METAPHONOLOGICAL AWARENESS AND SPELLING ABILITY

by

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ABSTRACT

The purpose of the present study was to investigate the relationship between metaphonological awareness and spelling ability. Twenty-five children in Kindergarten and Grades One and Two were asked to participate in two tasks of metaphonological awareness, one involving phoneme segmentation (Yopp, 1988) and the other phoneme deletion (Rosner, 1975). Children were also asked to provide self-generated spelling samples. Spelling samples were then analyzed according to a spelling assessment scheme developed for this study and based on the developmental spelling stages outlined by Beers and Beers (1981) and Gentry (1982). The major finding from this study is that some aspects of metaphonological ability are reliably and moderately related to spelling development. Other findings regard the characteristics of children’s spelling errors observed in the course of developing the spelling assessment scheme.
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CHAPTER ONE

INTRODUCTION

The purpose of the present study is to investigate the relationship between metaphonological ability and spelling ability in language normal children. The question of the role of metaphonological awareness in spelling acquisition arises out of the larger area of research on the relationship between oral and written language abilities. Preliminary findings in this larger area have consistently shown that children with oral language delays are more likely to acquire literacy difficulties than their language normal peers (Johnston, 1988), (NOTE 3). Researchers have subsequently addressed the question of whether specific oral language abilities are related to literacy acquisition. One aspect of oral language ability that has received considerable attention in the recent literacy literature is that of metaphonological awareness.

A large body of literature indicates that metaphonological ability is a critical factor in the acquisition of reading ability (Lundberg, Frost & Peterson, 1988). Although fewer studies have examined the relationship between metaphonological ability and spelling acquisition, preliminary findings suggest that metaphonological awareness is reliably related to spelling ability (Magnusson & Naucler, 1989). A separate area of research has investigated the nature of spelling acquisition in its own right. Researchers in the "developmental spelling" camp
(e.g. Gentry, 1982; Beers & Beers, 1981) have emphasized the developmental and multidetermined nature of spelling acquisition. Developmental spelling theorists have proposed that children progress through five "stages" of spelling knowledge as they refine their understanding of English orthography. Metaphonological awareness is thought to be of crucial importance in children’s spelling knowledge at the earliest stages of this developmental continuum.

The current study acknowledges both the developmental aspect of spelling acquisition and the multifaceted nature of spelling ability proposed by developmental spelling researchers (e.g. Henderson, 1985). Measures of spelling ability were based on children’s spontaneously generated spelling samples, and spelling ability was assessed according to a scheme developed for this study and based on the description of developmental spelling stages by Beers and Beers (1981) and Gentry (1982).

The relationship between metaphonological awareness and spelling ability has come to be a topic of current interest out of the efforts of researchers representing a variety of theoretical perspectives. In order to more fully understand the proposed relationships between metaphonological awareness and spelling ability, it is necessary to first understand how research in oral language learning and literacy acquisition have become connected. The next chapter reviews major themes in these two literatures and attempts to show how they have influenced the questions asked by the current study.
CHAPTER TWO

HISTORICAL PERSPECTIVE

Literacy learning paradigms have no doubt existed since the inception of the printed word. Researchers have long sought to determine how literacy skills develop, and to identify the underlying factors which enable children to take their first steps on the path to literacy. Most literacy learning paradigms have evolved from theories of oral language development. A review of literacy learning theories, then, must consider the historical development of the view of the relationship between oral and written language acquisition. The first part of the following review focuses primarily on the large body of literature on oral language development with respect to reading ability. The second part examines the smaller body of literature on theories of spelling development and their relationship to oral language.

Current theories of literacy learning have been influenced by a number of differing theoretical positions in diverse fields which are concerned with human activity in general and language learning in particular. Literacy learning paradigms from the first half of this century owe their primary allegiance to either psychological or linguistic theories.
ORAL LANGUAGE THEORIES FROM BEHAVIORISM TO COGNITIVISM

Until the mid 1960's, the predominant view of language learning was in accordance with behaviorist principles of learning theory. Behavioral theorists denied the role and importance of complex mental structures in the process of language acquisition. Instead, all learning was said to occur as a result of an individual's simple associative responses to environmental stimuli. Responses that were positively or negatively reinforced were likely to recur. Responses that were punished or not reinforced were likely to be extinguished. Thus, language learning was thought to develop in response to the presence or absence of specific environmental stimuli.

