DISCOURSE FACILITATION OF LANGUAGE PRODUCTION
BY A NONFLUENT APHASIC ADULT

by

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This study investigated the language production of a single nonfluent aphasic individual as it varied across a number of discourse tasks. The tasks were hypothesized to affect the performance of the aphasic individual differentially because they varied in terms of number of extralinguistic variables, although the support factors do not necessarily contribute equivalent amounts of support. The extralinguistic variables included: schematic structure, temporal structure, visual support, retelling opportunity, familiar context and graphic representation of the semantic relations that form the basis of a discourse. The tasks also varied in terms of discourse type: fairytale, procedural discourse, memorable experience, sequence picture, expository discourse and complex picture description.

A theory of sentence production (Garrett, 1980, 1982, 1984) provided a framework for identification of a number of dependent variables that were representative of the subject's level of language impairment at the functional and positional levels of Garrett's theory.

Results indicated that discourse type was a factor in the subject's differential performance, measured in terms of length of discourse (words per discourse and utterances per discourse), length of utterance, the proportion of complete sentences (in relation to total utterances), and production of verbs in relation to the production of nouns. The number of extralinguistic variables was a factor in the subject's differential performance, measured in terms of the total number of words produced per minute per
discourse and complete sentences as a proportion of total utterances. Also, the subject produced a greater proportion of complete sentences and a greater proportion of sentences having three arguments in a task represented in a format that emphasized the semantic relations of a discourse than in a task that did not, when all other variables were held constant. The subject produced longer discourses (measured in total number of words), a larger number of verb tokens, and a greater proportion of complete sentences in tasks having schematic structure than in tasks that did not, when all other variables were held constant.

The results suggest that certain discourse tasks facilitate certain aspects of language production better than others. Knowledge of which discourse tasks are more facilitative is important for the assessment, and potentially, the treatment of aphasia.
# TABLE OF CONTENTS

Abstract

Table of Contents

List of Tables

Acknowledgements

Chapter One. Review of the Literature

    Introduction

    Discourse Production Studies in Aphasia

    General Discourse Abilities of Aphasic Adults

        Narratives

        Procedural Discourse

        Summaries

        Morals

        Memorable Experience

        Severely Impaired Aphasics

    Nonfluent vs. Fluent Aphasics

    Retelling Abilities of Aphasic Adults

    Script Knowledge in Aphasia

    Reference Abilities of Aphasic Adults

    Discourse in the Assessment of Aphasia
Discourse Abilities of Aphasic Adults

Across Discourse Tasks 38

Summary 42

Statement of Research Questions 44

Chapter Two. Research Methodology

Overview 46

The Subject 47

Baseline Investigations 48

Overview 48

Rationale for Baseline Investigations 49

Agrammatism 50

Standardized Testing 53

Boston Diagnostic Aphasia Examination 53

Test of Comprehension of Syntactic Structure 54

Nonstandardized Testing 56

Verb Retrieval Task 56

Sentence Production Task 57

Sentence Judgment Task 58

Monitoring Procedures 59

Experimental Tasks 60

Overview 60

Explanation of Extralinguistic Variables 64
Chapter Three. Baseline Investigations

Results 87

Standardized Testing 87

Boston Diagnostic Aphasia Examination 87

Test of Comprehension of Syntactic Structure 90

Verb Retrieval Task 92
Sentence Production Task 92
Sentence Judgment Task 94
Baseline Discourse Tasks 95
Discussion 97

Chapter Four. Results and Discussion

Review of Research Questions and Hypotheses 99
Results 100
Monitoring Tasks 100
Discourse Type and Extralinguistic Support 102
Productivity 102
Lexicon 108
Syntactic Structure 110
Morphology and Function Words 116
Verb/Argument Structure 119
Cohesion Plan 121
Schematic Structure 122
Discourse Level 125
Interpretations and Clinical Implications 127
Discourse Type 127
Extralinguistic Variables 128
Cohesion Plan 128
Schematic Structure 129
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline vs. Experimental Tasks</td>
<td>130</td>
</tr>
<tr>
<td>Comparisons to Earlier Research</td>
<td>131</td>
</tr>
<tr>
<td>Conclusion</td>
<td>133</td>
</tr>
<tr>
<td>References</td>
<td>135</td>
</tr>
<tr>
<td>Appendix A. Sentence Judgment Task</td>
<td>140</td>
</tr>
<tr>
<td>Appendix B. The Moose Story Cohesion Plan</td>
<td>142</td>
</tr>
<tr>
<td>Appendix C. The Princess and the Pea</td>
<td>143</td>
</tr>
</tbody>
</table>
LIST OF TABLES

Table 2.1  Retrieval Task Verbs According to Frequency of Usage  56
Table 2.2  Sentence Production Task Verbs According to Frequency of Usage  58
Table 2.3  Levels of Extralinguistic Support According to Discourse Task  62
Table 3.1  DM's Scores on the Boston Diagnostic Aphasia Examination  88
Table 3.2  Results of the Test of Comprehension of Syntactic Structure  90
Table 3.3  Sentence Production Task Error Analysis  94
Table 3.4  Sentence Judgment Task Score  96
Table 3.5  Utterance Analysis for Baseline Discourse Tasks  96
Table 3.6  Function Word/Morphological Analysis for Baseline Discourse Tasks  97
Table 4.1  Productivity Measures for Monitoring Tasks  101
Table 4.2  Productivity Measures for all Discourse Tasks  103
Table 4.3  Averages of Productivity Measures Across Discourse Type  105
Table 4.4  Productivity Measures Represented as Mean Number Across all Discourse Tasks  105
Table 4.5  Averages of Productivity Measures According to Number of Levels of Extralinguistic Support  106
Table 4.6  Lexical Measures for all Discourse Tasks  108
Table 4.7  Classification of DM's Utterances According to Syntactic Structure and Complexity  112
Table 4.8  Results of Analysis of DM's use of Verb Inflections, Determiners, Auxiliaries and Prepositions

Table 4.9  Proportion of Determiners in Obligatory Contexts According to Discourse Type

Table 4.10  Proportion of Determiners in Obligatory Contexts According to Number of Levels of Extralinguistic Support

Table 4.11  Verb Argument Analysis Results
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CHAPTER ONE

REVIEW OF THE LITERATURE

Introduction

Many researchers devoted to the investigation of the comprehension and production of discourse in aphasia point out the discrepancy between assessing aphasic adults in the context of the standardized test and in the context of more natural communicative interactions. These researchers submit that the abilities of the aphasic adult may not be fully realized in standardized testing. The value in measuring performance using standardized testing measures in the form of word and sentence comprehension and elicitation tasks, is not disputed. However, there are two important reasons why aphasia research should be turning to the study of disordered language in natural contexts, one being clinically relevant and the other, theoretically relevant. First, it is important to assess aphasic speakers' abilities in a variety of contexts in order to acquire a valid picture of their ability outside the clinical setting. This has been called their 'communicative competence'. Second, in testing theories about language, it is important to be able to make statements about aphasic adults' abilities to access language competence or knowledge of language. Since performance may be susceptible context of speaking, it is important to assess aphasic speakers' in a wide variety of language-oriented situations in order to acquire insight into their facility in accessing linguistic competence.
'Performance' and 'competence' are defined by Chomsky (1965). Competence is the underlying knowledge of the rule system of language and performance is the processing of language, i.e. language comprehension and production in everyday situations. Performance only mirrors competence when it is not affected by "such grammatically irrelevant conditions as memory limitations, distractions, shifts of attention and interest, and errors" (1965:3). In making claims about competence, we can only consider the performance of the aphasic patient through measurable behaviours and infer competence from this. However, if one assumes that language competence is intact in aphasia, and that the impairment of language is due to an impaired ability to process language, the gap between performance and competence may be large, and it may be difficult to infer competence from performance. However, if one also assumes that fluctuations in performance allow performance to approach something closer to competence, then more about competence may be inferred. Wiegl and Bierwisch (1970) argue that daily fluctuations in abilities, and the fact that certain activities can deblock abilities, are evidence that language knowledge or competence in aphasia is not destroyed but is susceptible to performance variables.

The alternative to assessing the performance of aphasic adults in the context of single words and sentences, as in standardized tests, is assessing in more natural language contexts, for example, through discourse. Researchers often define 'discourse' simply as a series of connected sentences. However, when discourse is defined in terms of its communicative function, as in Brown & Yule's (1983) definition of discourse as a "verbal record of a communicative event" (1983:190), then one cannot impose length as
a criterion. Discourse may, in fact, take the form of a single sentence or a word. Halliday & Hasan (1976) provide a similar definition emphasizing a meaning-based definition of text or discourse rather than a form-based definition. This being only a preliminary definition, some theoretical perspectives will be explored in order to provide a more comprehensive definition of discourse. Exploration of this topic will also provide support to the argument that the assessment of the aphasic adult should be pursued in the context of discourse.

Early research into the comprehension of texts developed from the field of psychology. In comprehension of texts, experiments have demonstrated the existence of three levels of representation (Kintsch & van Dijk, 1978; van Dijk & Kintsch, 1983): 1) the 'surface trace', a rapidly decaying memory for particular words or surface structure elements; 2) the 'text base' representation, the meaning-based representation; and 3) the 'situation model', which focuses on how readers apply world knowledge to text comprehension. Of interest to this study is the text base representation, whose semantic structure is comprised of two levels: macrostructural and microstructural levels. The microstructure of a text is comprised of the underlying semantic relations between sentences. For example, one relationship between the following sentences occurs as a result of the dependency that (2) has on (1):

(1) John gave flowers to Helen.
(2) She liked the gift very much.
The reader must refer back to (1) to determine who *she* and what *the gift* are referring to. This notion of co-reference will be explained in more detail in a review of Halliday and Hasan's (1976) comprehensive treatment of cohesion and text analysis.

In the Kintsch & van Dijk model, the semantic form of the individual sentence is coded in the form of a proposition which is represented as a predicate, or relational concept, and one or more arguments. Predicates include verbs, adjectives, adverbs or connectives, and arguments consist of nouns. Sentence (1) has been analyzed in terms of a proposition:

(3) (predicate: *give*, agent: *John*, goal: *Helen*, theme: *flowers*)

The macrostructure is the overall meaning of the discourse, or its 'topic'. It is based on the meanings of the individual sentences and like the microstructure, is also represented in propositional form. A set of recursive macro-rules (van Dijk & Kintsch, 1983) determine the global meaning of the text by operating on micro-propositions, the process of which is partly controlled by schemata and inferencing based on world knowledge. Schemata are abstract cognitive structures, socially and culturally determined (Brown & Yule, 1983), and hierarchically organized. They are instrumental in the comprehension and production of discourse, and influential in terms of how an individual interprets events in the world around him (Brown & Yule, 1983). An example of a common schema is the narrative schema or story grammar (Stein & Glenn, 1979; Mandler & Johnson, 1977), which is normally comprised of a setting, complicating event, resolution and possibly an evaluation and coda in canonical order. The schema aids the
reader or listener in determining which micropropositions are relevant and which will form the topic of the discourse (Kintsch & van Dijk, 1978).

Brown & Yule (1983) point out some problems with the proposition-based model of discourse. First, the process of analyzing a discourse in terms of propositions is entirely subjective, especially in determining which propositions are relevant to determining the topic of the discourse. Second, the communicative function of the discourse is entirely ignored. That is, the meaning is interpreted outside the original meaning intended by a speaker or writer.

Another important theoretical perspective comes from Halliday & Hasan (1976) and Hasan (1985) on the 'cohesion' and 'texture' of discourse. One of our earlier, preliminary definitions of text or discourse comes from Halliday & Hasan (1976). These authors emphasize that discourse is communicative and a unit of meaning rather than of form. It is also distinguished from events that are not discourse because of a characteristic Halliday & Hasan call 'unity'. They then describe just how this textual unity is accomplished. Semantic unity or 'texture' (Halliday & Hasan, 1976) is determined by relations between the parts of the discourse "where the interpretation of any item in the discourse requires making reference to some other item in the discourse" (1976:11). These relations are called cohesive relations or ties. Cohesion refers to the set of semantic resources linking a sentence with what has gone before (1976:10). A tie must have two members having a common relation.

(4) The boy reached for the box.
(5) *He* was quite a tall *lad* for his age.

(Examples from Armstrong, 1990:49)

In the above noted example, *the boy* and *he* are the two members of a tie. When a reader infers that both members of the tie refer to the boy a semantic relation is created. Hasan (1985) lists three kinds of semantic relationships: co-referentiality, co-classification and co-extension. Co-referentiality occurs when both members of a tie refer to the same thing as in the sentence above where *he* refers to *the boy*. Through the use of vocabulary choice, another semantic relation is created between *lad* in (5) and *the boy* in (4). Co-referentiality was achieved in one instance through a device of reference, the pronoun, and in another instance through 'lexical cohesion' (Halliday & Hasan, 1976). In co-classification, both members of a tie refer to a distinct member of a class. In the following sentences, (6) and (7),

(6) Can I borrow *your pen*?

(7) Yes, but what happened to *yours*?

(Examples from Hasan, 1985:74)

both pens belong to the same class, the pen class, but they are two separate items, realized through the cohesive device, ellipsis (7). Co-extension involves two members which refer to the same thing in a general way:

(8) The heavy *storm* which hit Sydney last night brought chaos to many suburbs.

(9) Huge *hailstones* were reported along with *high winds* and *blinding rain*.

(Examples from Armstrong, 1991:50)
In (8) and (9) a semantic relation is created through the extended meanings of *storm* represented in *hailstones, high winds and blinding rain*. The nature of cohesive devices such as reference, lexical cohesion, etc., is that they signal the reader or listener to look elsewhere for the referent. This search could take the reader either in the extra-linguistic environment, the 'context', or the linguistic environment within the text, the 'co-text' (Hasan, 1985). When a referent lies within the co-text, the interpretation of the referent is 'endophoric', the referent either preceding, an instance of 'anaphora' or following, an instance of 'cataphora', the lexico-grammatical cohesive device (Halliday & Hasan, 1976). When the referent lies outside the text, the interpretation of the device is 'exophoric' (Halliday & Hasan, 1976).

Halliday & Hasan's (1976) definition of text hinges not only upon semantic relations but to a large part on the presence of cohesive devices. Brown & Yule (1983) question the necessity of defining a text in terms of Halliday & Hasan's explicit cohesive relations. They suggest instead, that the power of the cohesive relation may not be in the semantic relations themselves, but in the ability of the listener or reader to identify a text as a text (1983:195). The listener or reader approaches the discourse with the assumption that a text is coherent, that it has 'texture' (Halliday & Hasan, 1976). In a later work, Hasan (1985) concedes this point, saying that the "property of texture is related to the listener's perception of coherence" (1985:72) as well as on its lexical and grammatical structure.

A number aphasia researchers (Armstrong, 1991; Lemme, Hedberg & Bottenberg, 1984; Bottenberg, Lemme & Hedberg, 1985, 1987) have applied theoretical perspectives from cohesion analysis to aphasia. Armstrong further suggests that a goal of aphasia
treatment could be that of focusing the aphasic patient on the semantic relations within discourses. The assumption is that an aphasic patient who is cognizant of these semantic interactions might perform better in a discourse production.

It is the notion of the cohesive or semantic tie and that of the schema and its hypothesized influence on language production that serves the basis for this writer's two hypotheses about discourse and aphasia.

Hypothesis 1: The triggering of a cognitive schema, for example, the story schema, will improve the performance of an aphasic adult in the production of discourse by reducing the processing load at the level of development of the message.

A short summary of a model of language processing is necessary at this juncture in order to explain Hypothesis 1 more carefully. The development of the message occurs at a level of processing prior to levels of processing that access lexical and syntactic knowledge. These levels of processing have been outlined in a model of sentence production. Garrett (1980, 1982, 1984) has proposed a psycholinguistic processing model of sentence production based on normal speech errors. The first level is the 'message' level representation, where the plan of a discourse, or what it is one wants to say, is represented after processes of inferencing have been implemented. It is at this level of processing I assume the cognitive schemata are implemented. At the message level representation speakers have decided what they will talk about and what schematic format will organize the message, if any, i.e. a narrative schema, a joke schema, etc. Logical and syntactic processes allow for the selection of content words from the lexicon.
A knowledge of the thematic roles associated with verbs is requisite to selecting content words from the lexicon on a proposition by proposition basis. Once the thematic roles for the verb have been determined (for example, the verb, *give* has three thematic roles --agent, goal and theme), then the lexical items are selected. The thematic roles are then mapped onto verb/argument structure. This forms Garrett's 'functional' level of representation. Then syntactic and phonological processes allow for the retrieval of the phonological representation of content words, and the placement of grammatical morphemes into the positional frames, which is determined by the verb/argument structure of the sentence. This is the 'positional' level of representation. These processes are followed by phonetic and motor processes, and finally, the production of the discourse.

Possibly, the reduction in the processing component at the level of the message could facilitate the aphasic subject in a number of areas such as in accessing the lexicon, accessing the thematic relations associated with verbs, or in the mapping of thematic relations to verb argument structure. Quite possibly the facilitative effects could extend further to levels of processing that assign free and bound grammatical morphemes to positional frames.

The second hypothesis stems from Armstrong's (1991) application of cohesion analysis to the treatment of aphasia.

**Hypothesis 2:** An aphasic patient who is cognizant of the semantic relations that form the basis of discourse will be facilitated in discourse production.
because processing loads will be reduced at the level of the 'message'.

I will now turn to research on aphasia and discourse in order to determine what support exists for these hypotheses. I will review the research to date, keeping in mind the following questions:

1) Is there evidence that cognitive schemata are intact in aphasia despite numerous other language and cognitive impairments?

2) Do different discourse tasks result in different levels of performance, i.e. Are some discourse tasks more facilitative than others?

3) Given that some tasks are more facilitative than others, in what areas of performance are there signs of improvement?

The organization for the review is based upon common goals of researchers. Some researchers have focused on more general descriptive goals and others have opted to test specific hypotheses.

**Discourse Production Studies in Aphasia**

The general goals of the production studies on discourse in aphasia have been:

1) to characterise the general discourse abilities of mildly impaired aphasics (Ulatowska, North & Macaluso-Haynes, 1981;) moderately impaired aphasics (Ulatowska, Doyel, Freedman-Stern & Macaluso-Haynes, 1983a & 1983b), and severely impaired aphasics (Bond, Ulatowska & Macaluso-
Haynes, 1983) across a variety of discourse tasks and to compare them
with those of a normal control group;

II) to compare the narrative discourse styles of nonfluent with fluent aphasics and with
those of a normal control group (Berko-Gleason, Goodglass, Obler, Green, Hyde
& Weintraub, 1980; Ulatowska et al., 1983a & 1983b);

III) to test specific hypotheses about narrative structure and aphasic adults' abilities
to retell narratives (Ernest-Baron, Brookshire & Nicholas, 1987);

IV) to determine if knowledge of scripts is preserved in aphasic adults (Armus,
Brookshire & Nicholas, 1989);

V) to describe referential communication abilities of aphasics and to compare these
with those of a normal control group (Early & VanDemark, 1987);

VI) to propose a treatment program for an aphasic adult based on discourse theory
(Armstrong, 1991);

VII) to devise and evaluate means of measuring and eliciting discourse (Yorkston &
Beukelman, 1980); and

VIII) to compare performance of mild to moderate aphasics and normal subjects using
discourse tasks which vary according to experimentally controlled variables
(e.g. amount of structure, familiarity visual support, etc.) (Bottenberg et al., 1985,
1987; Lemme et al., 1984).

**General Discourse Abilities of Aphasic Adults**

The major purposes of Ulatowska et al. (1981, 1983a, 1983b) and Bond et al. (1983)
are: 1) to describe discourse in aphasia; 2) to devise means of eliciting discourse; and
3) to determine if aphasics' procedural vs. narrative discourse productions (to be defined later) result in differential performances. These authors point out the discrepancy between aphasics' performance on standardized tests and performance in naturalistic environments, and that clinical impressions suggest aphasics communicate better in more natural situations. However, no hypotheses are advanced to substantiate this notion, nor have any studies to date explored this hypothesis experimentally. The authors predict that there will be differences between aphasics' examples of narrative and procedural discourse because these genres differ in terms of information content, communicative intent, superstructure and cohesion (Ulatowska et al., 1990). Predictions are also made with regard to performance on other tasks within the studies: summaries are predicted to have the same schematic structure of narratives but will be of shorter length. No predictions are provided for the other tasks within the study. The following are definitions of the different discourse types provided by the authors.

Ulatowska et al. (1981, 1983b) define a fully formed narrative as having one or more episodes comprised of setting, complicating action, evaluation and resolution. Variations within the schematic structure are optional abstracts, morals and order variations. They say narrative discourse "is a language representation of a happening, real or imagined, which consists of matching a verbal sequence of clauses to the sequence of events which actually occurred" (Ulatowska et al., 1981:350). The schematic structure is an individual's "pragmatic knowledge" (1981:351) about how events are organized. The following is an example of a narrative, about a rooster and a hawk, produced by a moderately impaired aphasic individual:
Two roosters is fighting.  

And best rooster chuckled.  

And then the hawk swepted and picked up the rooster.  

And the defeated rooster is proud.  

And the hens are proud.  

