0%	0%	6,859	97	0	0	0%	0%
ACCPhI		2						1				
GEN	947	1	0	0	0%	0%	1,592	35	0	0	0%	0%
GENPhI		0						0				
VOC	101	4	0	0	0%	0%	59	0	0	0	0%	0%

TABLE D.12: TENSE, *S/V* AGREEMENT AND CASE PERFORMANCE FOR EXPERIMENT #2 – TASK II

Experiment 3 – Task I												
	CG_{DS}						CG_{TDC}					
	N	Match	Alternative		Task	overall	N	Match	Alternative		Task	overall
		COR	COR	INC	INC%	INC%		COR	COR	INC	INC%	INC%
PRES	2,448	161	3	1	0.6%	0%	2,299	27	2	0	0%	0%
PAST	744	158	0	0	0%	0%	1,246	303	0	0	0%	0%
DEP	512	62	3	0	0%	0%	383	45	0	0	0%	0%
IMP	144	6	0	0	0%	0%	230	0	0	0	0%	0%
1ST	1,081	258	1	0	0%	0%	1,011	282	0	0	0%	0%
2ND	404	6	0	0	0%	0%	699	2	0	0	0%	0%
2ND PhI		4										
3RD	2,371	113	1	7	5.8%	0.3%	2,466	94	0	0	0%	0%
SG	3,020	288	2	0	0%	0%	3,000	136	1	0	0%	0%
PL	821	99	0	0	0%	0%	1,125	239	0	1	0.4%	0.1%
NOM	4,079	154	0	16	9.4%	0.4%	4,473	118	0	2	1.7%	0.04%
NOMPhI		21						2				
ACC	4,845	541	2	2	0.4%	0%	6,859	686	0	0	0%	0%
ACCPhI		10						0				
GEN	947	120	1	1	0.8%	0.1%	1,592	111	0	0	0%	0%
GENPhI		4						0				
VOC	101	6	0	0	0%	0%	59	0	0	0	0%	0%

TABLE D.13: TENSE, *S/V* AGREEMENT AND CASE PERFORMANCE FOR EXPERIMENT #3 – TASK I

Experiment 3 – Task II												
	CG_{DS}						CG_{TDC}					
	N	Match	Alternative		Task	overall	N	Match	Alternative		Task	overall
		COR	COR	INC	INC%	INC%		COR	COR	INC	INC%	INC%
PRES	2,448	219	0	1	0.5%	0%	2,299	309	0	0	0	0%
PAST	744	85	0	0	0%	0%	1,246	16	0	0	%	0%
DEP	512	87	5	0	0%	0%	383	61	0	1	1.6%	0.3%
IMP	144	2	0	0	0%	0%	230	0	0	0	0%	0%
1ST	1,081	266	0	1	0.4%	0.1%	1,011	312	0	0	0%	%
2ND	404	6	0	0	0%	0%	699	0	0	0	0%	0%
2ND PhI		2						0				
3RD	2,371	113	3	7	5.7%	0.3%	2,466	75	0	0	0%	0%
SG	3,020	327	0	1	0.3%	0.03%	3,000	300	0	1	0.3%	0.03%
PL	821	68	0	2	2.9%	0.2%	1,125	85	0	1	1.2%	0.1%
NOM	4,079	158	0	15	8.7%	0.4%	4,473	164	0	0	0%	0%
NOMPhI		12						0				
ACC	4,845	604	2	0	0%	0%	6,859	505	0	0	0%	0%
ACCPhI		4						1				
GEN	947	115	0	3	2.5%	0.3%	1,592	111	0	0	0%	0%
GENPhI		9						0				
VOC	101	3	0	0	0%	0%	59	1	0	0	0%	0%