In response to perceived inadequacies in the behaviorist perspective, the linguist Noam Chomsky proposed a generative view of language learning. He argued that infants possess a highly enriched mental structure which predisposes them to language acquisition. Semantic, syntactic and phonological abilities were said to "unfold" in response to language use, and need not be learned. The motivation for this position was found in the assertion that the rule systems and procedures involved in language learning are so complex and abstract that they could not be learned from the child’s primary linguistic data (Chomsky, 1965). Following Chomsky's generative grammar theory, other theorists proposed more cognitively based theories of language learning. Cognitive theories included those that either denied the presence of an innate language faculty while maintaining that language arises from the interaction of several general cognitive processes, or those that acknowledged the presence of an innate language faculty but proposed this faculty to be a general one (Prideaux, 1985).
While cognitive theorists maintained that children possess an innate cognitive potential for processing language, researchers in the early 1970's (e.g. Derwing, 1973, Slobin, 1971, in Prideaux, 1985) focused their attention on the manifest surface structures in children's language behaviors. Primary consideration was given to the kinds of strategies children employ as they develop their linguistic knowledge. This cognitivist position differs from Chomsky's along two dimensions. First, the emphasis is placed on children's cognitive potential for processing language rather than on the innate presence of a language faculty that unfolds in response to language use. Second, children's primary task is viewed as one of learning to communicate, rather than one of testing hypotheses and constructing theories.

THE RELATIONSHIP BETWEEN ORAL AND WRITTEN LANGUAGE COMPETENCIES

During the 1960's, psychologists and linguists became increasingly aware of each others' work in the study of child language development. The study of psycholinguistics grew out of the integration of theories from these two fields of research. One of the early concerns of this "new" discipline was the relationship between oral and written language functions. Research in this area was primarily concerned with reading ability as a measure of literacy knowledge. In the late 1960's, researchers began to investigate the perceived similarities between phonological processing abilities in both oral language and reading. From these investigations emerged a "parasitic" and a "psycholinguistic" position on language and literacy learning.

and writing abilities are secondary to - or "parasitic" on - oral language development. Literacy learning was said to be primarily a process of associating phonemes to graphemes. This grapho-phonological process assumed some kind of interface between the visual presentation of print and the phonological processes involved in the comprehension and production of speech. Since most proponents of the parasitic position tended to take a strongly "bottom-up" view of perception, and hence of the reading process, this translating interface was involved only after the print symbols had been mentally registered. Written language, unlike spoken language, was not assumed to develop naturally, but rather by a process of superimposing a new symbol code upon an already acquired oral language code (Wiig & Semel, 1980).

Inherent in the parasitic, bottom-up view of literacy learning is the belief that literacy knowledge must be acquired through the mastery of sequentially taught subskills. Although the parasitic position remains a driving theory behind some of today's instructional models for literacy learning, it has been recently challenged on the following grounds. The parasitic position fails to account for the observation that many preschool children acquire some literacy knowledge long before any formal reading instruction begins. Further, researchers have not yet been able to identify oral language abilities that ensure learners will profit from literacy instruction (Gillam, 1989).

Early "psycholinguistic" theorists claimed that oral and written language development were different manifestations of one language learning process (Gillam, 1989). They reflected that view of oral language acquisition (e.g., Bloom, 1968, Brown, 1973, Slobin, 1971, in Prideaux, 1985) which proposed that oral language was acquired through children's active construction of a system of rules applied to the language of their culture. It was assumed that
children possess a tacit understanding of a set of rules for language comprehension and production that allows them to test and revise their own hypotheses about how language "works". Language learning was said to be a complex, unitary process which is operationalized by global strategies. Similar strategies and operations are applied to both oral and written language learning. Beginning readers employ strategies such as sampling, predicting, confirming and correcting to interpret available semantic, syntactic and graphophonetic cues. Interpretation of these cues allows expectations to form regarding what is likely to follow in text, and expectations are narrowed as hypotheses are confirmed or rejected (Gillam, 1989). In contrast to the parasitic position, psycholinguistic theory denies that literacy knowledge can be acquired through the mastery of sequentially taught subskills. First of all, literacy knowledge is thought to be a function of a complex, unitary process which cannot be analyzed into discrete areas of subskill knowledge. While psycholinguists do not deny the importance of grapho-phonetic associations in literacy learning, they do not believe the ability to associate phonemes to graphemes is the primary entry system into the reading process. Secondly, both oral and written language knowledge are said to be acquired through a developmental process of rule learning, which occurs without the aid of formal instruction.