(Example from Ulatowska et al., 1983b:333)

Procedural discourse is defined as follows:

Procedural discourse, in contrast to narrative, tells how something is done. It consists of steps or procedures that are stated in a specifiable order which is either conceptually or chronologically motivated. Procedural discourse is goal oriented because the focus is on telling something is done, not on who does it or what is done, as in narratives. Procedural discourse may contain introduction, resolution and coda, in addition to steps. It can also include evaluation, though much less frequently than narratives do. (Ulatowska et al., 1983a:316)

Some examples of types of procedures are: giving directions to a certain place, or explaining how something is done in the form of a series of steps. Procedural tasks, in these studies, varied according to the amount of cognitive demand imposed on the subjects, and were analyzed for the presence of essential, target and optional steps. Essential steps are those which enable the listener to successfully carry out the task, the target step denotes the completion of the task, and the optional steps are simply those which offer more detailed information as to how the procedure may be carried out. The following is an example of the procedure of a moderately impaired aphasic (type of aphasia was not identified) analyzed for types of steps (presumably, speech errors, hesitation, and pauses have been edited out):
Making a Sandwich

Two slices of bread
Open the peanut butter jar
And get the knife
And dip and spread it on
the slices
And fold it
And sandwiches

(Example from Ulatowska et al., 1983:338)

The memorable experience task was simply described as a self-generated account of a memorable experience that closely mirrors spontaneously produced discourse. The authors do not discuss the possible differences which could exist between a memorable experience structure and a traditional narrative structure such as the story schema. Nor do the authors mention the additional variable, familiarity. A familiar telling task would presumably have some effects on the quality of the task because it might be more motivating and interesting to the subject, and would have offered more opportunities for its retelling.

The summary and moral tasks consisted of summarizing and providing morals for two narratives that the subjects had earlier produced. Summaries were predicted to contain elements of schematic structure as seen in narratives. The act of telling a moral is described as being "largely cognitive since it requires isolating two elements of the narrative superstructure, the complicating action and the resolution, interpreting their
meaning, and then generalizing that meaning to a broader context of events" (Ulatowska et al., 1981:358).

Subjects were comprised of aphasics with mild and mild to moderate impairments (Ulatowska et al., 1981), moderate impairments (Ulatowska et al. 1983a & 1983b) and severe impairments (Bond et al., 1983), all having either anterior, posterior or mixed lesions. The etiology of the aphasia in almost all cases was a single cerebrovascular accident in the left hemisphere. Severity of aphasia was determined by severity ratings on the Boston Diagnostic Aphasia Examination (Goodglass & Kaplan, 1983), henceforth to be referred to as the BDAE (1983), and Part V of The Token Test (DeRenzi & Vignolo, 1962). Control groups were matched in age, sex and education. Experimental procedures used to elicit discourse in all three studies included:

1) a story about a "cat" elicited with the help of sequence pictures;

2) the retelling of a "rooster" story immediately following the examiner's reading of the story;

3) an account of a memorable experience;

4) a summary and moral for the first two tasks (the rooster story was an Aesop fable);

5) routine procedures elicited with the help of sequence pictures which were removed prior to the telling of the procedure (e.g. brushing teeth, combing hair, cutting bread and making sandwiches); and
6) procedures most likely learned but never performed, also facilitated with sequence picture (e.g. bowling and changing a tire).

Analysis of the discourse types consisted of measuring variables associated with sentential characteristics such as:

1) length of discourse measured in clauses or T-units (defined as one independent clause plus any dependent modifier of that clause) measured in mean number of words (Hunt, 1965); and

2) complexity of language, measured in terms of amount of embedding (expressed in number of clauses per T-unit), ratio of coordinate to subordinate conjunctions, percentage that dependent clauses are of total clauses, and percentage that nonfinite clauses are of total clauses.

Analysis also included measuring variables associated with discourse characteristics such as:

1) length of discourse (measured in T-units);

2) occurrence of superstructure elements in narratives (e.g. setting, resolution, etc.) and in procedures (e.g. procedural steps);

3) length of elements of superstructure (in T-units);

4) amount of evaluation measured in number of clauses containing evaluation in narratives and procedures;

5) amount of adverbial modification in procedures measured in number of adverbial phrases; and

6) content and clarity (defined below).
Content and clarity will be described in more detail because their measurement is more detailed. Content, according to the authors, is a rough measure of cohesion, and clarity is a rough measure of the coherence of a discourse. In discussing cohesion and coherence, the authors make reference to Halliday and Hasan (1976). Coherence refers to the "plausibility, conventionality, and conclusiveness of discourse, [and] is a general cognitive concept," while cohesion refers to "linguistic devices such as anaphora and reference, which produce coherence" (Ulatowska et al., 1983a:321). The authors do mention the complex relationship between cohesion and coherence: that cohesion does not necessarily reflect the other and vice versa. Including an analysis of coherence in the studies themselves, allows the authors a means of determining the extent to which perceived coherence of the aphasics' discourses is preserved or not preserved, despite their lack of correct use of cohesive devices and impairment in use of aspects of sentence grammar. Raters unfamiliar with the subjects performed the rating and were advised of the differences between the concepts, content and clarity. The investigators explained that while some discourses could be rated high in content, they could be rated low in clarity because of "unclear language" (1983a:321). Content was rated according to a four-point scale and clarity was rated according to a three-point scale, although scales varied slightly across studies. Questions used in this rating and scales are provided in Ulatowska et al. (1983a):
CONTENT RATING FORM AND INSTRUCTIONS

1. Are the objects necessary for performing the task clear?
   You must consider two factors in answering this question: Are all of the necessary objects mentioned and is reference to these objects unambiguous? Objects include ingredients and implements.

2. Are the actions necessary for carrying out the task clear?
   You must consider two factors in answering this question: Are all of the necessary actions mentioned and are they described so that you understand what is being done?

3. Was the amount of information given detailed enough to completely perform the task?
   In the instructions for giving procedures, subjects were told to imagine that they were talking to someone who had never done the task. You should judge whether or not a procedure is sufficiently detailed with this intended audience in mind. There is some overlap among this question and the other two; this one is meant to be a cumulative and more global assessment.

   All of the above questions were scored on the following four point scale:
   4 Yes
   3 For the most part
   2 Not for the most part
   1 No

4. How comprehensible is the language of the procedure?
   This question is an attempt to measure how hard you had to work to understand this procedure. In answering you would concentrate on the effect of the language itself, rather than on the content of the procedures.
   3 Ready, effortless comprehension.
   2 To a great extent; the language presented some difficulties but you were ultimately able to understand.
   1 Not at all; the language presented extreme difficulties and was largely incomprehensible.

   (Ulatowska et al., 1983a:337-8)

While the content and clarity was rated in all three studies mentioned, the specific questions and rating system changed somewhat across studies. The above questions and rating system relate specifically to analysis of procedural discourse and are shown
for perusal. Note that the correspondence between content and clarity does not seem to mirror that of coherence and cohesion as defined by Halliday & Hasan (1976). Questions 1-3, which supposedly refer to content, cover issues of cohesion and coherence, while Question 4 refers to the grammatical form of the discourse. Question 1 points specifically at questions of the speaker’s use of cohesive devices. Subsequent studies on discourse and aphasia (Armstrong, 1991; Bottenberg et al., 1985) provide more objective means of measuring an aphasic speaker’s use of cohesive devices such as described in Hasan (1985). Objective analyses should be used in combination with general holistic approaches to measuring coherence. To date, no other studies have contributed a means of rating coherence in this holistic fashion. Thus, these studies stand alone in that pursuit.

All of the three studies in question contain analyses and measures as mentioned above. Some studies contained additional analyses: Ulatowska et al. (1983b) performed a propositional analysis, and Ulatowska et al. (1983a) conducted a spectrum and profile analysis according to Longacre (1982). These will be discussed in more detail in the section on results.

General results of analyses of sentential characteristics of narratives, procedures, summaries and memorable experiences, when results from all narrative types and procedural types were grouped together, and compared to the normal control group, are summarized as follows:

1) The language of the mild and moderately impaired aphasic speakers was significantly reduced in complexity (measured in number of words and clauses per
T-unit, and in number of dependent and nonfinite clauses) (Ulatowska et al., 1981, 1983a, 1983b).

2) Mild and moderately impaired aphasics produced simpler language (measured in clauses per T-unit and percentage of dependent and nonfinite clauses) in procedures than in narratives, as do unimpaired speakers, although this was not statistically tested (Ulatowska et al., 1981 & 1983a).

3) Mild and moderately impaired aphasics produced less language (measured in number of words per T-unit) except in the retelling of the "rooster" story (Ulatowska et al., 1981, 1983b).

Results of analyses of discourse characteristics for all the discourse tasks compared to normal subjects are:

1) All essential schematic elements were present in mild and moderately impaired aphasics' productions with some optional elements such as introducers and codas present.

2) Chronological sequencing was preserved.

3) The amount of evaluation was significantly lower in mild and moderately impaired aphasics' discourses than in those of normal subjects, although all aphasic subjects' discourses did contain evaluation.

4) Errors of discourse were found for both mildly impaired aphasics and normal subjects, differing in degree but not in quality:

   a) Errors in tense shift: e.g., *The little girl was crying because the cat is in the tree.*
b) Errors of anaphora, i.e. the use of pronouns with no previous reference, e.g.

You slice through the loaf until it comes off the loaf.

c) Errors in use of connectors: e.g. The kitten jumped on the ground whereas

the little girl was now left on the ground with the father who had caught his
coattail on a limb of the tree.

d) Errors in chronological sequence of events (e.g. as in telling procedural

steps in the wrong order).

5) The content and clarity ratings found mild and moderately impaired aphasics' discourses to be rated lower than those produced by the normal subjects.

More specific findings related to individual discourse tasks follow:

Narratives:

Results from individual story-telling tasks, indicate that the performance of the aphasic individuals approaches that of the normal speakers on some measures. In terms of number of clauses, the mildly impaired aphasics did not differ significantly from normal subjects, except on the cat story task. In terms of number of dependent clauses and nonfinite clauses, the mildly impaired aphasics did not differ significantly from unimpaired adults except on the memorable experience task (a lower percentage of dependent clauses) and on the cat story (a lower percentage of nonfinite clauses). In terms of number of clauses and number of T-units, the mildly impaired aphasic adults performed as well as the normal subjects except during the cat story task where they produced significantly fewer clauses. During the memorable experience task, the
moderately impaired aphasics produced a number of clauses per T-unit that was not significantly different from that of unimpaired speakers, this being a measure of syntactic complexity according to the authors. Mildly impaired aphasics produced the longest T-units (measured in words per T-unit) and most complex language (percentage of dependent clauses) on the retelling of the rooster story (Ulatowska et al., 1981). A breakdown of the results from individual narrative tasks for the moderately impaired aphasics was not provided.

In an analysis of linguistic forms, the authors also found that there were no significant differences between unimpaired speakers and mildly or moderately impaired aphasics with regard to:

1) ratio of coordinate to subordinate conjunctions (only measured for mild aphasics);
2) use of determiners such as definite and indefinite articles (although moderately impaired aphasics used a higher percentage of definite articles, most of them inappropriately);
3) use of possessive pronouns and modifiers before nominals;
4) noun to pronoun ratio (although aphasic adults used a higher proportion of pronouns than unimpaired speakers);
5) use of indefinite verbs such as get and decide (although aphasic adults produced a higher number of these than normal subjects); and
6) production of adverbial clauses (although aphasics produced fewer adverbial clauses).
A propositional analysis done in Ulatowska et al. (1983b) found that those propositions essential to the structure of the stories were included by aphasics more often than propositions not essential to the story, although none of the moderately impaired aphasics produced all of the essential propositions. The essential propositions were determined by productions of normal subjects. The definition of a proposition was not provided by the investigators.

Procedural Discourse:

Ulatowska et al. (1983a) conducted a verb analysis on moderately impaired aphasics' productions of procedural discourse. Verbs were classified according to: 1) types of action; 2) semantic categories; and 3) specificity of action from more general -- as in get, fix and take -- to more specific, as in toast and unscrew. Results showed that aphasic and nonaphasic persons did not differ in their use of classes of verbs although posterior aphasics used more general verbs than anterior aphasics. Both normal and aphasic subjects were noted to delete the first-person singular in steps subsequent to the first step (Ulatowska et al., 1981). With regard to production of essential steps of procedures, the mildly and moderately impaired aphasic adults produced significantly fewer essential steps than unimpaired speakers and a significantly fewer total number of steps. No differences were described across the different procedural tasks, i.e. comparing frequently performed tasks with infrequently performed tasks.
Summaries:

Four of ten of the mildly aphasic subjects merely retold the story and all included extraneous detail. Seventy percent of the aphasics' summaries were devoid of resolutions, while all contained settings and complications. This is similar to the performance of the control group, however. Compared to normal subjects, mild aphasics produced longer summaries but simpler language (measured in percent of dependent and nonfinite clauses). Aphasics also used more pronouns, more deictic expressions and more general verbs (e.g. get). Summaries produced by moderately impaired aphasics did not differ significantly from those produced by the control subjects in terms of number of clauses, number of T-units, number of words per clause but did differ in terms of number of clauses per T-unit because nonaphasic adults used nonfinite clauses for embedding more than aphasics did.

Morals:

Two types of responses to the rooster story task were observed in mild aphasics (Ulatowska et al, 1981): 1) abstract morals; and 2) morals which related directly to the events of the story. No aphasic adult produced a moral to the cat story, but as the authors warned, this was not an Aesop fable. Nonaphasic speakers (7/10) tended to produce proverbs, while aphasic speakers responded with story-related advice or comments (9/10). After the rooster story all nonaphasic subjects produced proverbs, while aphasics either gave story-related responses (5/10), or could not see any moral (3/10). Two out of ten aphasics produced proverbs. Results of the similar task involving
moderately impaired aphasics (Ulatowska et al., 1983b) revealed comparatively weaker moral-giving skills on the part of the aphasics compared to the unimpaired adults, especially on the cat story task. During this task both controls and aphasics tended to produce advice or warnings (90% of unimpaired adults and 50% of aphasics).

Memorable Experience:

Three types of narrative discourse were produced in response to the memorable experience task by both mildly impaired aphasic and nonaphasic speakers (Ulatowska et al., 1981:359):

1) A complete narrative discourse having all the essential elements of the story schema (setting, complicating action, resolution).
2) An episodic narrative having temporally linked events, with no complicating action or resolution.
3) Expository discourse having thematic as opposed to chronological organization with an abstract, a short introduction to the experience, orientation, in which events relevant to the experience are given and evaluation, the attitude or emotion of the speaker.

The discourses of the aphasic speakers were well formed in terms of schematic structure, chronological structure and thematic organization when compared to those of normal subjects. Unfortunately, no texts are provided by the authors demonstrating this finding, nor do they provide examples of what constitutes a well-formed abstract, orientation, etc. The mildly impaired aphasic subjects did differ in one aspect of the
superstructure of the expository discourse: they produced evaluation much less than normal subjects. Mildly impaired aphasics produced significantly less language (words per T-unit), significantly fewer dependent clauses and a comparable number of nonfinite clauses. Moderately impaired aphasics produced comparable amounts of language to that of normal subjects in terms of number of clauses per T-unit and number of T-units per discourse, but significantly fewer words per clause which may be seen as a measure of syntactic complexity.

Ulatowska et al. (1983b) analyzed a different set of constructs of narrative discourse, spectrum and profile (Longacre, 1982), using a small portion of the data from the study. The spectrum of a narrative is the full range of information contained in verb elements, which forms a basis for dynamic elements and static elements of narratives. For example, background events would be associated with static verbs, and main events would be associated with more dynamic verbs. The profile of a narrative is the development of tension within a story plot. The three elements of the profile are: mounting tension, the peak element or climax, and the declining tension. Results, though tentative (due to the small sample size), indicate that aphasic subjects showed a reduction in their ability to generate a full range of verb elements and to use linguistic devices and mounting tension to create the climax.

Severely Impaired Aphasics:

The severely impaired aphasic adults will be discussed separately because the results from their performances were quite different from that of the mildly and moderately
impaired aphasic groups. Compared to moderately impaired aphasics, severely impaired aphasics produced considerably less language. However, of the five aphasic subjects in this study, four were diagnosed as nonfluent. As we shall see in another study shortly, nonfluent aphasics are noted to produce less language than fluent aphasics. For example, during the two story telling conditions, moderately impaired aphasics produced 29 clauses (Ulatowska et al., 1983b), while severely impaired aphasics produced only 8.7 propositions. Propositions were measured in verbal, gestural and combined modalities. There was, however, no difference between the amount of language produced by the moderately impaired aphasics studied by Ulatowska et al. (1983b) and the severely impaired fluent aphasic in this study. Results appear to be affected by the presence of a proportionately larger nonfluent group. In a propositional analysis, all severely impaired aphasics produced approximately 50% fewer propositions and, of these, approximately half were essential. Both severely impaired fluent and nonfluent aphasics demonstrated markedly impaired sequencing ability and impaired production of schematic elements.

**Nonfluent vs. Fluent Aphasics**

Berko-Gleason et al. (1980) compared the narrative styles of moderately severe and severe nonfluent aphasic patients to moderately severe fluent patients and to unimpaired adults. Discourse was facilitated with the Picture Story Test, a series of cartoon-like pictures which illustrated a short story. No explicit hypotheses were advanced with regard to the differential narrative performances of the two aphasia groups and matched controls, although a brief review is provided of work to date in methods of
classifying aphasics into their respective syndromes. The implicit hypothesis was that fluent and nonfluent aphasics would perform differentially in the narrative tasks.

Subjects were first shown the pictures while the examiner told a standard version of the story. Then the subjects were asked to retell the story given the pictures as visual stimuli. The rationale for producing the standard version first was to alleviate any potential difficulties associated with memory and recall of target words. A total of six picture sets comprised the experimental stimuli. An example of a typical story is as follows (slashes indicate theme units, and target words are italicized):

(10)  At lunch/this little girl's father noticed/that she hadn't touched her milk./ When he told her to drink it/ she said she didn't want it. (Berko-Gleason et al., 1980:372)

Narratives were analyzed in terms of number of target words, length of narrative, number of themes, ratio of nouns to verbs, deixis, anaphora, direct speech vs. indirect speech, and syntactic complexity.

The results are as follows: Normal subjects produced a mean of 9.9 target lexemes (content words produced by at least 90% of normal subjects) per story while the nonfluent and fluent subjects both produced a mean of 2.4 per story. The length of narratives was calculated as the mean number of words produced by each of the three groups for each of the six stories, or as a combined mean representing all the six experimental stories for the three groups. All tokens were included except repetitions of the same word and contractions were considered as a single word. The combined mean number of words per story for the fluent, nonfluent and normal groups are 41.1, 16 and 36.9 respectively.
Main themes, not to be confused with the semantic role, theme, were determined by a consensus of members of the investigative team. The criteria for their selection were not described. The example (10) above indicates divisions of thematic units, but it is unclear what proportion of the thematic unit the speakers would be required to provide before it was considered correct. The average number of themes for all the stories produced by the two aphasic groups is 1.7 for the fluent group, and 1.6 for the nonfluent group. Nonaphasic speakers produced an average of 4.2 themes out of a possible 4.7 themes (the average number of themes for all the stories). The ratio of nouns to verbs was calculated by dividing the mean number of definite noun tokens (excluding this and something) by the mean number of content verb tokens (copulas, modals and auxiliaries excluded). The noun:verb ratios for nonaphasic, fluent and nonfluent speakers across all six stories are 1.0, .42 and 1.2, respectively.

Comparisons were made across the study groups with regard to the use of pronouns with and without antecedents. Percentages were calculated by dividing the number of pronouns without antecedents by the total number of pronouns. Only a small proportion of pronouns produced by the normal group were without antecedents. The proportions for the normal subjects ranged from 3% to 22% across the six stories. The proportion of pronouns produced without antecedents by fluent subjects ranged from 41% to 100% and 60% to 100% for nonfluent aphasics, with the average proportion for the two aphasic groups being .85.

Deixis, defined as the use of words such as *this, that, here, there*, not including deictic verbs, *come* and *go*, was employed as a measure of the indefiniteness of a
subject's speech. Deictic items per story were measured in terms of percentages, although the authors do not explain how the percentages were calculated. Fluent subjects produced a higher percentage of deictic items per story than the other two groups. The average percentages of deictic items across the six stories for fluent, nonfluent and normal subjects are 4.23%, 1.17% and .33%, respectively. The study provides an example of the use of deixis by a fluent aphasic adult:

He's trying to get this. He had this in his hand, right? And he took it down and gave it to this guy. Now what the heck is this that's he's used to do? I don't see it, just in his hand. (Berko-Gleason et al., 1980:379)

Direct speech is operationally defined as actual dialogue vs. complex embedded constructions and is measured as the total number of instances per story. Nonfluent subjects use direct speech an average of 1.7 times, the mean across the six story tellings. Normal and fluent subjects employed this strategy less often, .33 and .17 times on average across the six story tellings.

Syntactic organization, measured by instances of simple concatenation (and), embedding (subordination), disjunction (but, or), causal conjunctions (so, because), and infinitive verb complement was not calculated for nonfluent adults because of a lack of complete sentence productions. Unimpaired speakers produced many more constructions that were deemed syntactically more correct than those of fluent subjects. Results from this study were not statistically tested. Using a variety of measures, Berko-Gleason et al (1980). illustrate some of the differences between the two aphasic groups and a group of nonaphasic speakers in the context of a connected discourse. In summary, fluent subjects produce longer narratives than nonfluent subjects, but a comparable number of
target words, significantly fewer than normal subjects. Both aphasic groups produced an equivalent number of themes, but fewer than normal subjects. While normal subjects production of nouns and verbs are roughly equal, fluent subjects produced more verbs than nouns and nonfluent produced more nouns than verbs. Both aphasic groups commonly use pronouns without antecedents. The fluent aphasic subjects produced more deictic items than either nonfluent subjects or normal subjects, and nonfluent subjects used direct speech more often than fluent subjects who did use embedded constructions. While syntactic utterances of the fluent aphasics, unlike those of the nonfluent aphasics, were sufficiently complex to allow for an analysis, they were syntactically inferior to those of normal subjects.