TABLE D.14: TENSE, *S/V* AGREEMENT AND CASE PERFORMANCE FOR EXPERIMENT #3 – TASK II

Experiment 4 – Task I												
	CG_{DS}						CG_{TDC}					
	N	Match	Alternative		Task	overall	N	Match	Alternative		Task	overall
		COR	COR	INC	INC%	INC%		COR	COR	INC	INC%	INC%
PRES	2,448	117	0	0	0%	0%	2,299	121	0	0	0%	0%
PAST	744	32	0	0	0%	0%	1,246	11	0	0	0%	0%
DEP	512	31	0	0	0%	0%	383	22	0	0	0%	0%
IMP	144	12	0	0	0%	0%	230	3	0	0	0%	0%
1ST	1,081	83	0	0	0%	0%	1,011	46	0	0	0%	0%
2ND	404	33	0	0	0%	0%	699	72	0	0	0%	0%
2ND PhI		32										
3RD	2,371	43	1	0	0%	0%	2,466	40	0	0	0%	0%
SG	3,020	169	1	1	0.6%	0.02%	3,000	148	0	0	0%	0%
PL	821	19	0	1	5%	0.1%	1,125	10	0	0	0%	0%
NOM	4,079	105	1	11	9.4%	0.3%	4,473	109	0	1	0.9%	0.02%
NOMPhI		5										
ACC	4,845	215	0	1	0.5%	0.02%	6,859	256	0	0	0%	0%
ACCPhI		4										
GEN	947	66	0	1	1.5%	0.1%	1,592	86	0	0	0%	0%
GENPhI		4										
VOC	101	13	0	0	0%	0%	59	0	0	0	0%	0%

TABLE D.15: TENSE, *S/V* AGREEMENT AND CASE PERFORMANCE FOR EXPERIMENT #4 – TASK I

Experiment 4 – Task II												
	CG_{DS}						CG_{TDC}					
	N	Match	Alternative		Task	overall	N	Match	Alternative		Task	overall
		COR	COR	INC	INC%	INC%		COR	COR	INC	INC%	INC%
PRES	2,448	39	0	0	0%	0%	2,299	23	3	0	0%	0%
PAST	744	4	0	0	0.%	0%	1,246	5	0	0	0%	0%
DEP	512	19	16	0	0%	0%	383	8	18	0	0%	0%
IMP	144	30	0	1	3.2%	0.7%	230	95	0	0	0%	0%
1ST	1,081	31	0	0	0%	0%	1,011	15	0	0	0%	0%
2ND	404	41	0	0	0%	0%	699	121	0	0	0%	0%
2ND PhI		20						0				
3RD	2,371	15	0	1	6.3%	0.04%	2,466	16	1	0	0%	0%
SG	3,020	97	0	0	0%	0%	3,000	151	0	0	0%	0%
PL	821	12	0	0	0%	0%	1,125	1	0	0	0%	0%
NOM	4,079	26	1	5	15.6%	0.1%	4,473	22	0	1	4.3%	0.02%
NOMPhI		3						0				
ACC	4,845	99	0	0	0%	0%	6,859	195	0	0	0%	0%
ACCPhI		0						0				
GEN	947	10	0	1	9.1%	0.1%	1,592	47	0	1	2.1%	0.1%
GENPhI		0						0				
VOC	101	1	0	0	0%	0%	59	0	0	0	0%	0%

TABLE D.16: TENSE, *S/V* AGREEMENT AND CASE PERFORMANCE FOR EXPERIMENT #4 – TASK II

APPENDIX E

CHAPTER 7 – DISCUSSION AND ANALYSIS

E.1 Case Defaults in Greek – Diagnostic Tests

To avoid confusion and/or bias I used the exact same sentences form Schütze (2001)[120] translated into Greek but sometimes changing the names and using both a name and a pronoun. For all examples proper nouns, not just pronouns, behave the same way, as shown in examples below.

(E.1) Left Dislocation and Apposition

(a) O kaliter-os aθlit-is, aft-os/ *aft-on/ ...
DET.MASC.SG.NOM best-MASC.SG.NOM athelete-MASC.SG.NOM 3-MASC.SG.NOM 3-MASC.SG.ACC

... o Kost-as, prep-i na niki-s-i.
DET.MASC.SG.NOM Costa-MASC.SG.NOM must.IMPF-PRES.3.SG SUBJ win-PRF-PRES.3.SG
'The best athlete, *he/him/ Costa, must win.'[121]

(b) Ti? Aft-os /*aft-on / o Petr-os ...
What 3-MASC.SG.NOM 3-MASC.SG.ACC DET.MASC.SG.NOM Petros-MASC.SG.NOM

.... na fore-s-i kostum-i? Pote!
SUBJ wear-PRF-DEP.3.SG suit-NEU.SG.ACC never
'What?! *He/him/Petros wear a tuxedo?! Never.'

In the *Left Dislocation and Apposition* examples we see that the left dislocated DP can be inflected only with Nominative. An attempt to inflect the DP with Accusative (i.e. **aft-on*) surfaces an ungrammatical result, while the reverse is true for English. (B.2) illustrates that in cases where a DP is not assigned Case via syntactic derivation, the chosen morphological default is Nominative. The second diagnostic tool utilised to determine default case is *Ellipsis*.