CURRENT THEORIES OF LITERACY DEVELOPMENT

Two theoretical positions are currently in favor in the literature on literacy development. These are the interactionist and the transactionist positions. Both draw heavily from the psycholinguistic perspective, but the interactionists continue to emphasize cognitive subskills, much like the early psycholinguists, while the transactionists are more influenced by
social semiotic learning theory. The following discussion is based largely on Gillam’s (1989) review of current literacy learning paradigms. It is interesting to note in passing that the literature on literacy acquisition has found it increasingly necessary to discuss oral language acquisition, and that the distinction between these two areas of research is becoming somewhat blurred.

**Interactionism**

Like other psycholinguistic theories, interactionism differs from parasitism in its recognition of the importance of semantic, syntactic and textual cues in addition to graphophonological knowledge in the reading process. However, interactionists maintain the parasitic assumptions that reading knowledge is a process which can be analyzed into discrete components, that reading ability is gained through sequential mastery of component subskills, and that phonetic analysis abilities are prerequisite to reading ability.

Interactionist theory recognizes both the potential effect of higher level cognitive processes on lower level peripheral processes and the cognitive processing demands involved in reading comprehension and word-recognition.

Interactionists claim that the cognitive operations required by the oral language modality differ from those involved in the written language modality. However, primary emphasis is placed on the view of oral and written language systems as parallel systems which share a "communicative potential" component. This component functions in a stable and recognizable manner for both modalities. A learner’s communicative potential comprises cognitive, social and
linguistic areas of knowledge. Learners access their communicative potential by strategies, procedures and competencies anchored in these knowledge areas. An individual's potential for communication varies according to the demands presented by listening, speaking, reading or writing. Thus, the interactionist position claims that oral and written language knowledge are similar in their shared use of a communicative potential.

Transactionism

The transactionist position is primarily an evolution of early psycholinguistic theory. Transactionism refers to the dynamic and mutually interdependent nature of the processes involved in listening, speaking, reading and writing. Like interactionists, transactional theorists (Bissex, 1984; Harste, Woodward & Burke, 1984, Newman, 1984, 1985, in Gillam, 1989) emphasize both the interdependent nature of oral and written language knowledge, and the variation of language processes across contexts of use. However, where interactionists emphasize the importance of "part to whole" learning by grapho-phonic relations, and argue that literacy learning is acquired through sequential mastery of subskills, transactionists emphasize the importance of "whole to part" learning. Transactionism has adopted and integrated the philosophy of a more general theory of sign systems known as semiotics.

Semiotic theory, as it pertains to language learning processes, proposes that objects, signs and their interpretations exist as mutually interdependent branches of a triad. Specifically, objects reveal themselves through signs which are then understood through interpretants, and each member of a triad may be interpreted only in its relation to other members of the triad (e.g. Halliday, 1975). Thus, signs exist as parts of wholes. The continuous nature of the elements
involved in sign interpretation may be applied to that of cognition. Just as one thought is preceded by another and determines the next, so the interpretation of one sign cannot be separated from the interpretation of all co-existing signs (Gillam, 1989). Further, cognition is said to co-occur in a mutually interdependent manner with sign interpretation, rather than as a process applied to sign interpretation.

Like interactionists, transactionists recognize a shared communicative potential for all areas of language use. Unlike interactionists, primary importance is placed on the semiotic notion of "wholeness" in communicative potential. Emphasis is placed on the interdependent relationship between all areas of oral and written language knowledge.

Summary

Interactionist theory proposes that language learning and use are primarily cognitive functions. Cognitive interpretations are distinct from, and applied to, communicative acts. Transactionists, on the other hand, claim that cognition and language are necessarily interdependent and thus that cognition cannot be viewed as a distinct set of processes which are applied to the task of language interpretation.

Where interactionists argue that different modes of communication - listening, speaking, reading and writing - produce distinct meaning systems, transactionists claim that different modes of communication create unified meaning structures which can be expressed in multiple ways.

Interactionists regard any language act as separable from its context of occurrence. An interaction is assumed to occur between the language user and the communicative context.
Transactionists regard language learning and use as transactions with the social world, and therefore inseparable from their context of occurrence.

These two different theoretical positions on language and literacy learning necessarily lead to different instructional models. Briefly, interactionism supports task analysis, subskill teaching and the sequential mastery of subskills in literacy learning. Transactionism emphasizes the developmental nature of language and literacy learning and supports functionality, text ownership and social interaction as important aspects of literacy learning. Both positions present alternative views to the parasitic position.