As was previously mentioned, the purpose of Ulatowska et al. (1983a & 1983b) was to characterize the discourses of mildly and moderately impaired aphasics subjects. In addition, some comparisons were made between nonfluent and fluent aphasics in terms of their production of procedural and narrative discourse. Compared to the fluent aphasics, the nonfluent aphasics produced shorter procedural discourses as measured by total number of clauses (but not significantly shorter), a significantly lower percentage of correct (undefined) T-units, a comparable clausal length and amount of embedding. Because of the simplicity of language in procedural tasks, the authors argue that the differences between nonfluent and fluent aphasics are reduced in the latter two measures of the complexity of language. Using more specific measures, fluent aphasics used general verbs more often, and more adverbials. Errors of anaphora (impaired use of definite and indefinite articles and pronouns) and use of pronouns with ambiguous
reference were higher in nonfluent aphasics, as well as errors in use of connectors. No difference between two groups existed in terms of production of essential targets and total number of steps in procedures, or in content and clarity ratings. The investigators warn that the small sample size and differences in performance on standardized tests prohibits anything but a conservative interpretation of these results. In terms of production of narratives by moderately impaired aphasics, only a few measures are described. Fluent aphasics used more pronouns with ambiguous reference (lower noun:pronoun ratio than nonfluent aphasic adults). Fluent aphasics produced more language, although authors do not say how this was measured. There were no significant differences in production of discourse errors although authors do not break the results down as comprehensively as they have done in previous studies. Content and clarity ratings were higher for the fluent aphasics.

Retelling Abilities of Aphasic Adults

Ernest-Baron et al. (1987) investigated the ability of aphasic subjects to retell narratives. They provide the reader with hypotheses regarding story structure and retelling of narratives: "In general, elements high in a text structure and therefore, more central to the story are more likely to be remembered than elements low in the text structure and more peripheral to the story" (Kintsch et al., 1975; Meyer, 1975; Rumelhart, 1977; Thorndyke, 1977, 1979, cited in Ernest Baron et al., 1987:44). They predict that "if aphasic listeners are less efficient at comprehending discourse and storing it in memory, then repeated presentations might normalize their recall, as repeated access to
the material allows them to compensate for their inefficiency. However, if aphasic persons are deficient in recall because of limitations in memory capacity, or difficulties in retrieval from memory, then repeated access to the material might not increase the amount of recall" (1987:45). Issues considered in this study are the importance of information and recall between mild to moderate aphasics and non-brain-damaged adults, the effects of repeated presentations of narratives and the preservation of order of information. The authors do not mention the problems associated with the production impairments of the aphasic subjects and how this might differentially affect their performance.

In the Ernest-Baron et al. study (1987), aphasic adults were classified as either nonfluent, mixed or fluent aphasic, whose scores ranged from 3-5 on the BDAE (1983) Severity Scale. These scores are defined below:

3. The patient can discuss almost all everyday problems with little or no assistance. Reduction of speech and/or comprehension, however, makes conversation about certain material difficult or impossible.

4. Some obvious loss of fluency in speech or facility of comprehension, without significant limitation on ideas expressed or form of expression.

5. Minimal discernible speech handicaps; patient may have subjective difficulties that are not apparent to listener. (from the BDAE, Goodglass & Kaplan, 1983)

The experimental stimuli consisted of one practice and two experimental stories, each story containing 50 information units, which were defined as non-repeated propositions. Subjects listened to and retold the two experimental stories three times in succession. Stories were approximately 200 words in length or 15 sentences and were at the fourth grade reading level. Salience of information units was determined by university graduate students; units were classified as either high, medium or low in salience. It is not clear
whether information units were comprised of words or phrases. Nor is it clear how grammatically complex the information units were, or if they were even controlled for grammatical complexity.

Results revealed that normal subjects retold a greater percentage of highly salient information units than aphasics, not significantly, however. This suggests that the retelling task enables the aphasic subjects to perform as well as normal subjects in terms of recall and production of essential information units. There were no differences among aphasic groups with regard to number of information units retold. Aphasic subjects and non-brain-damaged subjects retold more medium and low salience information across retellings, although only the change from the first to the second retelling was significant. Performance of nonfluent and mixed aphasic subjects approached that of the non-brain-damaged subjects across retellings with regard to the retelling of medium and low salience information. The authors do not state if the improved performance was manifested in other areas of performance in addition to recall of information units (i.e. in syntactic measures). All groups retold more high salience than medium and low salience information and all groups retold narratives in proper order.

Script Knowledge in Aphasia

Armus et al., (1989) wanted to determine if aphasic adults possessed knowledge of scripts to the same degree as nonaphasic adults. Scripts are types of schemata that are "mental representations of event sequences for situations that have been experienced in daily life" (1989:518). They may be organized according to either a central event or
chronological sequence. They are compatible with procedures or procedural discourse which was previously defined. Specifically, the authors of this study questioned whether aphasics could determine one script from another; whether they could point out the central events in scripts; and whether they could sequence the central events of scripts in chronological order. The aphasic adults in the study consisted of 6 nonfluent and 6 fluent aphasics.

The investigators found that there was no difference between the performance of the aphasic and nonaphasic adults in judging which events in a script were central events, or in discriminating one script text from another, for example, in determining whether a text belonged to the 'going to a restaurant' script category, or to the 'going grocery shopping' script category. Aphasics were less able to sequence central events than nonaphasics. However, the authors say that this finding may be due to the fact that the scripts in this section of the experiment were much more difficult than scripts found in other section of the experiment.

Reference Abilities of Aphasic Adults

The goal of the Early & VanDemark (1987) study was to look at mildly impaired aphasics’ use of definite and indefinite markers to identify given and new information. The 'given-new contract' (Clark & Clark, 1977) requires that speakers mark new information and identify information that they believe the listener already knows. The speaker brings to the communicative exchange awareness of the listener's background knowledge prior to the exchange, and awareness of how that knowledge changes
throughout the conversation. The authors hypothesize that errors in marking given and new reference might account for perceived lack of cohesion and coherence in the discourse of aphasics as was documented in Ulatowska et al. (1981, 1983a, 1983b). In this study, listeners' perceptions of aphasics' discourse, in the form of content and clarity ratings, were scored much lower in aphasic discourse than in the discourses of unimpaired speakers. They do not test this hypothesis, however. One significant finding was that the aphasics produced three times as many errors as normal subjects in use of definite and indefinite articles. One of the most pronounced findings was that the aphasic speakers used the definite marker (e.g. the man) in place of the indefinite marker (e.g. a man) to mark new information. This constituted 66% of the errors of reference, the other errors consisting of substitution of the indefinite article for the definite article (14%), omission of the definite article (11%), and omission of the indefinite article (8%). This is consistent with the finding in Berko-Gleason et al. (1980), who found that the fluent and nonfluent subjects produced errors of anaphora, that is, they produced pronouns without antecedents. This can also be seen as an instance of breaking the given-new contract, i.e. in treating new information as given information.

Discourse in the Assessment of Aphasia

Yorkston & Beukelman (1980) described discourse samples of aphasic adults as they recovered in severity. Recovery was documented in terms of communication efficiency. They point out the inadequacies of sentence and single word elicitation tasks, in that they do not shed light on an aphasic individual's ability to communicate in normal
social and vocational situations. For example, an aphasic adult might score high on the BDAE (1983), but have compromised communication abilities in everyday situations. The measures of communication efficiency used in the study were: 1) amount of information conveyed (number of content units or propositions); 2) speaking rate (syllables per minute); and 3) rate at which information is conveyed (content units per minute). Content units were defined as those information units consistently by unimpaired speakers and consisted of either a single word or a phrase. The task employed in this task was the Cookie Theft picture (BDAE, 1983), which was used to facilitate discourse production. They found that as severity of aphasia increased, the number of content units conveyed decreased. However, mild aphasics were indistinguishable from normal subjects on this measure. They also found that for measures of speaking rate and rate of information conveyed, unimpaired speakers fared significantly better than the aphasics and scores related inversely to severity of aphasia.

Because of the difficulty in differentially diagnosing dementia from fluent aphasia and anomic aphasia, Nicholas et al. (1985) wanted to see if the discourses of these groups could be distinguished on certain measures. They specifically looked at the linguistic contributions to 'empty' or 'noninformational' speech (1985:405) such as pronouns without antecedents, deictic terms, verbal and literal paraphasia, personal comments, etc. The authors supply no reason for using the discourse task as opposed to a single-word or sentence elicitation task, but one can assume that more information could be gleaned about 'empty' speech in a natural language task than a single word or sentence elicitation task. The discourse task took the form of the Cookie Theft picture
The task and analysis allowed the authors to differentiate the three language disordered groups based on distributions of the linguistic contributions to empty speech. Thus, the benefits of using a discourse task to complement the standardized assessment tools in the diagnosis of aphasia and other similar language disorders were demonstrated.

**Discourse Abilities of Aphasic Adults Across Discourse Tasks**

A handful of studies have compared the discourse performances of aphasic adults, employing tasks that were experimentally controlled to some degree. The studies by Lemme et al. (1984) and Bottenberg et al. (1984 & 1987) had the following goals in common: 1) to use picture stimuli that varied in a number of ways, such as structure (undefined by authors but examples are provided), content, familiarity and emotional impact, comparing the performances of the aphasic subjects; and 2) to apply a number of discourse analyses to the productions and evaluate their effectiveness. These analyses include the Cohesive Tie analysis (Hasan, 1980), Narrative Level analysis (Applebee, 1978), the Story Grammar analysis (Stein & Glenn, 1979), and the Logical Connective analysis based on Warren, Nicholas and Trabasso (1979). I will discuss how the stimuli varied, and the results in performance, without focusing in detail on the types of narrative analyses used. In all of the studies, the aphasic subjects, at the time of the study, were mildly to moderately impaired.

The stimulus set in Lemme et al. (1984) consisted of three different pictures, each differing according to structure. The authors fail to describe those structural differences...
other than in very general terms. Subjects were asked to tell a story about the stimuli presented. These are:

1) a set of toy dolls representing a family;
2) a Norman Rockwell print, *Looking out to Sea*; and
3) an ordered sequence of pictures illustrating a picnic scene.

I hypothesize that the sequence pictures trigger a story schema, that should facilitate discourse production better than the first two stimuli. Why the Norman Rockwell print would be more facilitative than the set of toy dolls might be explained in that a subject, upon seeing the print, might be motivated to explain what is happening in the picture, which might, in turn, trigger a story schema. This would, however, require planning prior to verbal production:

**Measures of discourse performance included:**

1) Productivity: the length of the narrative measured in words and T-units (Hunt, 1965).
2) Syntax level: average number of words per T-unit (Hunt, 1970).
3) Cohesion: total number of words in cohesive ties is divided by the total number of words in the story (Hedberg & Stoel-Gammon, 1983).
4) Narrative Level: the degree of centering and chaining (Applebee, 1978). An example of centering occurs when aspects of a story are centered on something such as an important event or character. An example of chaining is the repeated mention of an event or character. Centering and chaining are described in terms of stages or levels and are assigned a numerical value.
The results of Lemme et al. (1984) reveal that stimulus type did not have significant effects on either syntax level, or cohesion, but did have significant effects on productivity and narrative level, the sequence pictures allowing for greatest amount of productivity and narrative level, and the toy dolls allowing for the least amount.

Bottenberg et al (1985) introduced a control group and some alternate means of analyzing narratives, such as the subjects' use of logical connectives (Warren et al., 1979) and cohesive harmony (Hasan, 1985) to a study similar to that of Lemme et al. (1984). The measure of cohesion in this study differs from that is the earlier study, in that narratives are reduced to lexical tokens. The number of lexical items involved in chain interactions is divided by the total number of lexical items, resulting in a percentage. No measures of productivity were taken in this study. For a discussion of logical connectives see Warren, Nicholas and Trabasso (1979). This will not be discussed in detail here. As was found in Lemme et al. (1984), narrative level varied significantly, depending on the stimulus material and group (i.e. aphasics vs. controls). It is interesting to note that, as the structure of the task increased, the performance of the aphasics, measured in levels of cohesive harmony, approached that of the normal control group. The aphasic subjects also performed significantly differently depending on the stimulus task employed. Thus, while normal subjects did perform better on all measures than the aphasic subjects, in some areas, the performance of the aphasics approached that of the unimpaired speakers depending on the type of task employed. The sequence picture task can therefore be seen as a task that is higher in structure than the other tasks, possibly
because of its schematic structure. Consequently, it would be predicted to result in better discourses.

A third group of investigators (Bottenberg et al., 1987) altered the original stimulus set somewhat employing: 1) the Cookie Theft picture from the BDAE (1983); 2) a series of coloured sequence pictures depicting a fire scenario; and 3) coloured sequence pictures depicting the John Kennedy assassination. All three varied according to familiarity, the Cookie theft being the least familiar and the Kennedy assassination being the most familiar. It is not clear how the fire scenario and Cookie Theft picture differ in terms of familiarity; people might be more familiar with the antics of children and cookies than with a fire scene. Nor is it clear how the stimuli differ in terms of emotional content; some might consider a fire scene equally as serious as the assassination depending on their own personal experiences.

Variables measured included: 1) the total number of words, a measure of productivity; 2) the percentage of words in cohesive ties; and 3) the level of Story Grammar, which describes several levels representing a developmental sequence of narrative abilities. The relevance of this third measure to the analysis of aphasia is not explained. Statistical analysis revealed that:

1) The Cookie Theft picture resulted in significantly shorter discourses than the Kennedy assassination sequence pictures.

2) No significant differences in productivity existed between the Cookie Theft picture and the fire scenario, and the fire scenario and the Kennedy assassination sequence pictures.
3) There were no significant effects in terms of Story Grammar level or cohesive ties across the various tasks.

Bottenberg et al. (1987) argue that both familiarity and emotional content had measurable effects on discourse production. However, both of these variables are not controlled for in this study because the Kennedy assassination sequence pictures could be described in terms of both variables. The significant effects on productivity seem to be more attributable to the structure of the task, i.e. complex picture vs. sequence picture as found in the Lemme et al. (1984) study, than to the variable of familiarity.

Armstrong's (1991) proposal for an aphasic treatment program based on discourse theory was discussed briefly in the introduction to this chapter, and will be considered in more detail in Chapter 2.

Summary

Given the results of the research on discourse and aphasia summarized above, one can make some general statements about the ability of aphasic adults to produce discourses. First, cognitive schemata, such as the story schema and the script schema, are preserved in aphasia (Ulatowska et al., 1981, 1983a, 1983b). Second, the performance of aphasic adults approaches that of nonaphasic adults in certain discourse types, and on some measures (Ulatowska et al., 1981, 1983b). Third, the retelling of a narrative by an aphasic adult may result in improved performance, at least in the area of recall and production of essential information (Ernest-Baron et al., 1987). Fourth, aphasic adults produce more complex language in narratives than they do in procedures
Finally, aphasic adults tend to be more verbally productive (measured in total number of words) during the act of telling a story about a set of sequence pictures than during the act of describing a complex picture such as found in standardized tests (Bottenberg et al., 1987). The second and final general findings lead to an additional hypothesis about discourse and aphasia:

Hypothesis 3: Different types of discourse will result in differential performance on the part of the aphasic adult.

Type of discourse means the act of describing a single picture, as in the "Cookie Theft" picture (BDAE, 1983), or the act of telling a story from a set of sequence pictures, or relating a memorable experience, or telling a fairytale, etc.

In reviewing the research on discourse and aphasia, I have some concerns about the validity of the findings when results of performances of subjects, who differ in terms of severity and syndrome of aphasia, are averaged. How can one relate such results to the performance of the individual with aphasia?

An additional concern is the shortage of operational definitions in the studies that compared the performance of aphasic subjects across discourse tasks. For example, in Bottenberg et al. (1987), extralinguistic variables that affect aphasics' production of discourse were not accounted for. Finally, in all of the studies, the performance of aphasic individuals was measured by variables not necessarily related or relevant to the type or severity of aphasia. Given the above findings and concerns regarding the research into discourse and aphasia, four research questions are posed with regard to the performance of a nonfluent aphasic adult.
Statement of Research Questions

1) Will the performance of an aphasic adult, measured in terms of sentential and intrasentential variables (e.g. syntactic complexity, total number of words, etc.), relevant to the type of aphasia result in differential performance, depending on the type of discourse task (e.g. the description of a complex picture vs. the telling of a memorable experience)?

2) Will the performance of an aphasic adult, measured in terms of sentential and intrasentential variables (e.g. syntactic complexity, total number of words, etc.), relevant to the type of aphasia result in differential performance, depending on the presence or absence of schematic structure (e.g. the description of a complex picture vs. the telling of a story from a set of sequence pictures)?

3) Will the performance of an aphasic adult, measured in terms of sentential and intrasentential variables (e.g. syntactic complexity, total number of words, etc.), relevant to the type of aphasia result in differential performance, depending on the presence or absence (in graphic presentation) of the semantic relations that form the basis of a discourse?

And, because a number of the tasks used to elicit discourse production in aphasia are described in terms of other variables (e.g. visual support, familiar context, etc.), the following question will also be asked:

4) Will the performance of an aphasic adult, measured in terms of sentential and intrasentential variables (e.g. syntactic complexity, total number of words, etc.),
relevant to the type of aphasia be better in discourse tasks supported by a greater number of extralinguistic variables (e.g. visual presentation, schematic structure, etc.) than in discourse tasks supported by a lesser number of extralinguistic variables?
CHAPTER TWO

RESEARCH METHODOLOGY

Overview

This study takes the form of the A-B single subject case study design described in McReynolds & Kearns (1983). The A-B design allows for comparisons between baseline performance and performance in treatment. It does not have a control to rule out the effects of extraneous variables, but is characterized by a "careful, detailed description of the dependent and independent variables, the collection of objective data, and the use of operational definitions" (1983:20). The baseline stage consisted of baseline measures of an agrammatic aphasic adult's auditory language comprehension and verbal production abilities. Using Garrett's (1980, 1982, 1984) theory of sentence production, I tested hypotheses about the locus of the subject's impairment at the sentence level. Once the locus of the impairment was ascertained, dependent variables were chosen for measurement. The experimental stage was composed of a series of facilitative tasks which were hypothesized to differentially improve the performance of the subject at the time of the study. These tasks differed according to the presence of the following extralinguistic features: visual support, a retelling opportunity, schematic support, temporal support, familiarity, and a graphic representation of the semantic relations within a discourse. The tasks also differed in terms of 'type' of discourse: sequence picture description, procedural discourse, fairytale, and memorable experience. In order to rule
out confounding variables such as subject fatigue, etc., a monitoring procedure was conducted at the beginning of each session to determine whether the subject's verbal production was consistent from session to session.

The Subject

At the time of his stroke in May of 1990, DM (a pseudonym) was 64 years of age. As well as being employed as a construction foreman, he ran a professional photography business. He was raised in a rural environment and had a tenth grade education. This right-handed man suffered an ischemic cerebrovascular accident to the left anterior cerebral hemisphere. Initially, he demonstrated minimal right arm hemiparesis and had no usable speech, with a moderate to severe impairment of verbal language comprehension. Audiologic testing revealed that his hearing was within normal limits.

DM received speech and language therapy two times per week until December 1990. The hemiparesis was resolved by this time and he was demonstrating symptoms consistent with Broca's aphasia, i.e. laboured, telegraphic language production, and relatively spared auditory language comprehension. Telegraphic language refers to language devoid of grammatical words such as the and to, and verb inflections.

Therapy focused on DM's nonfluent speech, word finding abilities, augmentative communication skills, reading comprehension, and later, sentence formulation. His repetition skills were good and auditory language comprehension adequate; thus he was given Melodic Intonation Therapy (Sparks & Hölland, 1976). From May to December 1990 DM showed signs of improvement, although his severity was still rated as falling
between 1 and 2 on the Boston Diagnostic Aphasia Examination (Goodglass & Kaplan, 1983), henceforth BDAE (1983). This means that the burden of communication was, for the most part, the responsibility of DM's conversational partner. DM was, however, scoring high on most of the subtests of the BDAE except for the conversational and expository speech, naming fluency, and reading comprehension subtests, with moderate impairment on the auditory language comprehension subtest. His verbal language production was characterized by the production of nouns and a few verbs. From December 1990 to June 1991, DM received therapy once per week. Improvement during this period was minimal, demonstrated by the fact that his functional communication abilities were still seriously compromised. His severity score on the BDAE (1983), at the time of the study was estimated to be between 2 and 3. This means that he was sharing the burden of communication with his listener, but he was frequently unable to communicate his ideas.