[120] Except for (E.5b) which shows how the 1st Person pronoun is used in a Greek idiomatic expression.
[121] The grammatical judgements for the English translations (apart from those for proper names) are taken from Schütze (2001).

(E.2) Ellipsis

Pios θel-i na peks-ume ena pexnið-i?

Who wants to play a game?

(a) Eγo /*emena /o Steli-os.

1.SG.NOM *1.SG.ACC* *DET.MASC.SG.NOM* *Stelio-MASC.SG.NOM*

'*I/me/Stelio.'

(b) Mono eγo / *emena.

only *1.SG.NOM* *1.SG.ACC*

'Only *I/me.'

(c) ke esi/ *esena / i ðor-a.

and *2.SG.NOM* *1.SG.ACC* *det.FEM.SG.NOM* *Dora-FEM.SG.NOM*

'You/ Dora, too.'

(d) oxi emis, oute aft-i / i mamað-es.

NEG *1.PL.NOM* neither *3-FEM.SG.NOM* *DET.FEM.PL.NOM* *mum-FEM.PL.NOM*

'Not us/ neither them, the mums.'

(e) Pi-os θa bor-use na ton frondi-s-i ...

who-MASC.SG.NOM *FUT* *can-IMPF.PAST.3SG* *SUBJ* *3-MASC.SG.ACC* *take.care-PRF.DEP.3SG*

... an oxi emis / *emas?

if *not* *1.SG.NOM* *1.SG.ACC*

'Who could take care of him but *we/ us.'

Structures (a) through (e) in (E.2) exemplify how in the Case of *Ellipsis* as a reply to a question, Greek uses Nominative Case. For instance, in (B.2c), the use of the personal pronoun in Nominative, and the DP in Nominative are appropriate, while an attempt to use Accusative in the same position is perceived as ungrammatical. The use of Accusative in all cases is not possible. The next diagnostic test is *Gapping*.

(E.3) Gapping

(a) Ti e-faγ-an ol-i?
what PAST-*eat*-PRF.PAST.3SG *all*.MASC.SG.NOM

Eγo/ *emena fasol-ia, aft-os /*aft-on riz-i, ...
1.SG.NOM 1.SG.ACC *bean*-NEU.PL.ACC 3-MASC.SG.NOM 3-MASC.SG.ACC *rice*-NEU.SG.ACC

... aft-i/ *aft-us karrot-a.
3-MASC.PL.NOM 3-MASC.PL.ACC *carrot*-NEU.PL.ACC
'What did everyone eat? *I/me beans, *he/him rice, they/ *them carrots.'

(b) γiati ðe bor-use na par-i aft-os to ...
why NEG *can*-IMPF.PAST.2SG SUBJ *take*-IMPF.PRES.3SG 3-MASC.SG.NOM DET.NEU.SG.ACC

.... aftokinito mu i eγo / *emena to ðiko ...
car-NEU.SG.ACC 1.SG.GEN CONJ 1.SG.NOM 1.SG.NOM DET.NEU.SG.ACC *my*.NEU.SG.ACC

... tu?
3.MASC.SG.GEN
'Why couldn't he take my car or ?I/ me his?'

With this diagnostic test we see that in the absence of a verbal phrase, once again the appropriate Case to inflect the remnant nominal in Greek is Nominative, not Accusative, while the reverse is true for English. The next diagnostic tool tests Case inflection with conjoined DPs.

(E.4) Coordination

(a) Aft-i /*aft-in ke emis / *emas imaste ...
3-FEM.SG.NOM 3-FEM.SG.ACC CONJ 1.PL.NOM 1.PL.ACC *be*.IMPF.PRES.1PL

... fil-i apo palia.
friend-MASC.PL.NOM *from* *old*
'*She /her and *we/us have been friends for ages.'

(b) i γon-is su i aft-os / *afton/ ...
DET.MASC.PL.NOM *parent*-MASC.PL.NOM 2.SG.GEN CONJ 3.MASC.SG.NOM 3.MASC.SG.ACC

... o Kost-as parelav-e ti Len-a?
DET.MASC.SG.NOM Costa-MASC.SG.NOM receive-PRF.PAST.3SG DET.FEM.SG.ACC Lena-FEM.SG.ACC
'Did your parents or *he / him/ Costa pick up Lena?'