**Baseline Investigations**

**Overview**

Baseline data were taken 1) to determine the locus of the DM's impairment according to Garrett's (1980, 1982, 1984) model of sentence production; 2) as a precursor to the treatment condition; and 3) to provide standardized measures of the DM's verbal production and comprehension abilities.
Rationale for Baseline Investigations

As indicated in Chapter One, investigations into the production of discourse in aphasia are only beginning to attempt to combine theories of discourse with those of language production to form a more comprehensive view of language production. One can see this in the way that performance is measured in discourse production studies: 1) in terms of general productivity of language, e.g. words produced per minute (Bottenberg et al., 1985, 1987) and length of utterance (Ulatowska et al., 1981, 1983a, 1983b), or 2) in terms of production of schematic structures (Ulatowska et al., 1981, 1983b). These measures are interesting and do have a purpose, but they may not capture the features of the individual aphasic person's ability to produce language. All of the studies mentioned above are large sample studies that combine and average the results of aphasic adults' language productions who differ in terms of their aphasia syndromes and language abilities. The aphasia population, we are beginning to realize, varies considerably in terms of abilities and impairments even within their respective aphasia syndromes (Caplan, 1987). Consequently, those studies which have attempted to show that some discourse tasks may result in improved performance (Bottenberg et al., 1985, 1987; Lemme et al., 1984), are not equipped with any precise means of measuring that improvement. This study proposes to do just that -- assess an individual aphasic individual in terms of a theoretical model of language production and conceive some well-defined dependent variables and operational definitions to measure the performance of that individual across a variety of discourse tasks. Garrett's (1980, 1982, 1984) model of language processing will be employed in the present study, and while it
is agreed that the model is under-specified (Caplan, 1987), it has been adapted quite successfully to the assessment and treatment of agrammatic patients (Jones, 1988; Byng, 1986). Since this particular study evolves around the language production of an individual with agrammatism, a definition of agrammatism is in order. The definition will be followed by a brief overview of some theories on agrammatism.

Agrammatism:

Agrammatism, a class of aphasia, is associated with Broca's aphasia. Broca's aphasia defines a constellation of symptoms resulting from damage to the anterior portion of the left hemisphere of the brain. It is clinically described as a dissociation between comprehension and production of language, production being reduced to laboured, telegrammatic speech, with comprehension remaining relatively intact. Comprehension is hypothesized to remain intact because the comprehension of language is associated with intact functioning of the posterior portion of the left hemisphere. Agrammatism, a more limiting definition of aphasia than Broca's aphasia, has been identified by linguists and psychologists. The following features were some of the first used to distinguish agrammatic speech from other aphasic classes: omission of function words and inflections, relative retention of content words, short phrase length and simplified syntactic structures (Caplan, 1987).

Kean (1977) proposed that agrammatics have difficulty with production and comprehension of function words and inflections because they are unstressed. Badecker & Caramazza (1985) noticed a great deal of variability within the syndrome of
agrammatism and proposed that there are dissociations among levels of processing. For example, the processing of function words may be at a different level than the processing of inflections. Garrett (1982), in reference to his theory of sentence production, proposed that the symptoms displayed in agrammatism are due to impaired processing functions at the positional level, which is the representation at which syntactic structure, function words, inflections, and the phonological forms of content words are specified. Saffran, Schwartz & Marin (1980b) argued that the impairment in agrammatism is at an earlier level than the positional level: either in knowledge of thematic roles or in mapping thematic relations onto syntactic categories. They predict that this loss of linguistic knowledge would affect both the comprehension and production modes.

Agrammatic adults are also documented to experience more difficulty retrieving verbs than nouns (Zingeser & Berndt, 1990). Linguistic theory suggests that two sorts of information are conveyed in verbs, lexical-semantic information and lexical-syntactic information (Rappaport & Levin, 1986). Lexical-semantic information specifies the conceptual meaning of the verb, while lexical syntactic information specifies the thematic structure and its linking to predicate-argument structure which determines syntactic structures. Thus, if an agrammatic adult had difficulty in retrieving verb information such as verb-argument structure, this would most likely have repercussions at the level of sentence production.

Jones (1986) has combined linguistic theory (Jackendoff, 1972) with Garrett's (1980, 1982, 1984) language processing model and argues that speech and language clinicians, in prescribing therapy, have often focused on remediating positional level
features, such as grammatical words, neglecting the idea that the processing impairments might occur at an earlier level, i.e., the functional level. As a goal for therapy, clinicians might also want to see improvements in their client in terms of their ability to retrieve verbs, and neglect the possibility that the inability of the patient to retrieve verbs might have repercussions at the sentence production level.

Thus, in assessing the abilities and impairments of agrammatic subjects, and of course aphasic subjects in general, a clinician is confronted with a variety of theories from which she can test hypotheses about the locus of the impairment. For the purposes of this study, the focus will be on Garrett's theory of sentence production. Several measures will be employed in order to determine the level of representation that is compromised in the person chosen for this study. The following processes need to be assessed with regard to the following representational levels:

**Functional Level:**

1) retrieving the verb form

2) accessing verb thematic structure, (i.e. who does what to whom, e.g. *He pushed the girl*)

3) accessing lexical words associated with arguments

4) accessing mapping information (thematic roles mapped onto syntax)

**Positional Level:**

1) phonological specification of lexical words and function words and morphology

2) accessing grammatical words and inflections

3) accessing syntactic structure
Standardized Testing

Boston Diagnostic Aphasia Examination (Goodglass & Kaplan, 1983):

The BDAE (1983) assesses a wide range of communicative abilities, such as auditory comprehension, oral expression, understanding written language, writing and the ability to comprehend verbal language and to communicate in open-ended conversation. The Cookie Theft picture (BDAE, 1983) is used as a means of determining an aphasic patient's word-finding abilities. Because the picture is lexically constrained, the word-finding difficulties of anomic patients become more evident. It is interesting to note that the original intention of the Cookie Theft has been expanded to one of eliciting discourse (Yorkston & Beukelman, 1980; Bottenberg, Lemme & Hedberg, 1987; Jones, 1986). Scores on the BDAE (1983) may be compared to those of a standard group and also used to diagnose aphasia syndromes.

Instructions to the subject in this study were given in a standardized fashion. The Cookie Theft and Conversational and Expository Speech subtests measured the subject's baseline discourse performance. In the Conversational and Expository Speech subtest, the subject was asked to 1) talk about his family; and 2) describe the history of his stroke. When asked to talk about his family, DM was unsure of how to respond, so I provided him with some general topics such as who the members of his family were, what it was like raising them as children and what they now do for a living. No further prompting was required.

Tasks 1) and 2) are from the expository discourse genre which has a topical schematic structure, that is, the discourse is organized around a particular topic or
subject. In describing the events surrounding his heart attack and stroke, DM was also able to organize his presentation of the topic according to the chronological sequence of events. Both tasks dealt with material that was familiar to DM. DM was also familiar with the Cookie Theft picture.

Test of Comprehension of Syntactic Structures (Caplan, Baker & Dehaut, 1985):

This comprehension test was administered in order to assess the subject’s ability to access information about meaning relations entailed by verbs. The test is comprised of 9 sentence types presented auditorily by an examiner in random order five times, for a total of 45 sentences. Examples of the sentences are provided:

(1) Active (A): The elephant hit the monkey.
(2) Passive (P): The elephant was hit by the monkey.
(3) Cleft Subject (CS): It was the elephant that hit the monkey.
(4) Cleft Object (CO): It was the elephant that the monkey hit.
(5) Dative (D): The elephant gave the monkey to the rabbit.
(6) Dative Passive (DP): The elephant was given to the monkey by the rabbit.
(7) Conjoined (C): The elephant hit the monkey and hugged the rabbit.
(8) Subject-Object relative (SO): The elephant that the monkey hit hugged the rabbit.
(9) Object-Subject relative (OS): The elephant hit the monkey that hugged the rabbit.

(Source: Caplan, 1987:313)

In response to the sentences, the subjects taking the test are required to manipulate toy animals indicating the thematic roles of the sentences, i.e. who did what to whom. The relative difficulty of each sentence type was determined in three studies of 56, 37 and 49 aphasic patients (see Caplan, 1987, for a summary of the results).

The syntactic variables hypothesized to affect comprehension are: 1) linear ordering of categories; 2) verb-argument structure; 3) the hierarchical organization
of categories; and 4) the presence of function words or morphological markings. Results of the three studies revealed that sentences having canonical word order (e.g. active sentences) were easier to interpret than those having noncanonical word order (e.g. passive sentences). Sentences with two arguments (e.g. subject, direct object, etc.) were easier to interpret than those with three arguments. And sentences with relative clauses were more difficult to interpret than simple sentences. The presence of function words and morphological markings did not result in increased difficulty across all sentence types, but appears to be influenced by syntactic structure (Caplan, 1987:167). For instance, in passive sentences, passive morphology and the presence of the by phrase does result in more difficulties of interpretation than in sentences without the morphological and function word markers (e.g. active sentences). This may be due to the fact that passive sentences also have noncanonical word order. However, in Cleft-Subject and Active sentences, the presence of that does not appear to increase complexity.

DM was advised that the purpose of the test was to determine his ability to understand sentences and that some sentences would be easier and others more difficult. Prior to administering the test, a pretest determined if his performance would be affected by short-term memory impairments. For example, I asked DM to touch three of the animals in the order that they were said. DM was able to respond correctly a number of times, so testing continued. Had he failed at this task, then testing would have been discontinued. I then presented the test sentences auditorily and DM was asked to use the toy animals in front of him to act out the meanings of the sentences.
Verb Retrieval Task:

The purpose of this task was to give support to the hypothesis that the subject had no verb retrieval impairments. A verb retrieval task was undertaken in Jones (1986) because in that study, the subject failed to produce any verb forms in the Cookie Theft picture task in the BDAE (1983). While the subject the present study did produce verb forms, albeit very few in the picture description task, the possibility that there was an effect of frequency of usage, in verb retrieval, could not be ruled out. Zingeser & Berndt (1990) point out that frequency of usage has an effect on lexical retrieval in aphasia. Perhaps the reason that DM produced so few verbs in the picture description task was because the verb forms he was unable to retrieve are less frequently used in the English language. For this task a set of 15 verbs that varied according to frequency of usage was chosen. The verbs were categorized roughly as either high, medium or low frequency as shown in Table 2.1:

<table>
<thead>
<tr>
<th></th>
<th>High - Cumulative/Base</th>
<th>Medium - Cumulative/Base</th>
<th>Low - Cumulative/Base</th>
</tr>
</thead>
<tbody>
<tr>
<td>put</td>
<td>513/196</td>
<td>95/19</td>
<td>30/12</td>
</tr>
<tr>
<td>read</td>
<td>274/89</td>
<td>97/31</td>
<td>18/4</td>
</tr>
<tr>
<td>watch</td>
<td>209/53</td>
<td>72/15</td>
<td>7/1</td>
</tr>
<tr>
<td>play</td>
<td>333/110</td>
<td>102/30</td>
<td>1/-</td>
</tr>
<tr>
<td>walk</td>
<td>287/66</td>
<td>83/10</td>
<td>12/2</td>
</tr>
</tbody>
</table>

* Base refers to counts of the base form of a verb from a series of texts and cumulative refers to counts of all forms of the verb (Francis & Kucera, 1982).
DM was presented with 15 action pictures. He was asked to say what the action in the picture was in a single word. Three examples were provided prior to the presentation of the test pictures.

Sentence Production Task:

DM was presented with 18 pictures whose intended target sentences were irreversible, with either animate actors alone or both animate agents and inanimate themes and goals. His instructions were: "Use a sentence to tell what is happening in the pictures." A similar version of this procedure was used in Jones's (1986) study to determine if an aphasic subject was able to produce verb forms, access knowledge of argument structure, and access knowledge of mapping information. The target sentences varied according to number of arguments: each group of five sentences had one, two or three obligatory arguments (see examples below).

(10) The man is running. (one argument)
(11) The man drinks the milk. (two arguments)
(12) The woman gives the comb to the girl. (three arguments)

Because of the possible effects of frequency of usage, all verbs were controlled for frequency (see Table 2.2).
Table 2.2 - Sentence Production Task Verbs According to Frequency of Usage

<table>
<thead>
<tr>
<th></th>
<th>Cumulative/Base*</th>
<th>Cumulative/Base</th>
</tr>
</thead>
<tbody>
<tr>
<td>fight</td>
<td>155/43</td>
<td>eat</td>
</tr>
<tr>
<td>fly</td>
<td>92/18</td>
<td>change</td>
</tr>
<tr>
<td>cry</td>
<td>64/18</td>
<td>give</td>
</tr>
<tr>
<td>burn</td>
<td>103/10</td>
<td>pass</td>
</tr>
<tr>
<td>feed</td>
<td>133/145</td>
<td>put</td>
</tr>
<tr>
<td>drive</td>
<td>203/46</td>
<td></td>
</tr>
</tbody>
</table>

*Base refers to counts of the base form of a verb and cumulative refers to counts of all the forms of the verb (Francis & Kucera, 1982).

Sentence Judgment Task:

In this task DM was required to judge if a sentence was complete or not. In some of the sentences, arguments were missing (see Appendix A for the sentences used in the task). The purpose of the test was to determine if DM was able to access verb information, in particular, the obligatory arguments associated with verbs. This task was originally performed in the Jones (1986) study. There were 20 sentences in total which are described in terms of the following variables:

1) Number of verb arguments:
   a) Verbs with one obligatory argument
      e.g. The woman is running.
   b) Verbs with two obligatory arguments
      e.g. The man hit the boy.
   c) Verbs with three obligatory arguments
      e.g. The man put his money on the table.
2) Length

  e.g. The truck hit the car. (short)
  e.g. The policeman drove the car into the ditch. (long)

  Length was controlled so that the subject could not use the strategy of judging shorter sentences to be incomplete. Sentences were lengthened by the addition of a nonobligatory prepositional phrase or adverbial phrase. The sentences were randomized and matched with sentences whose obligatory arguments were all present. In order to ensure that the subject understood the task, two examples were provided. One of the examples was the following incomplete sentence:

  (13) The mailman delivered.

  DM was asked to judge if this sentence was complete. He judged the sentence to be complete. I then explained that it was incomplete because the mailman had to have delivered something, such as the mail or a parcel.

Monitoring Procedures

  In order to determine whether DM's performance varied to any great degree in terms of verbal output (measured in words per minute), each session was preceded by the presentation of a complex picture similar to the Cookie Theft picture (BDAE, 1983). DM was asked to describe what was happening in the pictures. These complex pictures came from the following sources:

  1) The Western Aphasia Battery (Kertesz, 1982)
  2) The Minnesota Test for the Differential Diagnosis of Aphasia (Schuell, 1965)
3) Menn & Obler (1990)


The complex picture in the Western Aphasia Battery shows a couple having a picnic at the beach with a boy flying a kite. The Minnesota Test for the Differential Diagnosis of Aphasia complex picture illustrates a man flying a kite and boy with his kite caught in a tree and a woman pointing to warn the man about the impending danger. The complex picture taken from Menn & Obler (1990) illustrates a living room scene where a man is watching television and smoking and a woman is knitting, etc. And, the CELF-R complex pictures show scenes from a cafeteria and a kitchen. There are many objects present in all of the complex pictures. The pictures vary with regard to the number of actions taking place in them.

**Experimental Tasks**

**Overview**

The experimental and baseline tasks varied according to the presence of one or more of the following extralinguistic variables:

1) Visual support (e.g. complex or sequence pictures);

2) Schematic support (e.g. story schema, topical schema, script schema);

3) Temporal support (e.g. chronological sequence of events found in narrative and procedural discourse and some expository discourse);
4) Retelling opportunity (e.g. subject will retell story that I have previously recounted);

5) Familiarity (i.e. a memorable experience would be more familiar to a subject than the story represented in a sequence of pictures); and a


The tasks were rated on a point system depending upon how much extralinguistic support was provided, even though the support factors do not necessarily contribute equivalent amounts of support. For example, the retelling of a story received 3 points because it has schematic structure, temporal structure and a retelling opportunity. Tasks with more points are presumed to result in better performance on the part of the subject. The facilitative tasks usually contain more extralinguistic support than baseline tasks: The "Cookie Theft" picture was rated as having 2 points for visual support and familiar context; the history of "Illness" task was rated as having 2 points for temporal support and familiarity; and the "Family" task was rated as having 2 points for familiarity and schematic support i.e. topical schema (see Table 2.1).

Discourse types were chosen for their potential to elicit a small target set of verbs and their obligatory arguments which are listed in the descriptions of the tasks. For some tasks, it was not possible to determine the set of verbs and arguments until after the task was administered (e.g. the memorable experience tasks). Each task was projected to elicit at least one of each of the following structures from the subject:

1) verb plus one argument

2) verb plus two arguments

3) verb plus three arguments
Table 2.3 - Levels of Extralinguistic Support According to Discourse Task

<table>
<thead>
<tr>
<th>Discourse Type</th>
<th>Task Name</th>
<th>Re-telling</th>
<th>Visual</th>
<th>Schema*</th>
<th>Temporal Sequence</th>
<th>Cohesion Plan</th>
<th>Familiarity</th>
<th>Number of Levels of Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline: Picture</td>
<td>Cookie Theft</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>2</td>
</tr>
<tr>
<td>Description &amp;</td>
<td>Illness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>2</td>
</tr>
<tr>
<td>Expository Speech</td>
<td>Family</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>2</td>
</tr>
<tr>
<td>Sequence Picture</td>
<td>Flowers</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Cowboy</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Man &amp; Dog</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Procedural Discourse</td>
<td>Camera</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Library</td>
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<td></td>
<td></td>
<td>X</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Haircut</td>
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<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>3</td>
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<tr>
<td>Fairytale</td>
<td>Goldilocks</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Princess</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
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<tr>
<td>Memorable Experience</td>
<td>Moose</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Police</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

*Included as schemata are the story schema, topical schema (information is organized according to a particular subject) or script schema (equivalent to procedural discourse).
The following are definitions of thematic roles adapted from Fillmore (1968). Thematic roles are represented at the lexical-semantic level and are realized as arguments at syntactic levels of representation. Note that some of the labels for the semantic roles are not those employed by Fillmore. The labels below are more consistent with current usage. Also note that this list is nonexhaustive.

**Agent:** The noun phrase naming the animate instigator of the action specified by the verb (e.g. *Harold broke the vase*).

**Theme:** The noun phrase naming the animate being or entity affected by the state or action specified by the verb (e.g. Harold ate *the cake*).

**Instrument:** The noun phrase or prepositional phrase naming the inanimate object or force used in carrying out the action specified by the verb (e.g. Harold pried the door open *with a hammer*).

**Goal:** The noun phrase or prepositional phrase naming the place or entity to which the action specified by the verb is directed (e.g. Harold told his opinions to *the mailman*).

**Source:** The noun phrase or prepositional phrase specifying from where the action specified by the verb originated (e.g. Harold took the meatloaf *out of the oven*).
Location: The noun phrase which specifies the general locality of the action of the verb (Harold drank his coffee at the Muffinbreak).

Explanation of Extralinguistic Variables

Visual Support:

When aphasic subjects are asked to name an item, different levels of success are attained depending on whether the stimulus is a picture, an orally presented open-ended sentence, or an orally presented description of the item (Barton & Maruszewski, 1971). Open-ended sentence conditions are found to be the most facilitative, followed by the visual condition, and lastly, by the oral description condition. It is assumed that the variability in performance is due to the different types of processing that each task demands. For this reason, and the additional reason that some of the discourse types are by definition, visually oriented tasks, the visual context, is included as a variable in this study; the processes involved in retrieving words during the acts of describing a picture as opposed to retrieving words during spontaneous story-telling are bound to result in different levels of performance.

The presence of a visual record of an event, or story, might also be a factor in an aphasic subject's planning and production of a discourse. It is assumed here that in both word retrieval and discourse planning, the effects of a visual stimulus will be facilitative.
Schematic Support:

As defined in Chapter One, narrative discourse has a predictable superstructure, consisting of elements such as setting, complicating action and resolution and additionally an abstract, evaluation and coda. In a series of studies by Ulatowska et al. (1981, 1983b) it has been demonstrated that the conventional superstructures are relatively preserved in the discourses of aphasic subjects. Hypothesis 1 in Chapter One states that those discourse procedures that trigger a cognitive schema, whether it be a story schema or a topical schema, will facilitate discourse production because they have the potential to reduce the processing load at the level of discourse planning.

Temporal Support:

Those tasks that may be organized and produced in a chronological sequence are also predicted to be facilitative at the level of discourse planning. Studies by Ulatowska et al. (1981, 1983a, 1983b) also demonstrated that aphasics' discourse productions showed preserved chronological sequence.

Retelling Opportunity:

As previously related in Chapter One, the retelling variable is included as an independent variable because retelling a story has been shown 1) to relieve some of the processing associated with organizing the material into superstructures, and 2) to minimize difficulties with word-finding. Aphasics are documented to retell a greater proportion of content central to a story structure as opposed to content peripheral to the
story (Ernest-Baron et al., 1987). Given these results, one could assume that if an aphasic subject was given a task in which they were able to focus on salient information, then the actual planning of the discourse might be facilitated.

Visual/Graphic Representation of Semantic Relations (Cohesion Plan):

The final extralinguistic variable is that which has been suggested by Armstrong (1991) to be a potentially facilitative factor in aphasic discourse therapy. In my study, I presented a discourse to DM in graphic representation that breaks the discourse into its component parts, i.e. the semantic relations (the 'cohesion' plan will be explained in more detail later; refer to Appendix B for an example of a 'cohesion' plan used in the present study).