The *Coordination* examples once again verify that Nominative is the chosen default Case value in Greek. Compare the Greek example, where the Accusative Case value is not available, with the English equivalent, where Accusative is the appropriate Case value to be inflected on the Masculine pronoun, while the use of Nominative is ungrammatical in English. The last diagnostic tool proposed by Schütze (2001) is the use of Case with *Modified Pronouns*.

(E.5) <u>Modified Pronouns</u>

(a) i mikr-i eγo *emena / eγo, mikr-i.
DET.FEM.SG.NOM little-FEM.SG.NOM 1.SG.NOM 1.SG.ACC 1.SG.NOM little.FEM.SG.NOM
'The little *I/ me // me little.'

(b) Pliγoθik-e to "eγo" mu.
hurt-PRF.PAST.3SG DET.NEU.SG.ACC 1.SG.NOM 1.SG.GEM
'My self-esteem/ego was hurt.'

(c) Emis / *emas i γlossoloγ-i imaste ...
1.PL.NOM 1.PL.ACC DET.MASC.PL.NOM linguist-MASC.PL.NOM be-IMPF-PRES-1PL

... trell-i.
crazy-MASC.PL.NOM
'We/ us linguists are crazy.'

In (E.5c), while both Accusative and Nominative are possible in English, in Greek the appropriate Case to use is Nominative. The use of the Accusative Case value in the relevant structure surfaces an ungrammatical result. In order for Accusative to be used in an equivalent word initial position, we need topicalization of the DP, which functions as an object. An extra diagnostic tool is provided by Schütze (2001:235): *Post Copular DPs* (found in the Appendix).

(E.6) Post copular DPs

(a) O ðolofonos ine aft-os / *aft-on.

DET.MASC.SG.NOM murderer-MASC.SG.NOM be.IMPF.PRES.3SG/PL 3-MASC.SG.NOM 3-MASC.SG.ACC

'The murder is *he / him.'

(b) An isun eγo / *emena ðen θa ...

COND be-IMPF-PRES-2SG 1.SG.NOM 1.SG.ACC NEG FUT

'If I you were *I/me you wouldn't…'

Both examples provided in (E.6) illustrate that when a pronoun is used after a copula the appropriate Case to use is Nominative, not Accusative. On the contrary, the appropriate Case with such a construction for English is the Accusative.

The five diagnostic tools (and the *Post Copular DPs* test), proposed by Schütze (2001) show that the default Case for Greek (SG_{TD} and CG_{TD}) is Nominative. Similar examples in this study's database show that the default Case for CG_{DS} and CG_{TDC} is also Nominative. *Table 5* in *Chapter 7* summarises the results on Schütze's diagnostic tools for Eng_{TD}, SG_{TD}, CG_{TD}, and CG_{DS}.

E.2 Discussion on Unmarked Greek Case

Tsimpli (2001), in agreement with Stephany (1997) argues that the Accusative Case value is the underspecified Case value in $Greek_{TDC}$ language acquisition, while she states that children have a problem with Nominative nouns ending in *-s*. She awards this difficulty to the syntactic complexity of Subject agreement, which requires the presence of a Tense head, as opposed to Object agreement, which is only dependant on D. However, she earlier reports that in most cases we can know the Case inflected on nouns through the determiner, which is frequently omitted. Moreover, Stephany (1997) notes that setting aside the omission of definite determiners, the second most frequent error is consonant reduction of *CV(C)* (e.g., *to(n)* ''the'') syllables to *CV* or *V* (e.g., ***to*** or ***o***), thus "resulting in Gender and Case underspecification". At the second stage of

language acquisition however, a few months later, children are able to use the Case feature specification for the article at least 91% of Nominative and Accusative tokens.

I find this argumentation problematic. First, concerning nominals, how is it possible to determine that the targeted Case is altered to Accusative when the determiner is not present to clarify if the observed /s/ omission is syntactic, altering the Case value from Nominative to Accusative? Second, in the case of syncretic forms with nouns and adjectives, where Accusative and Nominative surface with the same phonological exponent, how can one know which Case is the selected one, in the absence of a determiner? Third, why is this case of consonant omission with determiners perceived as phonetic/phonological, while the /s/ omission above with nominals is perceived as syntactic? Fourth, why were no cases with 1st and 2nd Person pronouns, which do not include a final /s/ for Nominative, tested? Fifth, how can the default Case value for nouns and clitics be Accusative[122] and yet we have underspecification of the definite article (located under D, where the Case features reside) to an overt form matching Nominative? One can argue that this is a result of late acquisition of *CV* syllable structure or acquisition of the phoneme /t/. However, the simplification of syllables like /ton/ to /o/ cannot be attributed to a phonetic or problem since a large number of studies on acquisition of Greek phonology verify that /t/ is acquired at 1;6 or earlier and *CV* syllables including /t/ are produced by young $\text{Greek}_{\text{TDC}}$ at that same age. Therefore, these cases do in fact seem to be the ones that are in fact morpho-syntactically conditioned. Finally, it should be mentioned that this study considers data from only four $\text{Greek}_{\text{TDC}}$, out of which one inflects Case (including Nominative) successfully at 91%. Besides, Stephany (1997) does not screen for phonological acquisition of inflectionally related

[122] Nominative clitics are not nearly as frequent as Accusative.

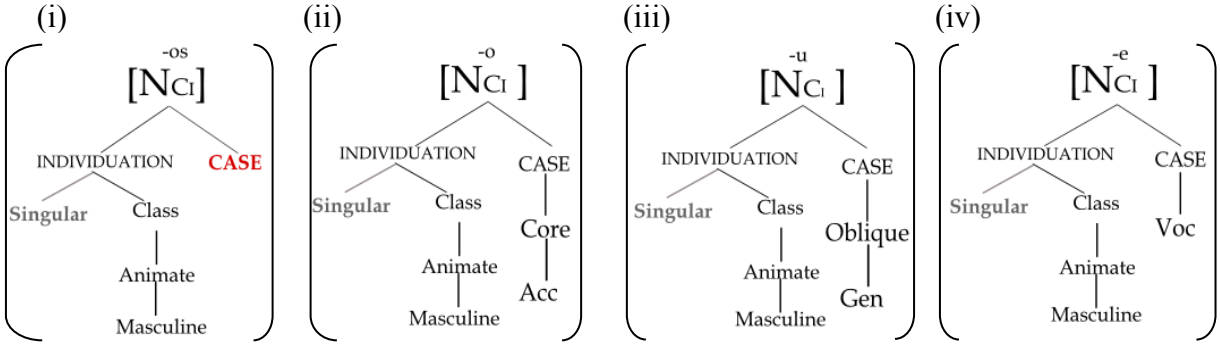
sounds (testing both inflectional and non-inflectional environments) to verify whether this is indeed a discrepancy with Case inflection or a more generalised phonological phenomenon.

Thomadaki (1994:106) argues that given the surfacing representation of a bundle of nominal features (i.e. whether the phonological exponent includes /s/ or not, and depending on the vowel included in the inflectional suffix), Accusative is ***morphologically*** the least marked Case. She uses Stephany (1997) as supporting evidence of acquisition of Accusative earlier than all other Case values. She argues that no Accusative-Singular ending of any inflectional paradigm for nouns presents a marked inflectional "element"/ending, usually consisting a vowel /u/ for Masculine and Neuter Genitive or consonant /s/ for Feminine-Genitive, and Masculine-Nominative. Therefore, Accusative-Singular is the most simplified form. Thomadaki (p.c.) clarified that her Dissertation focused more on the architecture of the morphological relations in noun inflection than in the consequences for syntax or language acquisition. Further, she considers that "trying to establish a default Case for the sake of syntactic structures (the information needed for my analysis) is something very different from assuming that, given the interdependencies between Case forms in a system such as that of MG (Modern Greek) nouns, the formal expression of a Case remains generally 'silent'". Therefore, this analysis was not adopted due to the fact that it is only based on purely morphological information taken from the distribution of inflectional paradigms, rather than a result of its use in a structural environment.

E.3 Towards a Unified Analysis – Feature Underspecification

E.3.1 Full P-EX Representation of Derived Feature Bundles

(E.7) VOCABULARY ITEMS FOR FEATURE BUNDLES



(E.7) shows the (expected) full representation of P-EX for the Masculine feature bundles . As established above, the default Case for Greek is Nominative and the default Number is Singular. The universal (grey) and language-specific defaults (red) are included in the P-EX in (E.7).

E.3.2 Feature Bundles and Vocabulary Items for Neuter

Below, I give the vocabulary items list (P-EX) for instances where all nominal feature values for Gender (Neuter), Number (Singular) and Case (Nominative) are default but also exhibit a great amount of syncretism with Nominative, Accusative and Vocative sharing the same P-EX. I give possible bundles of features resulting from the syntactic derivation with different feature combinations and the P-EX for each of these bundles. The P-EX may include one, two or all three defaults.