Narrative Discourse Tasks

1) "Flowers" Sequence Picture from Berko-Gleason et al. (1980)

I displayed the sequence pictures before DM and read the following version of the story. He was then asked to retell the story while looking at the pictures. The auditory version of the story is as follows (slash bars indicate thematic units and target words are italicized):

This man had just bought a bouquet of expensive white roses/ and he was thinking of giving it to his girlfriend,/ when a man hurrying around the corner bumped into him/ and knocked the flowers all over the sidewalk./ But after the man picked them up,/ he was able to deliver them to his friend and she gave him a thank-you kiss. (Berko-Gleason et al., 1980:373)
The following analysis is based upon on a target lexeme analysis of Berko-Gleason et al. (1980) in which 20 narratives produced by nonaphasic adults were analyzed for presence of key words. The following verbs are included in their list of target words. Target words, as mentioned in the literature review section of this paper, were defined as the content words produced by at least 90% of normal subjects. The arguments are expressed in terms of the thematic relations associated with each of the verbs.

Verb/Argument Structure:

- buy (agent: man, theme: flowers)
- hurry (theme: man)
- bump into (agent: man hurrying around corner, theme: man carrying flowers)
- knock (agent: man hurrying around corner, theme: flowers, goal: sidewalk)
- pick up (agent: man, theme: flowers)
- deliver (agent: man, theme: flowers, goal: woman)
- kiss (agent: woman, theme: man) or
- give (agent: woman, theme: kiss, goal: man)

2) The "Cowboy Story" Sequence Picture (Ombredane, 1951, adapted by Joanette & Goulet, 1991)

DM was shown the sequence picture and asked to tell the story shown in the pictures. He was given an opportunity to look over the pictures prior to telling the story. A description of the sequence of pictures is as follows (square brackets are my additions):
First, there is a "setting" [or initiating event] in which a tired cowboy comes into a small town, gets off his horse, and rests, [and falls asleep] sitting on a bench, holding his horse's bridle (frames 1, 2 and 3).
Second, there is a "complication" in which a tricky young boy passes by with a small wooden horse, cuts off (with scissors) the horse's bridle and, having replaced the horse with his wooden horse, runs away with the real horse (frames 4, 5, 6 and 7).
Third, a "resolution" occurs, in which the awakening cowboy finds himself holding a small wooden horse; he is quite surprised to see that his horse has changed (frame 8). (Joanette & Goulet, 1991:134)

Verb/Argument Structure:

This analysis is based upon the propositional analysis of Joanette & Goulet (1991). These authors analyzed the "Cowboy Story" for core propositions based initially upon their own narratives. A proposition is a means of coding a sentence. It is represented as a predicate or relational concept, and one or more arguments. The propositional representations of the sentences in the "Cowboy" story are shown below. The first proposition, arrive (theme:cowboy, goal:town), represents the sentence, The cowboy arrives in town.

Later, productions of right-brain damaged and non brain damaged control subjects were included to determine the core propositions. On the basis of the authors' narratives, information not produced by at least 20% of the subjects was eliminated, and information which was included by 20% of the subjects was also added to the initial set. This resulted in a final checklist of 32 core propositions, upon which the predicate/argument analysis for my study is based. Note that propositions having a relational concept (e.g. on [cowboy, horse]) as opposed to a verb were not included in this analysis.
Verb/Argument Structure:

arrive (theme: cowboy, goal: town)
be (theme: cowboy, location: horse)
get off (theme: cowboy, source: horse)
tie (agent: cowboy, theme: horse)
sit (theme: cowboy, location: bench)
sleep (agent: cowboy)
hold (agent: cowboy, theme: large horse)
arrive (theme: boy)
hold (agent: boy, theme: small horse)
cut (agent: boy, theme: bridle, instrument: scissors)
tie (agent: boy, theme: small horse, goal: cowboy's hand)
run away (theme: boy)
run away (theme: large horse)
wake up (theme: cowboy)
have (theme: cowboy, goal: small horse)
overturn (agent: cowboy, theme: bench)

3) "Man and Dog" Sequence Picture (Huber & Gleber, 1982, adapted from Kossatz, 1972)
The cartoon picture has six frames and the story is as follows:

While walking down the street with his dog, an elderly gentleman was suddenly hit on the head by a flower pot falling from a balcony (frame 1). Both master and dog scolded the culprit on the balcony angrily at the top of their voices (frame 2). In order to teach the culprit a lesson, they entered the house purposefully (frame 3). They stopped on the second floor and the gentleman knocked on the apartment door with his cane (frame 4). An elderly lady opened the door and, full of sympathy, comforted the dog with a bone (frame 5). This made the elderly gentlemen feel good and he gallantly kissed the lady’s hand (frame 6).

(Huber, 1991:164)

DM was first given the set of pictures to look over. He was then asked to tell the story that the pictures told while the pictures were still present.

Verb/Argument Structure:

The analysis was adapted from an analysis of the propositional text base obtained from a group of 20 normal speakers by Huber (1991).

walk (theme: man)
walk (theme: dog)
fall from (theme: pot, source: balcony) or
fall on (theme: pot, goal: man)
scold (agent: man)
bark (agent: dog)
enter (theme: man, goal: apartment building)
knock on (agent: man, theme: door)
come out of (theme: woman, source: apartment)
pet (agent: woman, theme: dog)
give (agent: woman, theme: bone, goal: dog)
thank (agent: man, theme: woman, instrument: kiss) or
kiss (agent: man, theme: woman)

4) Fairytale - "Goldilocks"

DM was asked to tell a fairy tale he was familiar with and was given advance
notice of this task. He was asked not to rehearse the story. Instead, his wife was asked
to remind DM of the general plot of the story.

Verb/Argument Structure:

walk (theme: Goldilocks, location: woods)
come upon (theme: Goldilocks, goal: house)
see (theme: Goldilocks, goal: porridge, location: table)
sit (theme: Goldilocks, goal: chair)
break (agent: Goldilocks, theme: chair)
eat (agent: Goldilocks, theme: porridge)
explore (agent: Goldilocks, theme: house)
try (theme: Goldilocks, goal: bed)
fall asleep (theme: Goldilocks, location: bed)
come (theme: bear(s), goal: home)
see (theme: bear(s), goal: Goldilocks, location: bed)
wake up (theme: Goldilocks)
run away (theme: Goldilocks)
5) Fairytale - "Princess and the Pea"

DM was asked to retell a version of this fairytale. He was advised that I was going to tell the story first, then he would be asked to retell it immediately after me. The story was adapted by the author from a version of the tale in a children's fairytale book (see Appendix C for the version of the story used in my study). The total length of the story (measured in words and number of sentences), syntactic complexity and length of sentence was consistent with the story in the story retelling task in Ernest-Baron et al. (1987).

Verb/Argument Structure:

be (theme: prince)

want to marry (theme: prince, goal: princess)

travel (theme: prince, location: everywhere)

find (agent: prince, theme: princesses)

return (theme: prince, goal: palace)

be (theme: storm)

knock (agent: princess, goal: door)

answer (agent; old King, theme: door)

stand (theme: princess, location: outside)

go (agent: Queen, goal: bedroom of princess)

take off (agent: Queen, theme: sheets and blankets, source: bed)

put (agent: Queen, theme: pea, location: mattress)

pile on top (agent: Queen, theme: mattresses, goal: pea)
sleep (theme: princess, location: bed)
feel (theme: princess, goal: pea, location: mattresses)
kiss (agent: prince, goal: princess)
mARRY (agent: prince, goal: princess)
find (agent: prince, goal: real thing)

6) Memorable Experience Story - "Police" Story

DM and his wife were asked to think of a memorable experience that was interesting to both of them. His wife produced a short synopsis of the story, and from this it was determined if the story was suitable as a task, i.e. that it was of a suitable length and that it a large number of actions. Then, DM was asked to tell the story. After he told the story, DM, his wife and I, discussed any queries I had about the story. With this information, I was able to reconstruct the verb/argument structure of the story.

Verb/argument structure:

come home (theme: daughter)
see (theme: daughter, goal: dog, location: chair)
go (theme: daughter, goal: neighbour's house)
phone (agent: neighbour, goal: police)
phone (agent: police, goal: DM)
ask (agent: police, theme: DM, goal: name)
hang up (agent: DM, theme: phone)
come (theme: police, location: DM's house)
see (theme: DM, goal: squad car)
put (agent: DM, theme: hands, location: out)

7) Memorable Experience Story - "Moose" Story

DM was asked to retell a personally relevant short story with a setting, complicating action and resolution. I discussed potential stories with DM and his wife. DM's wife provided a sample of the story prior to the testing procedure to determine if it was suitable, i.e. that it was roughly 100 words in length and contained appropriate verbs and arguments. Then, I analyzed the story for semantic relations and from this made a 'discourse plan' or 'cohesion plan' similar to that in Armstrong (1991). The plan displays a series of boxes arranged in columns and rows (see Appendix B for an example of the first part of the "Moose" story in a 'discourse' plan). The columns divide the components of a sentences into who performed the action, the action, who or what the action was performed on, and where or when the action occurred. These are roughly consistent with the thematic roles and predicates discussed earlier. In each of the boxes are a number of words from which one or more can be chosen to form part of a sentence. In order to create a sentence DM had to follow along the rows guided by arrows. The words in the boxes were semantically related to each other. What was particularly helpful for DM is that all the parts of speech of each sentence were represented visually and graphically. I gave DM a simpler plan at first which told a story about a hypothetical birthday party.
I explained how to use the plan, and once DM became familiar with the format, we tried the experimental plan. DM was asked to tell the "Moose" story while following the plan.

Verb/Argument Structure:

- hunt (agent: DM, location: North)
- be (theme: snow)
- shoot (agent: DM, theme: moose)
- stay by (theme: DM, goal: moose)
- gut (agent: DM, theme: moose, location: field)
- get (agent: friend, goal: rope)
- have (theme: DM, theme: gun, bullets)
- come back (theme: moose)
- shoo away (agent: DM, theme: moose)
- go back (theme: moose, goal: bushes)
- change direction (theme: moose)
- talk about (theme: guy, goal: moose)
- rent (theme: DM, goal: shed)
- have (theme: shed, goal: fridge)
- butcher (agent: DM, theme: moose, goal: steaks)
- give away (agent: DM, theme: meat)
- wrap (agent: DM, theme: meat, goal: plastic)
Procedural Discourse Tasks

Procedural discourse was previously defined in Chapter One. Briefly, one uses procedural discourse to tell how something is done in a sequence of steps; it has a specifiable order, either conceptually or chronologically (Ulatowska et al., 1983a). Some examples of procedures are: giving directions, telling someone how to make or fix something, and telling what the steps are in performing a specific task, e.g. changing a lightbulb.

Three procedural discourse tasks were chosen: 1) the steps in loading film into a camera; 2) the steps in taking a book out of the library; and 3) the steps involved in getting a haircut. These tasks vary according to the degree of familiarity. For example, the subject is a professional photographer, so he is highly familiar with the steps involved in loading film into the camera. On the other hand, he has only gone to the library a few times since he was a child. While the steps involved in getting a haircut are highly familiar to the subject, they differ from the steps in loading film into the camera, in that they are more abstract, or are performed by another person.
The subject was given a procedure to practice first. Instructions were simply: "Tell me the steps in loading film into a camera," etc. As the subject appeared to understand the nature of the task, it was not deemed necessary to supply him with a sequence of pictures depicting the procedure, as was done in Ulatowska et al. (1981, 1983a).

1) Procedural Discourse - Loading film into a camera

I determined what the essential steps and verb/argument structure were, prior to the administration of the tasks.

Essential Steps and Verb/Argument Structure:

a) You open the camera - open (agent: you, theme: camera)

b) You put the film in the camera - put (agent: you, theme: film, goal: camera)

c) You advance the film - advance (agent: you, theme: film)

d) You close the camera - close (agent: you, theme: camera)

2) Procedural Discourse - Getting a book from the library

Essential Steps and Verb/Argument Structure:

a) You get the book - get (agent: you, goal: book)

b) You sign the book out - sign out (agent: you, theme: book)

3) Procedural Discourse - Getting a haircut

Essential Steps and Verb/Argument Structure:

a) You make an appointment - make (agent: you, goal: appointment)
b) The hairdresser cuts your hair - cut (agent: hairdresser, theme: hair)

c) You pay for the haircut - pay (agent: you, goal: hairdresser)

Data Analysis

Overview

Results of the baseline investigations are presented in Chapter Three. The following analyses were designed on the basis of the outcome of the baseline investigations. The analyses will measure the differential facilitative nature of the experimental tasks.

Transcription

All discourse data elicited were tape-recorded and first transcribed in CHAT 1.0 (MacWhinney, 1991) format. Information included with each of the discourse transcripts was: the participants involved in the interaction, the age of the subject, the sex of the subject, the date that the subject performed the task, the name of the discourse task, the format of the transcription, i.e. CHAT 1.0, the subject’s aphasia type and the total time duration of the task.

Prior to transcribing the data the following had to be determined:

1) How the discourse would be divided into utterances, i.e. sentences vs. T-units.
2) The definition of an utterance.
3) What to include in the transcript, e.g. sound errors, interjections, etc.
4) How to code those items in the utterances that were to be excluded or included in the analysis.

Guidelines on the preparation of transcripts were taken from Saffran, Berndt & Schwartz (1989) and Menn & Obler (1990). Both of these research groups provide guidelines for quantitative analyses of agrammatic discourse productions, the former restricting the analyses to study of agrammatism in English, the latter extending the guidelines to cross-language analysis. Only those guidelines relevant to this study were considered.

The independent clause was chosen as a means of dividing the transcript into utterance groups. Because the analysis was to include verb/argument structure, it was preferable to isolate verbs in separate utterances; i.e., it was necessary to avoid the instance of a coordinated sentence having two or more main verbs. The following hierarchy adapted from Saffran et al. (1989:470) was used to determine what constituted an utterance:

1) A syntactically well-formed clause was taken to be an utterance unless it was strongly contraindicated.

2) Falling intonation at the end of an utterance was used to support the first assumption.

3) Pauses were not considered to be utterance boundaries because the subject paused many times in what was considered to be a syntactically well-formed clause.

4) When the utterance boundary was not clear, boundaries were chosen to create shorter, less complex utterances in preference to longer, more complex utterances.
Note that criteria 1) and 3) are not consistent with the guidelines of Menn & Obler (1990). These authors are more conservative in their definition of an utterance boundary: boundaries are further demarcated by omissions of lexical words, by retracings of two or more words or self-corrections involving an attempt at a different target word (1990:18). It was necessary to be a little less conservative in defining what constituted an utterance in my study, because DM separated what appeared to be syntactically continuous utterances with retracings and attempts to retrieve lexical items. Detached utterances such as these would have been scarcely worth analyzing. Guidelines for material to be counted as words included in the transcript were taken from Saffran et al. (1989). They separated 'narrative' words or words that were assumed to "represent the propositional speech" (1989:469) of the subject from the following:

1) neologisms (part word substitutions)
2) direct responses to the examiner's questions
3) subject's comments on the narrative or on the task
4) habitual starters (e.g. by the way)
5) conjunctions (and, then)
6) direct speech (e.g. She said, "Isn't that nice!")
7) material that is subsequently repaired:
   a) repetitions
   b) interruptions
   c) amendments
   d) elaborations
For more complete definitions of the above terms see Saffran et al. (1989:469-470). In addition to the above, interjections (e.g. *uh*, *um* and *oh*) were also excluded from word counts. The above listed non-narrative words were separated from narrative words according to codes established by CHAT 1.0 (MacWhinney, 1991). See the CHAT 1.0 manual for an explanation of these codes. Deviations from coding specified in the CHAT 1.0 manual are as follows:

1) Sound errors are coded in orthographic representation. Uncorrected approximations of an obvious target appear in square brackets with an arrow, meaning that the target word was realized as the attempt in brackets (e.g. *stool* [>skul]); and those which are attempts at a particular word appear in square brackets without the arrow, and mean that the subject tried one or more times to produce the word (e.g. *[car] [uh] copper counter, [tre] [uh] tap).

2) Direct responses of the subject are coded in square brackets with the following notation:

*EX:  I'd like you to tell me what's happening in the picture.

*DM:  [DR=oh lots of things happening in uh uh uh].

3) The subject's comments on the task or the narrative are coded in square brackets as follows:

(13)  *DM:  [C=that's all important about that card].

4) As no guidelines were provided in CHAT 1.0 for determining whether omissions of parts of speech were elliptical or not, the following guideline was developed for the purposes of this study. When the omission of the subject of a sentence was
preceded by a sentence that mentioned the same subject, then it would be considered elliptical. The following is an example of ellipsis. The coding preceding an elliptical part of speech is "00."

(14) *DM: and man bumped uh picked up the roses.

(15) *DM: and 00subject delivered them uh to his family uh his girlfriend.

The following is not defined as ellipsis. Parts of speech that are omitted and not considered elliptical are coded with "0."

(16) *DM: after a while uh 0article ambulance did come.

(17) *DM: and 0subject uh threw up on the floor.

Productivity Analysis

In this analysis the following productivity variables are measured for each discourse task:

Measures of productivity:

1) number of narrative words per utterance

2) number of narrative words

3) number of utterances

3) number of words per minute
Lexical Analysis

The following variables are measured in the lexical analysis:

1) number of verbs (types and tokens)
2) number of nouns (types and tokens)
3) number of pronouns (types and tokens)

Structure Analysis

Measures of utterance type (see below for definitions):

1) number of complete sentences
2) number of incomplete sentences categorized as follows:
   a) noun or noun phrase (verb omitted)
   b) verb omission (with arguments present)
   c) argument omission

Measures of utterance complexity:

1) number of nonfinite clauses
2) number of embedded clauses

Complete sentences are defined as having minimally a subject and a verb, with all obligatory arguments present. For example, the utterance, *John put*, would not be considered a sentence because two of the arguments are missing, the direct object and the oblique object. The complete sentence would read: *John put the coffee on the counter*. Incomplete sentences are broken into three categories: those being comprised
of a noun or noun phrase alone, (e.g. *cookie*); those being comprised of arguments without the verb, (e.g. *cookie in the jar*); and those having argument omissions (e.g. *John put*).

**Verb/Argument Structure Analysis**

This analysis is derived in part from an analysis done by Byng (1988) who applied theoretical models of language production and comprehension to therapy. First, utterances must be deemed acceptable for analysis at this level. Utterances without main verbs or copulas are excluded from this analysis. Remaining utterances are examined for the following:

1) number of realized arguments
2) number of obligatory arguments
3) number obligatory argument omissions
4) number of retracing errors; i.e. if subject retraces, which arguments are involved in the retracing
5) number of order violations involving arguments

These variables were measured in baseline tasks in order to determine the subject's ability to process verb/argument structure, and in treatment tasks in order to assess performance across different tasks. Byng (1988) found that the verbal productions of a nonfluent aphasic subject consisted largely of holophrastic utterances and verbs having one realized argument. In fact, 79% of his utterances were so described. She also noted that the subject preferred the use of intransitive verbs so that
he would not be in the position of producing incomplete transitive utterances. In contrast, 80% of the utterances of the normal control subject consisted of verbs with two realized arguments and embedded sentences. A treatment condition was introduced, and later these same variables were measured in the verbal productions of the nonfluent aphasic subject. Results showed that the number of holophrastic utterances was reduced by 40% and that roughly 80% of the subject's utterances consisted of verbs with one or two realized arguments, 50% being verbs with two realized arguments. What this short review of an efficacy study reveals is that the measurement of verb/argument structure can be quantified and can monitor change.

**Function Word and Verb Inflection Analysis**

This analysis, also taken in part from Saffran et al. (1989), measures changes in DM's productions of function words and verb inflections. The following were measured:

1) number of inflectable verbs (definition below)
2) number of inflectable verbs correctly inflected
3) number of inflectable verbs incorrectly inflected
4) number of nouns requiring determiners, with determiners
5) number of nouns requiring determiners, without determiners
6) number of auxiliary verbs in obligatory contexts
7) number of auxiliary verbs overall
8) number of prepositions in obligatory context
9) number of prepositions overall
Saffran et al. (1989) define 'inflectable' verbs: Inflectable verbs are those verbs that can be inflected and exclude imperative forms, irregular verb forms, and those that because of certain contexts, require uninflected forms (e.g. should go, did run).

**Discourse Level Analysis**

In this analysis, narrative discourse tasks were analyzed for presence of elements of schematic structure (e.g. setting, complicating action, resolution), and procedural discourse tasks were analyzed for presence of preserved chronological sequence, and presence of essential targets, according to Ulatowska et al. (1981, 1983a, 1983b).
Results

The following are the results of an assessment of DM's level of language processing impairment, according to Garrett's (1980, 1984) theory of sentence production.

Standardized Testing

Boston Diagnostic Aphasia Examination (Goodglass & Kaplan, 1983):

Results from the subtests of the BDAE (see Table 3.1) characterize DM's speech and language abilities in the following way:

The severity rating falls between 2 and 3 (0=severe impairment, 5=minimal impairment). DM can discuss some everyday problems with little assistance. However, for the remainder of the time, help from his conversational partner is required. While DM is able to produce longer utterances, the intonation contour is not maintained throughout them (assessed in fluency subtests). His speech is characterized by inconsistently produced sound production errors: cluster reduction and metathesis (e.g. [lape] for plate), final consonant deletion (e.g. [hi] for him), assimilations (e.g. [shu shud] for you should), and sound substitutions (e.g. [skul] for stool). Relatively consistent sound production errors are the deletion of the initial consonant in the. These types of errors occur more
frequently when stimulus materials are constrained, as they are in most subtests within the BDAE. DM's auditory language comprehension of single words and up to five part commands is good (e.g. *Tap each shoulder twice with two fingers keeping your eyes shut*). His auditory language comprehension is, however, impaired in complex ideational material; this includes comprehension of sentences regarding factual material and comprehension of paragraphs in which an affirmative or negative response is required.