(E.8)

C_{VIII}	SG	PL
NOM	-i	-ia
ACC	-i	-ia
GEN	-iu	-ion
VOC	-i	-ia

(E.9) POSSIBLE FEATURE BUNDLES RESULTING FROM SYNTACTIC DERIVATION (NEUTER)

a. [+N-CVII, +NEU, +SG, +NOM] b. [+N-CVII, +NEU, +SG, +ACC] c. [+N-CVII, +NEU, +SG, +GEN] d. [+N-CVII, +NEU, +SG, +VOC]

e. [+N-CVII, +NEU, +PL, +NOM] f. [+N-CVII, +NEU, +PL, +ACC] g. [+N-CVII, +NEU, +PL, +GEN] h. [+N-CVII, +NEU, +PL, +VOC]

(E.10) PHONOLOGICAL EXPONENT AND VOCABULARY ITEMS FOR FEATURE BUNDLES

Singular a., b., d. c. Plural a., b., d. c.

(i) -i [NCVII]

(ii) -iu [NCVII] CASE Oblique Gen

(iii) -ia [NCVII] INDIVIDUATION Plural

(iv) -ion [NCVII] INDIVIDUATION Plural; CASE Oblique Gen

The vocabulary item under (i) applies to the feature bundles in a., b., and d. The vocabulary item under (iii) applies to the feature bundles in e., f., and h. That is, in Greek syncretic forms are captured by a single vocabulary item. Therefore, when a bundle of features results from the syntactic derivation, bearing the features in (E.9a), it receives the P-EX [+N_{CVII}] ↔ -i. Coincidentally, this is also the P-EX for Singular-Accusative and Singular-Vocative of the same inflectional class.

E.4 Alternative Syntactic Analysis Based on Caha (2009)

In his PhD dissertation, Caha (2009), based on Strake (2005), proposes a derivational breakdown of features, such that, Case features are syntactic heads, ordered in a universal functional sequence. Based on the Peeling Theory, initially proposed by Starke (2005), arguments are base-

generated with a number of Case projections located above them. When arguments move up the tree, they strand these projections along. However, instead of the traditional view of head movement, Caha proposes that head movement is a "special instance of phrasal movement" and could therefore, be perceived as such, by eliminating head movement and using phrasal movement, or otherwise called "roll-up." Again based on Starke (2005), Caha proposes *spell out* of non-terminal nodes, thus, individual morphemes spell out phrasal constituents (any size). This type of insertion is governed by the *Superset Principle*[123]. Different phrases (NPs) can be spelled out (multiple *spell out*), but ignored for the purpose of insertion of further features/ markers at a later stage. Hence, Caha (2009) combines fusion and spell out of terminals in a single operation namely, *spell out* of non-terminal nodes, and suggests that with this, fusion is redundant.

Through individual phrasal spell outs, the model proposed by Caha, we can explain why in fusional morphology with CG_{DS} we can have only one out of three or four features spelled out as the default, instead of the entire bundle producing a default form based on all the features in the portmanteau morpheme, i.e. a generic form made up of the default values of all features included in the morpheme. Nonetheless, Caha's model cannot provide a unified account for a potential breakdown of the inflectional system each time a default is used because, there is no common basis which can explain feature underspecification at different times with different unrelated features each time. In addition, apart from default feature values, we also observe default structures with CG_{DS}. Thus, even by using Caha's model, we would once again have to argue for impairment of the entire inflectional system without being able to predict the extent of the impairment, and when each underspecified form is used. Another option is to argue for problems with the spell out mechanism, but that would still imply there was an ungrounded selective impairment of one spell out instance but not another (i.e. *Spell Out* is sometimes affected while

[123] According to the *Superset Principle* Starke (2005), "a phonological exponent is inserted into a node if its lexical entry has a (sub-)constituent that is identical to the node (ignoring traces)".

other times it is not). Finally, if [TENSE] is impaired and spells out a default form, either under T/INFL or any other feature related to it, how can we explain the same issues with nominal Person and Number, or Gender and Aspect? Finally, omission of full words (inflectional and non-inflectional) as well as the different phonetic representation of non-inflectional words cannot be accounted for by such an analysis. Note also that this system is currently available only for Case and therefore, it still cannot predict why anything apart from Case can be used in its default from. Under the proposed model, we can avoid concluding an analysis arguing for an impairment of the entire inflectional system. We can still argue for a different realisation of the CG_{DS} Grammar, one that differs from adult CG_{TD}, but nevertheless, the cause distinguishing between the two Grammars cannot be determined through a syntactic analysis.