Table 3.1 - DM's Scores on the Boston Diagnostic Aphasia Examination (Goodglass & Kaplan, 1983)

<table>
<thead>
<tr>
<th>Subtest Category</th>
<th>Score</th>
<th>Possible Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severity Rating</td>
<td>2-3</td>
<td>5</td>
</tr>
<tr>
<td>Fluency</td>
<td>25</td>
<td>35</td>
</tr>
<tr>
<td>Auditory Comprehension</td>
<td>107</td>
<td>119</td>
</tr>
<tr>
<td>Naming</td>
<td>132</td>
<td>167</td>
</tr>
<tr>
<td>Oral Reading</td>
<td>34</td>
<td>40</td>
</tr>
<tr>
<td>Repetition</td>
<td>22</td>
<td>26</td>
</tr>
<tr>
<td>Automatized Sequences</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Reading Comprehension</td>
<td>41</td>
<td>46</td>
</tr>
<tr>
<td>Writing</td>
<td>81</td>
<td>104</td>
</tr>
</tbody>
</table>
Naming is unimpaired when DM is presented with picture and stimulus question prompts (e.g. "What do we tell time with?"), but when asked to name as many items as possible from a particular category (e.g. animals) in a restricted amount of time, he was only able to name four items. DM's reading performance was unimpaired at the single word level, but he experienced more difficulty in reading sentences. Scores were reduced due to the presence of whole word sound substitutions (e.g. arrow for rein). DM's repetition skills were good in high and low probability sentences (determined by presence vs. lack of contextual cues). However, the production of whole word and single sound substitutions (e.g. fair for fan and tlin for tin) reduced his scores in low probability sentences. DM produced a small number of whole word, single sound and part-word (e.g. [topal] for hospital) substitutions in subtests where this aspect was scored. In the sentence repetition subtest of the BDAE (1983), DM produced four sound substitutions in a total of 16 sentences, along with one whole word substitution and one part-word substitution. DM recited days of the week, months of the year, etc., with few errors. DM's reading comprehension was good in the context of single words, sentences and paragraphs. DM's writing appeared more impaired than his verbal production. Written sentences were characterized by incomplete short utterances and graphemic errors.
Table 3.2 - Results of the Test of Comprehension of Syntactic Structure

<table>
<thead>
<tr>
<th>Sentence Structure</th>
<th>Example</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active (2 arguments)</td>
<td>The monkey patted the rabbit.</td>
<td>5/5</td>
</tr>
<tr>
<td>Passive (2 arguments)</td>
<td>The monkey was touched by the rabbit.</td>
<td>4/5</td>
</tr>
<tr>
<td>Cleft Subject</td>
<td>It was the goat that caught the elephant.</td>
<td>5/5</td>
</tr>
<tr>
<td>Cleft Object</td>
<td>It was the rabbit that the monkey kissed.</td>
<td>2/5</td>
</tr>
<tr>
<td>Active (3 arguments)</td>
<td>The monkey sent the rabbit to the turtle.</td>
<td>2/5</td>
</tr>
<tr>
<td>Passive (3 arguments)</td>
<td>The turtle was given to the rabbit by the goat.</td>
<td>2/5</td>
</tr>
<tr>
<td>Co-ordinated</td>
<td>The goat bit the monkey and caught the elephant.</td>
<td>5/5</td>
</tr>
<tr>
<td>Subject-Object</td>
<td>The turtle that the rabbit touched pushed the elephant.</td>
<td>1/5</td>
</tr>
<tr>
<td>Object-Subject</td>
<td>The monkey chased the elephant that kissed the goat.</td>
<td>0/5</td>
</tr>
</tbody>
</table>

Test of Comprehension of Syntactic Structure (Caplan et al., 1985):

Table 3.2 presents DM's scores on all of the syntactic structures tested. DM obtained perfect and near perfect scores on the interpretation of active and passive sentences having two arguments, cleft subject sentences and co-ordinated sentences. He showed impaired ability to interpret cleft object sentences, active and passive sentences with three arguments, and sentences having subject-object and object-subject relative clauses. In addition to effects triggered by syntactic structure, two possible interpretations of results exist: 1) the effects of short-term memory, and/or 2) motor or
perceptual factors (Caplan et al., 1985). Evidence that short-term memory is not a factor in DM's case is that shorter sentences (e.g. cleft object) were not always easier for DM to interpret than longer sentences (e.g. co-ordinated sentences). And sentences of equal length were not interpreted with the same ease (e.g. cleft subject were easier than cleft object sentences of the same length). Motor and perceptual effects were not a factor because the physical positions of the animal figures, prior to DM manipulating them, were varied as a function of their thematic roles. Thus, DM could not have successfully used a strategy to interpret the actions of the figures based upon the physical location of the animal figures. In addition, the grammatical category of the lexical item did not give DM cues as to the thematic role as they are all animate common nouns.

Remembering that the four syntactic structures included in the test are:

1) hierarchical organization of categories,

2) verb structure,

3) function word/morphological markings, and

an additional factor which was not included in the test,

4) number of verbs,

DM showed sensitivity to verb structure (i.e. number of arguments), embedded structures, and sentences having noncanonical word order (cleft object) and function words and morphology. For example, DM was able to interpret the function words in passive sentences (with only two arguments) as markers of a reversal of thematic roles, but not in sentences with embedded clauses whose thematic roles were not in canonical order (as in cleft object sentences). Simply, DM could not use the cues given by the
morphological marking in relative clauses to the same degree that he could use the same
cues in passive sentences. DM also was interpreting object-subject relative clauses as
co-ordinated sentences, which may have either been a strategy, or perhaps he was
interpreting the relative pronoun, that, as the conjunction, and.

Verb Retrieval Task:

Given picture stimulus cards depicting 15 different actions, divided into high
frequency, moderate frequency and low frequency, DM was able to correctly name the
actions 12 out of 15 times. Two of the stimulus cards resulted in DM's production of
action verbs that were semantically close, i.e. running for walking, and drawing for
painting. The third error was either a result of DM's misinterpretation of the action in the
picture, or his inability to retrieve the target action. Although this was a verb frequent in
usage, it was not a picturable verb (e.g. put). Overall, DM's ability to retrieve verbs from
picture stimuli does not appear impaired for either common or less common verbs. The
effect is, however, restricted to highly picturable verbs due to the type of task. Also, the
verb set chosen for the task was small. This does, however, appear to rule out any
problems associated with verb retrieval that DM might have during the description of
sequence picture tasks.

Sentence Production Task:

DM's success in producing sentences upon presentation of the test pictures was
dependent upon the number of arguments in the sentence in two ways. First, incomplete
sentences, defined as those having verb omissions, arguments omissions, or reversed ordering of arguments, occurred more commonly when sentences contained three arguments. Of the 9 incomplete sentences, 5 were composed of 3 arguments, 2 were composed of 2 arguments, and 2 were composed of 1 argument. Note that two of the sentences with 3 arguments contained the same verb, *put*. The second way in which DM's sentence formulations were dependent upon the number of arguments was evident in his retracing errors. Errors of retracing are those in which DM produced a portion of the utterance and subsequently repaired it, where this is not due to attempts at accessing the phonological forms of words (at least for the purposes of the present study). As shown in Table 3.3 below, some patterns become evident when errors of retracing are displayed with the number of arguments in a sentence. Of the 5 sentences having retracings, all of them have 2 or more arguments. Another characteristic of these sentences is that they are typically longer than sentences having only 1 argument.

Given that DM appears able to access verb argument structure and map thematic roles onto syntactic categories, it is probable that the retracings and omissions of arguments are due to processing constraints due to either an increased length of utterance, or an increased number of arguments. Other errors that characterized DM's sentence productions were: sound production errors, whole word substitutions, omissions of determiners, and omissions of auxiliary verbs. Because tasks like this one had been employed in therapy with DM, he was probably quite practiced at producing auxiliary verbs and determiners in obligatory contexts. As we shall see, this ability is compromised to some degree in other tasks.
Table 3.3 - Sentence Production Task Error Analysis

<table>
<thead>
<tr>
<th>Stimulus Number</th>
<th>Number of Arguments</th>
<th>Error Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>3</td>
<td>Direct discourse</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>Retracing of oblique object (thematic role: location)</td>
</tr>
<tr>
<td>8</td>
<td>3</td>
<td>Retracing of direct object (thematic role: theme)</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>Omission of subject (thematic role: theme)</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>Omission of verb</td>
</tr>
<tr>
<td>12</td>
<td>3</td>
<td>Retracing of direct object (thematic role: theme)</td>
</tr>
<tr>
<td>13</td>
<td>2</td>
<td>Retracing of verb and direct object (thematic role: theme)</td>
</tr>
<tr>
<td>16</td>
<td>3</td>
<td>Retracing of direct object (thematic role: theme) Omission of subject (role: agent)</td>
</tr>
<tr>
<td>18</td>
<td>3</td>
<td>Reversal of direct object and oblique object (roles: theme and goal)</td>
</tr>
</tbody>
</table>

Sentence Judgment Task:

Table 3.4 shows the number of sentences that DM judged correctly to be incomplete or complete, depending upon the number of arguments in the sentence. DM made only three errors in judgment, suggesting that DM's knowledge of the obligatory arguments associated with verbs is intact. This hypothesis is tempered by the fact that
these sentences tested his knowledge of a finite set of verbs in sentences having a simple syntactic structure. DM's judgment ability might be compromised given a more complex syntactic structure, such as an embedded sentence.

**Baseline Discourse Tasks**

Measures of productivity (number of words and utterances per discourse, words produced per minute and length of discourse) revealed some degree of variability across the three discourse tasks. Comparisons of the discourses in terms of the parameter, productivity, will be discussed in more detail when baseline tasks are compared to treatment tasks. In terms of production of lexical items such as verbs, nouns and pronouns, a degree of variability among the three tasks is also evident. While the low proportion of verbs to nouns in the "Cookie Theft" picture description suggests that DM has lost access to verb argument structure (see Table 4.6), the same hypothesis is not supported when one views the same proportions in the latter two discourse tasks. Rather, the proportions of verbs to nouns approaches the ratio 1, which is comparable to noun/verb ratios in nonimpaired speakers (Berko-Gleason et al., 1980).

The hypothesis that DM has knowledge of verb argument structure is also supported by results from an utterance analysis, as shown in Table 3.5 below. While a large portion of the utterances in the "Cookie Theft" picture are characterized by missing verbs or arguments, the utterances in the remaining two tasks are, for the most part, characterized by complete sentences, a small number of which contain nonfinite and embedded clauses.
Table 3.4 - Sentence Judgement Task Score

<table>
<thead>
<tr>
<th>Number of Arguments</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5/6</td>
</tr>
<tr>
<td>2</td>
<td>5/6</td>
</tr>
<tr>
<td>3</td>
<td>7/8</td>
</tr>
</tbody>
</table>

Table 3.5 - Utterance Analysis for Baseline Discourse Tasks

<table>
<thead>
<tr>
<th>Task Name</th>
<th>Missing Verb</th>
<th>Missing Argument</th>
<th>Complete Sentence</th>
<th>Nonfinite Clause</th>
<th>Embedded Clause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cookie Theft</td>
<td>8 (73%)</td>
<td>1 (9%)</td>
<td>2 (18%)</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Family</td>
<td>3 (19%)</td>
<td>1 (6%)</td>
<td>12 (75%)</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Illness</td>
<td>2 (17%)</td>
<td>2 (17%)</td>
<td>8 (67%)</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Note: Numerals show the number of analyzable utterances characterized as having missing verbs, missing arguments, complete structure, nonfinite clauses or embedded clauses. Percentages are the numerical values divided by the total number of analyzable utterances.

A function word and morphological analysis of the baseline discourse tasks demonstrates that a large portion of the verbs that could be inflected, were correctly inflected (see Table 3.6). Auxiliary verbs and prepositions were consistently produced in obligatory context. However, DM's production of determiners was not consistent. This may have been due to a failure of the examiner to interpret his interjections, e.g. *uh*, as determiners. Or, there may be a dissociation between DM's productions of determiners and his production of inflections, auxiliary verbs and prepositions.
Table 3.6 - Function Word/Morphological Analysis for Baseline Discourse Tasks

<table>
<thead>
<tr>
<th>Task Name</th>
<th>Inflectable Verbs</th>
<th></th>
<th>Determiners</th>
<th></th>
<th>Auxiliaries</th>
<th></th>
<th>Prepositions</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Correct. Inflect.</td>
<td>In Oblig. Context</td>
<td>Actual Total</td>
<td>In Oblig. Context</td>
<td>Actual Total</td>
<td>In Oblig. Context</td>
<td>Actual Total</td>
</tr>
<tr>
<td>Cookie Theft</td>
<td>3</td>
<td>3</td>
<td>--</td>
<td>14</td>
<td>7</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Family</td>
<td>18</td>
<td>16</td>
<td>2</td>
<td>6</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Illness</td>
<td>9</td>
<td>8</td>
<td>1</td>
<td>11</td>
<td>8</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

Discussion

Results from the test of comprehension of syntactic structure (Caplan et al., 1985) suggest that DM's ability to comprehend utterances is influenced by the number of arguments within a sentence and its syntactic structure. Analysis of DM's discourses suggests that DM has knowledge of verb argument structure and the mapping of thematic roles to syntactic categories. Therefore, his impairment may be due to an inconsistent access to this knowledge in production, which may be related either to length of utterance or the number of arguments within an utterance.

DM also has knowledge of verb inflections, auxiliary verbs, pronouns and determiners but his use of them is inconsistent. DM has some difficulty accessing the phonological forms of words, which is more evident in tasks that are constrained, such as in the "Cookie Theft" picture description. DM also shows evidence of impaired access to syntactic structure. Therefore, in order to measure change in performance in the experimental tasks, I chose to measure certain performance variables; these are presented in Chapter Two. Since DM's impaired access to language knowledge appears to be at both levels of Garrett's model, i.e. in his access to verb/argument structure and
function words and morphology, and syntax, they include variables that are hypothesized to measure DM's performance at both the functional and positional levels of Garrett's (1980, 1982, 1984) model of sentence production.
RESULTS AND DISCUSSION

Review of Research Questions and Hypotheses

In Chapter One, I hypothesized that the type of discourse would have an effect on the sentence and discourse production of a nonfluent aphasic individual. The major purposes in looking at this effect were: 1) to demonstrate that discourse performance is variable, and this variability in performance is useful in determining different levels of language ability of aphasic patients; and 2) to demonstrate that certain discourse types allow the performance of an aphasic adult to approximate his linguistic competence. This hypothesis was based upon research which revealed that different discourse types resulted in differential performance in the aphasic population. I also hypothesized that the triggering of a cognitive schema would facilitate discourse production. This hypothesis stems from research demonstrating that sequence pictures, which tell a story, enable better performance on the part of aphasic individuals than complex pictures ("Cookie Theft"), which do not have story structure.

The graphic representation of semantic relations that form the basis of discourse, has been used as a therapeutic technique and might also facilitate discourse and sentence performance in aphasic individuals. From this research, yet another hypothesis emerges: An aphasic patient who is cognizant of the intersentential semantic relations
that form the basis of discourse, will be facilitated in discourse production because processing loads will be reduced at the level of the discourse plan.

Finally, I hypothesized that performance is not as likely to reflect the competence of the individual when discourse tasks low in extralinguistic support are used as stimuli. All of the baseline and experimental discourse tasks were rated according to the number of levels of extralinguistic support of which they were comprised.

The following are the results of the productivity, lexical, structural, verb/argument structure, morphological and function word analyses for the baseline and experimental tasks. Results of the productivity analysis for the monitoring tasks are also related. In presenting the results, I begin by looking at the following variables: discourse type and number of levels of extralinguistic support, followed by schematic structure and representation of semantic relations. Finally, the results of the discourse level analysis will be presented.

Results

Monitoring Tasks

Table 4.1 displays the results of the productivity measure (narrative words produced per minute, or NWPM) taken for each of the complex picture tasks that were administered prior to each testing session. Also shown are the same productivity measures for each of the experimental tasks administered on the same day as the monitoring tasks. DM's verbal output does not appear to be related to the particular
session during which the tasks were administered. His verbal output (NWMP) varies within each session. It is probable that the range in verbal output scores is due to the tasks themselves, and we can assume that no overt variations in DM’s performance occurred over the testing interval.

Table 4.1 - Productivity Measures for Monitoring Tasks

<table>
<thead>
<tr>
<th>Name of Monitoring Task</th>
<th>Number of Narrative* Words/Minute for Monitoring Tasks</th>
<th>Name of Experimental Task Given on Same Session as Monitoring Task</th>
<th>Number of Narrative Words/Minute Produced for Experimental tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Complex Picture (Kertesz, 1982)</td>
<td>34</td>
<td>Goldilocks</td>
<td>30</td>
</tr>
<tr>
<td>Minnesota Test for Differential Diagnosis of Aphasia, Complex Picture (Schuell, 1965)</td>
<td>20</td>
<td>Man &amp; Dog</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Family</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flowers</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Camera</td>
<td>51</td>
</tr>
<tr>
<td>Complex Picture reproduced in Menn &amp; Obler (1990)</td>
<td>26</td>
<td>Cowboy</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Library</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Princess</td>
<td>30</td>
</tr>
<tr>
<td>Complex Picture from CELF-R (Semil &amp; Wiig, Form. Sent., Item 2, 1987)</td>
<td>22</td>
<td>Police</td>
<td>40</td>
</tr>
<tr>
<td>Complex Picture from CELF-R (Semil &amp; Wiig, Form. Sent., Item 4, 1987)</td>
<td>31</td>
<td>Haircut</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moose</td>
<td>42</td>
</tr>
</tbody>
</table>

*Narrative word counts exclude direct responses of subject to examiner, repetitions, habitual starters, comments of subject, direct discourse markers (e.g. “She said, …”), interjections, etc.
Discourse Type and Extralinguistic Support

Productivity:

The total number of narrative words and number of utterances for each discourse were calculated (see Table 4.2). DM produced an average number of 76 narrative words for each discourse task (see Table 4.4) and an average number of 15 utterances for each discourse task, although this number is inflated due to the two memorable experience tasks, the "Moose" and "Police" stories, which were the longest discourses, both in terms of number of narrative words and number of utterances per discourse. DM produced 243 narrative words and 43 utterances during the "Police" narrative, and 123 narrative words and 23 utterances during the "Moose" narrative. He produced the lowest number of narrative words and utterances during the description of the "Cookie Theft" picture (BDAE, 1983), the "Flowers" sequence picture and the "Haircut" procedural discourse task, ranging from 27 to 33 narrative words per discourse and 5 to 12 utterances per discourse. While the "Library" task, a procedural discourse task, had only 6 utterances, it did contain 48 narrative words in all. The "Library" task and the remaining tasks all totalled between 43 and 105 narrative words, and 6 and 21 utterances per discourse. The type of discourse does appear to affect the total number of words and utterances that DM produced. Table 4.3 displays the average number of narrative words per discourse according to discourse type (note that the picture description type contains only one task, the "Cookie Theft" picture description). The memorable experience, fairytale and expository discourse were the longest discourse types when measured by total narrative
words and number of utterances. What these genres have in common is that they are not limited by propositional content in the same way that a picture or a finite set of pictures is. These genres are also a more familiar discourse context to DM than that of the complex picture and sequence picture discourse types.

Table 4.2 - Productivity Measures for all Discourse Tasks

<table>
<thead>
<tr>
<th>Discourse Type</th>
<th>Task Name</th>
<th>Number of Words/Task</th>
<th>Number of Utterances/Task</th>
<th>Number of Words/Utterance</th>
<th>Number of Words/Minute</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline: Picture</td>
<td>Cookie</td>
<td>33</td>
<td>12</td>
<td>3.0</td>
<td>33</td>
</tr>
<tr>
<td>Description and</td>
<td>Theft</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expository Speech</td>
<td>Illness</td>
<td>58</td>
<td>13</td>
<td>4.8</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>Family</td>
<td>89</td>
<td>19</td>
<td>5.6</td>
<td>21</td>
</tr>
<tr>
<td>Sequence Picture</td>
<td>Flower</td>
<td>30</td>
<td>6</td>
<td>5.0</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>Cowboy</td>
<td>44</td>
<td>12</td>
<td>3.7</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>Man&amp;Dog</td>
<td>50</td>
<td>13</td>
<td>3.8</td>
<td>32</td>
</tr>
<tr>
<td>Procedural Discourse</td>
<td>Camera</td>
<td>43</td>
<td>8</td>
<td>5.0</td>
<td>1-12</td>
</tr>
<tr>
<td></td>
<td>Library</td>
<td>48</td>
<td>6</td>
<td>9.6</td>
<td>7-11</td>
</tr>
<tr>
<td></td>
<td>Haircut</td>
<td>27</td>
<td>5</td>
<td>6.8</td>
<td>3-10</td>
</tr>
<tr>
<td>Fairytale</td>
<td>Goldilocks</td>
<td>80</td>
<td>19</td>
<td>4.2</td>
<td>2-8</td>
</tr>
<tr>
<td></td>
<td>Princess</td>
<td>105</td>
<td>21</td>
<td>5.0</td>
<td>2-9</td>
</tr>
<tr>
<td></td>
<td>Moose</td>
<td>124</td>
<td>23</td>
<td>5.4</td>
<td>3-11</td>
</tr>
<tr>
<td></td>
<td>Police</td>
<td>243</td>
<td>43</td>
<td>5.4</td>
<td>2-14</td>
</tr>
</tbody>
</table>

*Words counts refer to narrative word counts which exclude direct responses of subject to examiner, repetitions, habitual starters, comments of subject, direct discourse markers (e.g. "She said, ...."), interjections, etc.*
Next, I will consider the relationship between length of discourse and the number of levels of extralinguistic support, remembering that each discourse task has been rated according to the number of supportive extralinguistic contexts present during the presentation of the task (e.g. visual context, schematic structure, familiar context, etc.). Table 4.5 shows the relation between number of levels of extralinguistic support and length of discourse. Discourses with three levels of support are documented to result in longer discourses. This does not support the prediction that discourses with a greater number of extralinguistic contexts will result in longer discourses.

The next measure of productivity to be considered is the number of narrative words produced per utterance. DM produced an average number of 5.2 words per utterance across all discourse tasks (see Table 4.4). The longest utterance is found in the "Library" task, a procedural discourse task (see Table 4.2). This value is large because DM used the same sentence structure for all the six utterances (range 7-11 words per utterance) produced in this discourse.
Table 4.3 - Averages of Productivity Measures Across Discourse Type*

<table>
<thead>
<tr>
<th>Discourse Type</th>
<th>Mean Number of Words/ Discourse</th>
<th>Mean Number of Utterances /Discourse</th>
<th>Mean Number of Words/ Utterance</th>
<th>Mean Number of Words/ Minute</th>
</tr>
</thead>
<tbody>
<tr>
<td>Picture Description</td>
<td>33</td>
<td>12</td>
<td>3.0</td>
<td>33</td>
</tr>
<tr>
<td>and Expository Speech</td>
<td>74</td>
<td>16</td>
<td>5.2</td>
<td>28</td>
</tr>
<tr>
<td>Sequence Picture</td>
<td>41</td>
<td>10</td>
<td>4.2</td>
<td>34</td>
</tr>
<tr>
<td>Procedural Discourse</td>
<td>39</td>
<td>6</td>
<td>7.0</td>
<td>36</td>
</tr>
<tr>
<td>Fairytale</td>
<td>90</td>
<td>20</td>
<td>4.6</td>
<td>29</td>
</tr>
<tr>
<td>Memorable Experience</td>
<td>184</td>
<td>33</td>
<td>5.4</td>
<td>41</td>
</tr>
</tbody>
</table>

*Averages are taken of each measure for discourse tasks of the same type.

Table 4.4 - Productivity Measures Represented as Mean Number Across all Discourse Tasks.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Mean Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Narrative Words/Discourse</td>
<td>76</td>
</tr>
<tr>
<td>Utterances/ Discourse</td>
<td>15</td>
</tr>
<tr>
<td>Narrative Words/Utterance</td>
<td>5.2</td>
</tr>
<tr>
<td>Narrative Words/Minute</td>
<td>34</td>
</tr>
</tbody>
</table>

Aside from the "Library" task, those tasks which resulted in utterances longer than the average for all the tasks were the "Moose" and "Police" memorable experiences, at an
average of 5.4 words per utterance each, the "Family," of the expository discourse genre at an average of 5.6 words per utterance and the "Haircut" discourse at an average of 6.8 words per utterance. DM spoke shorter utterances during the "Cookie Theft" picture description, the "Goldilocks" fairytale, and the "Man & Dog" and "Cowboy" sequence pictures, at 3, 4.3, 3.8 and 3.7 words per utterance, respectively. Table 4.3 also shows the average length of utterance according to discourse type. Utterances are longer in procedural types of discourse than in any other type. The average length of utterance for the procedural discourse tasks is 7 words per utterance. The average length of utterance for the other discourse types ranges between 3 and 5.4 words per utterance.

Table 4.5 - Averages of Productivity Measures According to Number of Levels of Extralinguistic Support

<table>
<thead>
<tr>
<th>Number of Levels of Support</th>
<th>Average # of Words/Discourse</th>
<th>Average # of Utterances/Discourse</th>
<th>Average # of Words/Utterance</th>
<th>Average # of Words/Minute</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>77</td>
<td>15</td>
<td>5.2</td>
<td>43</td>
</tr>
<tr>
<td>3</td>
<td>84</td>
<td>17</td>
<td>4.8</td>
<td>34</td>
</tr>
<tr>
<td>2</td>
<td>57</td>
<td>13</td>
<td>5.8</td>
<td>29</td>
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</tbody>
</table>

*Averages are taken for each measure for discourse tasks having either 4, 3, or 2 levels of support.*
The number of levels of extralinguistic support was not a strong factor in DM's mean length utterances (see Table 4.5). However, tasks that have higher levels of support ("Moose" and "Flowers") did possess a mean length of utterance that approached the average for all discourse tasks.

Lastly, in terms of productivity, we shall consider the number of narrative words produced per minute (NWPM) by DM across the tasks. Although this is a crude measure of performance, confounded by a number of variables related to DM's language production such as retracings, pauses between utterances, comments and interjections, it is included in order to see which of DM's discourse productions were associated with fewer pauses, retracings, general discourse planning, etc. DM produced an average of 34 NWPM for all the discourse tasks (see Table 4.4). Table 4.2 shows that he produced the largest number of NWPM during the "Camera" procedural discourse task (51 NWPM), the "Flowers" sequence picture task (44 NWPM), the "Moose" (42 NWPM) and "Police" (40 NWPM) narratives. The four tasks with the lowest scores of NWPM were the "Family" description (21 NWPM), the "Library" procedural discourse task (25 NWPM), the "Cowboy" sequence picture (26 NWPM) and the "Goldilocks" fairytale (28 NWPM). Table 4.3 shows that there are no apparent trends recognizable for discourse type. When looking at the number of levels of extralinguistic support in Table 4.5, the tasks having 4 levels of support, ("Moose" and "Flowers"), when averages are combined, reveal that DM produced more words per minute, when multilevels of extralinguistic support were provided.
Lexicon:

Lexical measures include numbers of verb types and tokens, noun types and tokens and pronoun types and tokens. The purpose in looking at the occurrences of nouns and verb tokens is to see to what degree DM's production of lexemes approaches that of the normal speaker depending upon the discourse task in addition to seeing how DM's use of lexical words changes across tasks.

Table 4.6 - Lexical Measures for all Discourse Tasks

<table>
<thead>
<tr>
<th>Discourse Type</th>
<th>Task Name</th>
<th>Number of Verbs</th>
<th></th>
<th>Number of Nouns</th>
<th></th>
<th>Number of Pronouns</th>
<th></th>
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</thead>
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<tr>
<td></td>
<td></td>
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<td>Tokens</td>
<td>Types</td>
<td>Tokens</td>
<td>Types</td>
<td>Tokens</td>
</tr>
<tr>
<td>Baseline</td>
<td>Cookie Theft</td>
<td>3</td>
<td>3</td>
<td>13</td>
<td>17</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Descript.</td>
<td>Illness</td>
<td>11</td>
<td>14</td>
<td>7</td>
<td>13</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Expos. Speech</td>
<td>Family</td>
<td>17</td>
<td>21</td>
<td>22</td>
<td>28</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Sequence</td>
<td>Flowers</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>9</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Picture</td>
<td>Cowboy</td>
<td>10</td>
<td>12</td>
<td>5</td>
<td>12</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Man&amp;Dog</td>
<td>9</td>
<td>9</td>
<td>11</td>
<td>20</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Proced. Discourse</td>
<td>Camera</td>
<td>6</td>
<td>7</td>
<td>6</td>
<td>10</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Library</td>
<td>2</td>
<td>10</td>
<td>5</td>
<td>14</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Haircut</td>
<td>5</td>
<td>5</td>
<td>7</td>
<td>8</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Fairytale</td>
<td>Goldilocks</td>
<td>11</td>
<td>19</td>
<td>11</td>
<td>20</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Princess</td>
<td>10</td>
<td>18</td>
<td>12</td>
<td>25</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Memorab. Exp.</td>
<td>Moose</td>
<td>17</td>
<td>24</td>
<td>20</td>
<td>28</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Police</td>
<td>29</td>
<td>53</td>
<td>28</td>
<td>54</td>
<td>7</td>
<td>13</td>
</tr>
</tbody>
</table>
As previously stated in Chapter Two, unimpaired speakers have a tendency to produce equal numbers of noun and verb tokens, while nonfluent aphasic adults tend to produce a greater number of noun tokens than verb tokens (Berko-Gleason et al., 1980). Table 4.6 displays the lexical measures for all the discourse tasks.

In all of the tasks, except for the "Cookie Theft" picture description, the number of noun tokens does not exceed the number of verb tokens by more than a ratio of 2:1. A noun:verb ratio of 2:1 has been documented in the productions of nonfluent aphasic adults (Berko-Gleason et al., 1980). In the "Cookie Theft" picture description, however, the number of noun tokens exceeds the number of verb tokens by approximately five times. DM produced an equal number of noun and verb tokens in both memorable experience tasks, the expository baseline discourses, "Goldilocks" and the "Cowboy" sequence picture. Verb type:token ratios are generally high (i.e. approaching a ratio of 1:1) in all tasks except the "Library" procedural discourse task, and the "Princess" fairytale discourse task. As was explained in an earlier section, DM used a similar syntactic construction for a large portion of his utterances in the "Library," which explains why he produced relatively few verb types during this task. And during the "Princess" fairytale telling task, DM employed a great deal of direct discourse. An example of direct discourse in DM's utterances is: *Princess said, "I'll see about that."* For this reason, many of DM's utterances include the verbs, *said* or *told*.

The noun type:token ratios are high in all tasks except: the "Illness" description, all of the sequence picture tasks, the "Camera" and "Library" procedural discourses, and
both of the fairytales. In these tasks, DM made reference to a restricted set of nouns dictated by the tasks themselves.

Syntactic Structure:

The analysis of syntactic structure is an additional means of characterizing DM's verbal productions across discourse tasks and discourse types. It attempts to incorporate a theory of language production, namely Garrett's (1980, 1984) theory of sentence production, which was described in earlier chapters. The representation of syntactic structure occurs at the positional level, along with representations of the phonological forms of content words and function words and morphology. Measures of syntactic structure in this analysis included the total number of complete sentences vs. the number of incomplete sentences in a discourse (note that the definition of a sentence and an utterance are different for the purposes of this study). Measures of syntactic complexity included total number of nonfinite clauses and total number of embedded clauses in a discourse. These numerical values are presented in Table 4.7 for all the discourse tasks. These values are also represented in terms of percentages, i.e. the percentage that the number of complete sentences are of total utterances, the percentage that the number of incomplete sentences are of total utterances, the percentage that nonfinite clauses are of total utterances, and the percentage that embedded clauses are of total utterances.

The results of this analysis show that two thirds of the utterances in eleven out of the thirteen discourse tasks were complete sentences. Only 18% of the utterances in the "Cookie Theft" picture description were complete sentences. In the "Man & Dog"
sequence picture task, only 50% of the utterances were complete sentences. DM produced the highest proportions of complete sentences in the two procedural discourse tasks, the "Library" and the "Haircut," in which complete sentences totalled 100% of the total number of utterances in each task.

The percentage of utterances composed of complete sentences is combined and averaged according to discourse type. In procedural discourse, 92% of the utterances are complete sentences, in fairytales, 80% are complete sentences, and in memorable experiences, 70% are complete sentences. Without statistical analyses, it is difficult to say, whether these differences are significant. However, there does seem to be a wide variation in terms of the number of complete sentences when discourse type is taken into consideration. The result that procedural discourse results in a large proportion of complete sentences is consistent with Ulatowska et al.'s (1981, 1983a) conclusion that procedural discourses result in simpler language than narratives. If the language structures used in procedural discourse have a tendency to be less complex, then chances are the aphasic individual has a higher probability of producing complete sentences (given that his/her impairment was at the level of syntax). However, their conclusion is not supported in this study for measures of utterance length (procedural discourse on average contains longer utterances) or for measures of syntactic complexity, as we shall see shortly.
<table>
<thead>
<tr>
<th>Discourse Type</th>
<th>Task Name</th>
<th>Number of Analyzable Utterances</th>
<th>Number of Complete Sentences</th>
<th>Number of Incomplete Sentences</th>
<th>Number of Non Finite Clauses</th>
<th>Number of Embedded Clauses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>Family</td>
<td>16</td>
<td>12 (75%)</td>
<td>--</td>
<td>3 (19%)</td>
<td>1 (6%)</td>
</tr>
<tr>
<td>Picture Theft</td>
<td>Flowers</td>
<td>6</td>
<td>5 (83%)</td>
<td>--</td>
<td>1 (17%)</td>
<td>--</td>
</tr>
<tr>
<td>Description</td>
<td>Cowboy</td>
<td>12</td>
<td>9 (75%)</td>
<td>--</td>
<td>3 (25%)</td>
<td>--</td>
</tr>
<tr>
<td>Expository</td>
<td>Man &amp; Dog</td>
<td>12</td>
<td>6 (50%)</td>
<td>3 (25%)</td>
<td>1 (8%)</td>
<td>2 (17%)</td>
</tr>
<tr>
<td>Speech</td>
<td>Camera</td>
<td>8</td>
<td>6 (75%)</td>
<td>--</td>
<td>1 (13%)</td>
<td>1 (13%)</td>
</tr>
<tr>
<td></td>
<td>Library</td>
<td>5</td>
<td>5 (100%)</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>Haircut</td>
<td>4</td>
<td>4 (100%)</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Procedural Discourse</td>
<td>Goldilocks</td>
<td>18</td>
<td>14 (78%)</td>
<td>1 (6%)</td>
<td>1 (6%)</td>
<td>2 (11%)</td>
</tr>
<tr>
<td></td>
<td>Princess</td>
<td>21</td>
<td>17 (81%)</td>
<td>--</td>
<td>3 (14%)</td>
<td>1 (5%)</td>
</tr>
<tr>
<td>Fairytale</td>
<td>Moose</td>
<td>23</td>
<td>20 (87%)</td>
<td>--</td>
<td>3 (13%)</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>Police</td>
<td>42</td>
<td>29 (69%)</td>
<td>3 (7%)</td>
<td>3 (7%)</td>
<td>9 (21%)</td>
</tr>
</tbody>
</table>
In looking at the effects of number of levels of extralinguistic support, some trends are also reportable. For example, the average proportion of complete sentences for both tasks with four levels of extralinguistic support was 85%. In tasks low in extralinguistic support, i.e. with two levels of support, the proportion of complete sentences was only 65%.

Incomplete sentences, as described in Chapter Two, were those utterances characterized by either a verb omission with one or more arguments remaining, an argument omission (e.g. subject, direct object, etc.), or the presence of a single noun or noun phrase without a verb. This breakdown of incomplete sentences is also shown in Table 4.7. Of the incomplete utterances in the "Cookie Theft" picture description, 64% were due to the presence of single noun or single noun phrase utterances; in the "Man and "Dog" sequence picture, the incomplete sentences were composed almost equally of single nouns or noun phrases and utterances with arguments omitted. More about incomplete sentences will be discussed in the results of the verb/argument structure analysis.

DM produced 24 complex syntactic structures in eight out of thirteen of the discourse tasks. The remaining five discourse tasks contained no complex syntactic structures. A visual component was the common feature in all discourse types displaying no evidence of complex syntactic sentences. While in one of the sequence picture
descriptions ("Flowers"), DM did use the relative pronoun, *that*, its presence did not result in a complete syntactic structure:

(1) \text{DM: man had roses.}\]

\text{DM: and and uh uh ... that that the man bumped into him uh.}

Tasks that did result in a high proportion of complex constructions were the "Police" story, the description of DM's "Illness and the "Family" expository discourse: 26% of the utterances in the "Police" story were embedded clauses; 25% in the "Illness" task were either nonfinite or embedded clauses; and 19% in the "Family" description were either nonfinite or embedded clauses. In the "Haircut" procedural discourse task, consisting of only four utterances, 100% of the utterances were complete, and 50% were embedded clauses. These results compare to the productions of unimpaired speakers during production of procedural tasks. In Ulatowska et al. (1983a), of the utterances produced by unimpaired speakers, 28% were either embedded or nonfinite clauses. In Ulatowska et al. (1983b), of the utterances produced by unimpaired speakers in memorable experiences and stories (one of which was a retelling and the other was a sequence picture task), approximately 30% of the utterances contained dependent clauses (in both stories and experiences) and approximately 12% to 20% were nonfinite clauses (in stories and experiences respectively). Most of the tasks having a greater number of complex syntactic structures had the extralinguistic variable, familiarity, in common. The number of levels of extralinguistic support and discourse type as factors in DM's production of syntactically complex utterances cannot be demonstrated.
Table 4.8 - Results of Analysis of DM's use of Verb Inflections, Determiners, Auxiliaries and Prepositions

<table>
<thead>
<tr>
<th>Discourse Type</th>
<th>Task Name</th>
<th>Task Name</th>
<th>Task Name</th>
<th>Task Name</th>
<th>Task Name</th>
<th>Task Name</th>
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<th>Task Name</th>
<th>Task Name</th>
<th>Task Name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Inflectable Verbs</td>
<td>Determiners</td>
<td>Auxiliaries</td>
<td>Prepositions</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Overall Total</td>
<td>Correctly Inflected</td>
<td>Incorrectly Inflected</td>
<td># of Nouns Requiring a Det.</td>
<td># of Nouns With an Aux.</td>
<td># of Verbs Requiring an Aux.</td>
<td># of Verbs With an Aux.</td>
<td># of Nouns Requiring a Prep.</td>
<td># of Nouns With a Prep.</td>
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<td>--</td>
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<td>Proceed.</td>
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<td>9</td>
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</tr>
<tr>
<td>Fairytales</td>
<td></td>
<td>20</td>
<td>16</td>
<td>4</td>
<td>11</td>
<td>7</td>
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<td>16</td>
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<td></td>
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</tr>
<tr>
<td>Memorab.</td>
<td></td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>18</td>
<td>8</td>
<td>n/a</td>
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<td></td>
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<tr>
<td>Exper.</td>
<td></td>
<td>41</td>
<td>36</td>
<td>5</td>
<td>50</td>
<td>30</td>
<td>10</td>
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</tbody>
</table>
Rather, the effects appear to be due to the presence of a visual component that results in simpler sentences, and the familiar context that results in more complex sentences. The visual component must somehow constrain the aphasic individual in terms of his ability to generate complex syntactic utterances; syntactic complexity is difficult to portray in a visual stimulus.

Morphology and Function Words:

The analysis of morphology and function words addresses Garrett's (1980, 1982, 1984) theoretical model. Function words and morphology are realized at the positional level of Garrett's theory of sentence production. To ascertain DM's ability to access morphology and function words, the following measures were made: the total number of verbs that could be inflected, the total number of verbs that could be inflected that were inflected correctly, the total number of verbs that could be inflected that were inflected incorrectly (discourse context, was taken into consideration), and the number of determiners, auxiliaries and prepositions in obligatory contexts, and the number of times DM produced them in obligatory contexts.

For the most part, DM produced correctly inflected verbs (see Table 4.8). In eleven out of thirteen of the tasks, DM produced only one or two errors per discourse. He made a relatively large number of verb inflection errors in two tasks: the "Cowboy" sequence picture (seven of twelve verbs that could be inflected were incorrectly inflected), and the "Goldilocks" fairytale (four of sixteen verbs that could be inflected were incorrectly inflected). DM tended to produce verb inflection errors whenever he employed the
present tense (excluding the progressive). Both the sequence picture task and fairytale
mentioned above were tasks in which DM relied heavily on the present tense. The
following excerpt from the "Cowboy" sequence picture demonstrates this finding:

(2) DM: sleeping uh horse sleeping...
       DM: ride uh little boy come along.
       DM: he sleeping.
       DM: sleep little boy cut arrow.

DM does not appear to experience the same difficulty when inflecting verbs in the past
tense. The following excerpt from the "Man & Dog" sequence picture demonstrates
this:

(3) DM: gave the dog a bone uh uh.
       DM: woman kissed uh uh ... kissed the man's hand.
       DM: and the dog went away with the bone.

The number of nouns requiring determiners and the number of nouns with
determiners were calculated. On average, DM produced determiners about 50% of the
time that they were required. Table 4.9 lists the proportion of determiners in obligatory
contexts according to discourse type. No one discourse type seems to stand out as
being a factor in DM's use of determiners. His use of determiners in obligatory contexts
is also shown in Table 4.10 for the number of extralinguistic support levels. Again, the
original hypotheses are not supported. The discourse tasks having three levels of
extralinguistic support are the contexts in which DM produces a higher proportion of
determiners in obligatory context. Thus, the hypotheses are not borne out with regard to use of determiners.

Table 4.9 - Proportion of Determiners in Obligatory Contexts According to Discourse Type

<table>
<thead>
<tr>
<th>Discourse Type</th>
<th>Proportion of Determiners in Obligatory Contexts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Picture Description</td>
<td>50%</td>
</tr>
<tr>
<td>Expository Speech</td>
<td>62%</td>
</tr>
<tr>
<td>Sequence Picture</td>
<td>48%</td>
</tr>
<tr>
<td>Procedural Discourse</td>
<td>61%</td>
</tr>
<tr>
<td>Fairytale</td>
<td>54%</td>
</tr>
<tr>
<td>Memorable Experience</td>
<td>52%</td>
</tr>
</tbody>
</table>

Table 4.10 - Proportion of Determiners in Obligatory Contexts According to Number of Levels of Extralinguistic Support

<table>
<thead>
<tr>
<th>Number of Levels of Extralinguistic Support</th>
<th>Proportion of Determiners in Obligatory Contexts</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>51%</td>
</tr>
<tr>
<td>3</td>
<td>61%</td>
</tr>
<tr>
<td>2</td>
<td>46%</td>
</tr>
</tbody>
</table>
DM produced prepositions and auxiliaries with varying amounts of success. Again, discourse type and extralinguistic variables do not assist in predicting performance here.

Verb/Argument Structure:

The verb/argument structure analysis consisted of: 1) counting the number of arguments realized in each of DM’s utterances that contained a verb; 2) counting the number of utterances in each discourse deemed incomplete due to argument omissions (see Table 4.7); 3) counting the number of retracings of arguments per discourse; and 4) counting any utterances having order violations. These values are represented in Table 4.11 as percentages of analyzable utterances (i.e. those containing a verb) that have one, two or three realized arguments, and as numerical values for retracings and order violations.

The verb/argument structure analysis that looked at number of realized arguments was not very useful when describing the “Cookie Theft” picture description, because only three of the eleven utterances contained a verb. The remainder of the tasks contained varying percentages of utterances with one, two or three realized arguments. No patterns can be explained by either discourse type, discourse task or extralinguistic variable. Even if the patterns could be explained, one could not make judgments about proportions of utterances containing one, two or three arguments because there are no normative samples yet available of productions by unimpaired speakers. The number of argument omissions does not appear to be restricted to any discourse type or extralinguistic variable (see Table 4.7).
Table 4.11 - Verb Argument Analysis Results

<table>
<thead>
<tr>
<th>Discourse Type</th>
<th>Task Name</th>
<th>Percent of utterances having the following number of realized arguments:</th>
<th>Number of Utterances Having Argument Retracings*</th>
<th>Number of Utterances Having Argument Order Violations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Baseline:</td>
<td>Cookie Theft</td>
<td>33</td>
<td>33</td>
<td>33</td>
</tr>
<tr>
<td>Picture</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>Illness</td>
<td>40</td>
<td>60</td>
<td>--</td>
</tr>
<tr>
<td>and</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expository</td>
<td>Family</td>
<td>17</td>
<td>83</td>
<td>--</td>
</tr>
<tr>
<td>Speech</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sequence</td>
<td>Flowers</td>
<td>--</td>
<td>80</td>
<td>20</td>
</tr>
<tr>
<td>Picture</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cowboy</td>
<td>64</td>
<td>36</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>Man &amp; Dog</td>
<td>25</td>
<td>50</td>
<td>25</td>
</tr>
<tr>
<td>Procedural</td>
<td>Camera</td>
<td>33</td>
<td>33</td>
<td>33</td>
</tr>
<tr>
<td>Discourse</td>
<td>Library</td>
<td>--</td>
<td>80</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Haircut</td>
<td>--</td>
<td>75</td>
<td>25</td>
</tr>
<tr>
<td>Fairytale</td>
<td>Goldilocks</td>
<td>31</td>
<td>69</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>Princess</td>
<td>33</td>
<td>56</td>
<td>11</td>
</tr>
<tr>
<td>Memorable</td>
<td>Moose</td>
<td>35</td>
<td>35</td>
<td>30</td>
</tr>
<tr>
<td>Experience</td>
<td>Police</td>
<td>29</td>
<td>68</td>
<td>5</td>
</tr>
</tbody>
</table>

*Retractions are instances when DM begins an utterance with an argument that is not in its syntactic position, and subsequently inserts it in the correct position.
Argument retracings (i.e., instances when DM begins an utterance with an argument that is not in its syntactic position, and subsequently inserts it in the correct position) only occur in visually presented stimuli. An explanation of this phenomenon will follow in the summary section. Argument retracings and order violations do not appear to be predictable when discourse type and extralinguistic variables are considered.

Cohesion Plan

I will now return to the following research question presented in Chapter One: Will the presentation of stimuli that emphasize the semantic relations of a discourse result in differential performance on the part of an aphasic adult. The research design allows only one comparison in answering this question -- the "Moose" and "Police" memorable experiences will be compared.

The cohesion plan, or graphic representation of the semantic relations of a discourse, was used as an additional means of facilitative support. It differs from the "Police" story only by the presence of the cohesion plan. Both memorable experiences have schematic structure, are supported by chronological sequences of events, and are highly familiar to DM. The two tasks will be compared in terms of productivity, lexicon, syntactic structure, and function words.

In terms of productivity measures, the "Police" story was longer than the "Moose" story in total number of words and total number of utterances. Both stories were comparable in terms of length of utterance and total number of words produced per minute. The ratio of nouns to verbs was the same for the two tasks, as well as verb, noun and pronoun type:token ratios. DM produced a greater proportion of complete
sentences during the "Moose" story (87% of his utterances were complete compared to 69% in the "Police" story), but a much smaller proportion of complex syntactic structures. For instance, 4% of the utterances in the "Moose" story contained embedded clauses, contrasting with 26% of the utterances in the "Police" story. The two stories could not be compared with regard to verb inflections and auxiliaries because these were provided in the cohesion plan itself. DM's use of determiners when they were obligatory was proportionally greater during the "Police" story (60%) than in the "Moose" story (44%). DM used prepositions in obligatory contexts in the "Moose" story a greater proportion of the time (100%) than he did during the telling of the "Police" (70%) story.

The verb/argument analysis reveals that during the "Moose" story, DM used a greater proportion of three-argument structures than he did in the "Police" story, and omitted arguments less often in the "Moose" story. For instance, DM omitted arguments in 13% of obligatory contexts in the "Moose" story and in 21% of obligatory contexts in the "Police" story.

Thus, it appears that in general there was no difference in DM's performance in the two tasks; but he did perform differently on some measures, such as the proportion of complete sentences, the use of prepositions in obligatory contexts, and the use of three-argument structures. The significance of this finding was not tested statistically.

Schematic Structure

I will now respond to the following research question: Did DM perform better in discourse tasks when schematic structure was employed than when schematic structure
was absent? The experimental design allows for two comparisons: 1) the "Cookie Theft" complex picture description vs. the "Man and Dog" sequence picture, and 2) the "Cookie Theft" picture vs. the "Cowboy" sequence picture.

Both of the sequence pictures differ from the "Cookie Theft" in terms of the extralinguistic variables, schematic structure and temporal structure. While it could be argued that one cannot test schematic structure alone when it is also influenced by temporal structure, and while in rating the tasks according to levels of extralinguistic support, I separated temporal structure from schematic structure, it can also be argued that temporal structure is an inherent part of the schematic structure and cannot be separated. The only means of controlling this would be to ask the subject to describe the "Cookie Theft" in a particular order, which would have altered the task considerably. Arguments aside, discourse produced in response to the "Cookie Theft" picture will nonetheless be compared to discourse based on the sequence pictures. Note that the "Cookie Theft" is also enhanced by a degree of familiarity on the part of DM; he has seen it a number of times before.

DM produced longer discourses (measured by total number of words) when describing the sequence pictures than when describing the complex picture. The total number of utterances produced was roughly the same for all tasks. The number of words per utterance is higher in the sequence pictures (3.7 and 3.8 words per utterance) than in the complex picture (3.0 words per utterance). There is no difference between the tasks in terms of number of words produced per minute. It is interesting to note that when the retelling opportunity variable is added to the context of the task, as was done...
during the "Flower" sequence picture, more remarkable differences in DM's productions during the "Cookie Theft" pictures and the sequence picture genre are revealed in terms of length of utterance and number of words produced per minute.

There is a remarkable difference between the complex picture and sequence pictures when noun:verb ratios are considered. For every seventeen noun tokens that DM uttered during the "Cookie Theft," he produced only three verb tokens. In contrast, during the sequence picture description of the "Cowboy" story, DM produced an equivalent number of verb and noun tokens (12:12). During the "Man and Dog" series of pictures, for every nineteen noun tokens that DM produced, he produced nine verb tokens. His production of nouns compared to verbs more closely approximates that of unimpaired speakers during the sequence picture descriptions.

Only 18% of DM's utterances in the "Cookie Theft" were complete sentences, while respectively, 75% and 50% of the utterances in the "Cowboy" and "Man and Dog" sequence pictures were complete sentences. None of the tasks contained complex syntactic structures in the form of nonfinite or embedded clauses. There were no differences in the tasks with regard to DM's production of determiners in obligatory contexts. DM had some difficulty inflecting for the present tense during his telling of the "Cowboy" sequence picture story, a difficulty that has already been discussed in an earlier portion of the results section. Aside from this, no differences were noted in terms of verb inflections and use of prepositions in obligatory contexts. All tasks resulted in a fairly comparable distribution of one, two or three-argument structures, except in the "Cowboy" pictures where DM produced no three argument structures. DM uttered greater
proportions of incomplete sentences in the sequence picture tasks due to argument omissions. However, in the "Cookie Theft" picture, 64% of the incomplete sentences were because DM used nouns or noun phrases alone. He tended to label items in the complex picture, rather than incorporate them into sentences within a story frame as he did in the sequence pictures. Thus, the sequence picture task appears to be a much more facilitative format for DM's productions of complete sentences, longer discourses (in total number of words), and longer utterances.

**Discourse Level**

As previously stated in Chapter Two, narrative discourse tasks were analyzed for the presence of schematic structure: setting, complicating action and resolution; procedural discourse tasks were analyzed for presence of essential steps and preservation of chronological sequence. No hypotheses were advanced with regard to DM's use of schematic structure in organizing his discourse. However, earlier research described in Chapter One predicts that aphasic adults will demonstrate preserved use of schematic structure (Ulatowska et al., 1981, 1983a, 1983b; Armus et al., 1989). Discourses analyzed for presence of narrative schematic structure were: the sequence pictures, fairytales and memorable experiences.

All narrative discourses showed preserved schematic structure except for the "Man & Dog" sequence picture and the "Police" memorable experience. DM did not describe a setting in the "Man & Dog" sequence picture, which should have included a sentence about the man and dog walking down the street. His failure to produce the setting may
have something to do with his misinterpretation of the first picture of the story; he interpreted a balcony as a light and did not interpret the sequence of actions as occurring on the outside of a building. This most likely led to some confusion on his part about the remaining events of the story. During his telling of the memorable experience story, the "Police" story, DM does not explain the setting in enough detail, which led to problems of interpretation on the part of the examiner. The "Flowers" sequence picture story is shown below, labelled with realized schematic structures (interjection, non-narrative words and retracings have been edited out):

(4) DM: man had roses. Setting
    DM: that the man bumped into him. Complication
    DM: roses all over the street.
    DM: man picked up the roses.
    DM: delivered them to his girlfriend. Resolution
    DM: she giving him a thank-you kiss.

DM experienced some difficulty with the chronological sequence of steps and essential steps in all of the procedural discourse tasks. During his listing of the steps to loading film into a camera, all essential steps were present except the one that explains in enough detail how to advance the film. One step was out of sequence. The step that tells the listener to close the camera was repeated twice; the second time it was repeated, it was out of order. The first time DM produced the step, he was not able to complete the utterance, so this may have been an attempt on his part to repair the sentence at a later time. In his description of the steps in getting a book out of the
library, the steps that 1) outline the procedure to get the actual book, and 2) say to look
the book up on the computer were reversed chronologically. All essential steps were
present in the "Library" procedure. Two essential steps in the "Haircut" procedure were
missing: 1) call the hairdresser for an appointment, and 2) pay the hairdresser. His
omission of the first essential target may have been due to his interpretation of the task
as simply describing what occurs once you are at the hairdresser's. The steps in this
procedure were all in chronological order.

**Interpretations and Clinical Implications**

**Discourse Type**

In summary, discourse type (e.g. fairytale vs. memorable experience vs. sequence
picture) is a factor in DM's production of: 1) longer vs. shorter discourses (measured in
total number of narrative words and number of utterances); 2) length of utterance
(measured in narrative words per utterance); 3) production of verbs in relation to
production of nouns; and 4) proportion of complete sentences.

This is not to say that all discourse types will result in differential performance
across all measures, but rather that certain discourse types are instrumental in affecting
DM's production along a specific parameter. Having this knowledge, a clinician could
focus on one aspect of DM's linguistic performance within the context of a discourse task
predicated to facilitate DM's performance on that particular linguistic feature. Or, if the
clinician were to assess the performance of a client, it would be important to assess it
within the context of a task predicted to facilitate performance rather than inhibit it. This knowledge is also important for the clinician in terms of monitoring change.

**Extralinguistic Variables**

In summary, the number of extralinguistic variables present in the discourse context was a factor in DM’s production of: 1) the total number of words produced per minute; and 2) his production of complete sentences.

It is difficult to say that merely because there is a large number of supportive contexts, a particular aphasic client would produce a greater number words per minute and a greater proportion of complete sentences. This is because we would also have to consider the type of discourse task used to facilitate language production. Thus, in order for multilevels of extralinguistic support to be effective in facilitating language production in aphasia, the appropriate discourse type would also have to be taken into consideration.

**Cohesion Plan**

In summary, when DM was presented with the semantic relations of a discourse explicitly represented in graphic format (i.e., in a cohesion plan), he produced a greater proportion of complete sentences (because he omitted fewer obligatory arguments), and a greater proportion of utterances having three arguments, than when his language production was unassisted by a similar cohesion plan. It is difficult to conclude that DM was not simply reading during this task; Sentences were presented in graphic form including sentences with three arguments. However, because function words such as
determiners and prepositions were not also displayed on the cohesion plan, and because DM produced these on his own accord, it is probable that he was not simply reading. It is possible that the task reduced the amount of processing required for DM to plan his overall discourse and individual sentences and consequently he omitted fewer obligatory arguments.

**Schematic Structure**

The presence of schematic structure (e.g. story schema and temporal sequence) in sequence picture tasks, enabled DM to produce: 1) longer discourses (in total number of words); 2) a larger number of verb tokens; and 3) a greater proportion of complete sentences, when his performance was compared to that in the complex picture description of the "Cookie Theft."

Looking at the results from the DM's description of sequence pictures, a clinician has a much better idea of DM's better linguistic ability. Some concern has been voiced from the research community (Bottenberg et al., 1985) about the use of visual stimuli to elicit language. Use of the "Cookie Theft" as a sole means of assessing discourse production and monitoring change is surely inadequate. As is obvious from this study, the use of a number contexts of language production, even a few, will give the clinician a more global picture of the client's performance.
Baseline vs. Experimental Tasks

It was brought to the reader's attention in Chapter One that many researchers on aphasia and discourse agree that there is a discrepancy between assessing aphasic clients in the context of standardized tests and the context of natural communicative interactions between two or more people. The baseline discourse tasks in this study represented those tasks normally administered in a standardized situation, and the experimental tasks represented more natural language contexts. All of the baseline tasks were predicted to be low in extralinguistic support (all having two levels of support). The prediction was that the information about DM's linguistic ability, learned through an assessment using only baseline discourse tasks (and standardized testing material in the BDAE, 1983), would not be as complete without the addition of more natural language elicitation contexts found in the experimental tasks. What was surprising was that while the "Cookie Theft" severely depressed DM's level of linguistic performance, information provided by the administration of the expository speech subtests of the BDAE (1983) ("Illness" and "Family" descriptions) was not contradicted by the additional information gleaned from the experimental tasks. This suggests that the expository speech subtests of the BDAE (1983) are quite good indicators of discourse language ability, at least in DM's case. For example, in terms of length of discourse (total number of words and number of utterances), DM produced 89 words and 19 utterances during the baseline "Family" description, compared to 76 words and 19 utterances during the telling of "Goldilocks." In his description of his "Family," 75% of DM's utterances were complete sentences compared, to 75% in the "Cowboy" sequence picture story and 75% in the
"Camera" procedural discourse. DM also produced a fair proportion of complex utterances in the "Illness" description (33% of total utterances) and in the "Family" description (19% of total utterances). In DM's case, the expository speech subtests allowed the experimenter to make judgements about his linguistic ability consistent with information obtained from subsequent language sample elicitation tasks. It has not been shown that this is true for all aphasic individuals. Therefore, it would be the responsibility of the practising clinician to make judgments about the necessity of further language probes after completing the expository language subtests of the BDAE (1983).

Comparisons to Earlier Research

As argued in Chapter One of this study, the results of research in discourse and aphasia, averaged across subjects who differ in terms of both aphasia severity and syndrome, may not be applicable to an individual aphasic subject. Because the same tasks and measures were not always used in this study, as in previous research studies, we cannot evaluate every finding. I will discuss a few, in any case.

Ulatowska et al. (1981, 1983a, 1983b) found that, on average, aphasic subjects used schematic structure in organizing their discourses, and correct temporal ordering of events. In this study, DM did show evidence of using schematic structure to organize his narratives. However, during procedural discourse tasks (e.g. steps to loading film into a camera) in some cases essential steps were omitted and others were out of chronological sequence. To what degree his omissions were due to his language impairment or inability to use temporal sequence or script schemata is not possible to determine from
this study. However, it is important to note that one cannot always assume that cognitive schemata are intact, in terms of governing production by aphasics.

Ulatowska et al. (1983a) found that aphasics' procedural discourses are characterized by simpler language generally. DM's sentence productions in procedural discourse cannot be described as simple. For instance, he produced a fair proportion of complex syntactic structures: 4 utterances out of a total of 17 utterances in all the procedural discourse tasks, a proportion (24%) that is comparable to proportions of complex utterances produced by unimpaired speakers during narratives. And, his length of utterance was higher in procedural discourse (7.0 words per utterance) than in any other discourse type. Thus, results in this study, regarding procedural discourse, are not consistent with results of earlier studies (Ulatowska et al., 1983a) when the single aphasic individual is considered.

Within the procedural discourse tasks, the retelling opportunity resulted in remarkable differences between DM's performance in the "Flowers" sequence picture and the other two sequence picture tasks on some measures. As previously reported, Ernest- Baron et al.'s (1987) results led me to predict that the retelling opportunity might assist aphasic subjects in recalling and producing essential information units. This result, although limited to a comparison between a few tasks, is supportive of this prediction.

Using Garrett's theory of language production enabled me to decide on a number of variables to measure that reflected DM's level of language impairment. However, the model did not help explain:

1) Why DM had more difficulty inflecting for the present tense than the past tense;
2) Why DM had more variable performance using determiners in obligatory contexts than in using prepositions or auxiliaries in obligatory contexts; or

Clearly the sentence production model does not account for dissociation of performance within the respective processing levels as demonstrated in 1) and 2). And 3) demonstrates why the sentence production model needs to incorporate theories of discourse production so that a more comprehensive theory of language production may be developed.

Conclusion

The results of this study, although confined to the performance of one aphasic individual, lend support to the general hypothesis that sentence production in different types of discourse is variable. This is not surprising. Speech-Language clinicians have always been aware that the performance of aphasics in word recall, auditory language comprehension, sentence production, etc., is variable. However, we need to be more aware, when we use certain tasks to stimulate language production, of how they are facilitative or not facilitative. This study has taken a small step toward that goal by
characterizing the discourse language production of a nonfluent aphasic individual and determining his optimal discourse performance. This is not to say that we only need to consider optimal language performance. But, by optimizing performance, we can gain insight into linguistic competence, and also come to a better understanding of aphasia.
REFERENCES


APPENDIX A

Sentence Judgement Task

Example Sentences:

The mailman delivered.
The clerk sold.

Test Sentences:

The policeman drove the car into the ditch.
Sam bumped.
The waitress gave Mrs. Jones.
On Sunday my family introduced me.
The truck hit the car.
I was given a dozen roses at Easter.
He received at the party.
After a long time she bought.
Jeremy put his books.
John introduced Bill to Mary.
Bertha swam at the beach.
He gave her a bottle of perfume for Christmas.
The movie star received fan mail.
They put the criminal in the jailcell.
Mr. Smith put his tools on the shelves in the garage.
Ran down the street.

Jumped.

Every so often, he put jam.

Santa Claus received.

The bird flew.
APPENDIX B

The Moose Story Cohesion Plan

<table>
<thead>
<tr>
<th>Who</th>
<th>Action</th>
<th>Who/What</th>
<th>Where/When</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
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<tr>
<td>-friends</td>
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<td></td>
</tr>
<tr>
<td>-we</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>-was</td>
<td></td>
<td></td>
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<tr>
<td>-It</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-I</td>
<td>-shot</td>
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<tr>
<td>gutting</td>
<td></td>
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</tr>
<tr>
<td>-I</td>
<td>-old bull</td>
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<td></td>
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<tr>
<td>-moose</td>
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<td></td>
<td></td>
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<tr>
<td>-it</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>-My friend</td>
<td>-went back</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>-I</td>
<td>-had</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>-came back</td>
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<td></td>
</tr>
<tr>
<td>-partner</td>
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<td></td>
<td></td>
</tr>
<tr>
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</tr>
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</table>
The Princess and the Pea

Once there was a prince who wanted to marry a real princess. He travelled everywhere and found many princesses. But, he could not tell if they were real. So, he returned to his palace very sad.

One evening, there was a violent storm. It rained and thundered and was very dark. All of a sudden, someone knocked on the door of the prince's palace. The old king answered the door. A very wet princess was standing outside. She said she was a real princess.

The old queen said to herself, "We shall see about that!" and went to the bedroom where the princess was to spend the night. She took the sheets and blankets off the bed and put a little pea under the mattress. Then, she piled twenty mattresses on top of the pea. There, the princess slept.

The next morning when the princess came out of her room, the queen asked, "How did you sleep last night?". The princess said, "Very badly indeed. There was something very hard in the bed and now I am black and blue all over."

It was clear that she was a real princess because she could feel the pea under all the mattresses. Only a real princess has such a delicate sense of feeling. The prince kissed the princess and married her soon after because he was sure he had found the real thing.