THEORIES OF SPELLING DEVELOPMENT

It is clear from the review thus far, that most of the debate on the relationship between oral and written language abilities has focused on reading ability. A smaller body of literature concerns the relationship between oral language abilities and spelling ability. A review of this literature reveals that similar historical themes run through both areas of research.

The earliest views of spelling acquisition were based on the assumption that memorization was the key to spelling knowledge. Memory based spelling theory extends as far back as 1783, under Webster’s influence, and was the predominant view of spelling acquisition until the mid-1950’s. One of the earliest views of spelling ability was the Rote Memory Position. In the early part of this century, researchers (Dolch, 1943, E.Horn, 1919, Mann, 1940, Webster, 1831, in Nelson, 1989) believed that learning to spell was a matter of memorizing word-specific information, and that letter sequences were arbitrarily, rather than logically determined. Thus, written English was said to be "unprincipled".
Memorization was taught by vocal repetition of letter-names in a word, and hand-to-eye coordination of letter writing (Hanna & Hanna, 1959, in Nelson, 1989). Towards the latter half of the period dominated by memory-based spelling theory (1840-1950), emphasis was increasingly placed on the visual memorization of words as wholes. The belief that spelling was learned one word at a time precluded any claims that word-specific information was generalized to knowledge about words similarly spelled or related in meaning (Hillerich, 1976, E.Horn, 1957, in Nelson, 1989). Spelling word lists therefore included frequently occurring words at grade level rather than words which were similarly spelled or related in meaning. Individual differences in spelling ability were thought to be determined by children's capacity for memorization, and small hope was offered those children whose capacity was "fixed" at an insufficient level. The drilling of word lists was a frequently used instructional device. The teaching of writing at this time emphasized writing mechanics such as preferred hand, the correction of letter-reversals, directionality and script styles (Ames & Ilg, 1951, in Wanner, 1983). Thus, learners were passive recipients of instruction.

This view of spelling and writing acquisition was in accordance with the behaviorist principles of learning of the time. Written English was thought to be "talk written down" rather than a linguistic system in its own right. Learning to spell occurred as a consequence of a learner's simple associative responses to visually presented stimuli.

As discussed earlier, during the mid-1960's, a paradigm shift occurred in theoretical perspectives on language acquisition. The behaviorist principles of learning, which had predominantly influenced theory and practice until this time, were replaced by cognitivist and psycholinguistic views. While most research in literacy development at this time focused on
reading ability, this theoretical shift also influenced the smaller area of research in the acquisition of spelling ability.

Memory based spelling theory encountered its first major opposition in the 1950’s. In response to the claim that written English is unprincipled, linguistic researchers of the time (e.g. Hanna & Moore, 1953, in Nelson, 1989) began to investigate the surface regularities of English spelling. These linguistic studies "permanently altered theory and practice in spelling instruction" (Nelson, 1989). Based on Bloomfield’s linguistic model of reading theory, Hanna and his colleagues (Hanna, Hodges & Hanna, 1971, Hodges, 1977, E.Horn, 1960, T.Horn, 1969, in Nelson, 1989) developed a Generalization theory of spelling development. As the name suggests, spelling knowledge was believed to come through the generalization of commonly occurring orthographic patterns in written English. Spelling was no longer viewed as a letter-by-letter or word-by-word memorization process, but rather as a process of "internalizing" the sound values of patterned sequences for graphemic representation. Spelling instruction now included the examination of word lists for pattern regularities, and the speller was thought to be able to generalize spellings for novel words by accessing information about already learned patterned sequences. The generalization position recognized the alphabetic principle in written English and the active role of the child in learning to spell. The influence of linguistic research also effected a change in writing instruction. In the early 1960’s, Hildreth (1963, in Wanner, 1983) proposed that researchers should consider writing as a linguistically based skill which serves a primarily communicative function. Writing instruction now de-emphasized the mechanics of writing in favor of early "creative" writing experiences which served the purpose of furthering a child’s communication skills. Hildreth and other researchers (C. Chomsky, 1971, Durkin, 1966, in
Wanner, 1983) suggested that children should be taught to read by writing first. Chomsky insisted that early writing experiences provided a concrete basis for the more abstract task of learning to read.

The Generalization position encompassed both the ideas of orthographic pattern sequencing and the importance of the communicative task in written language acquisition. Since the Generalization position, researchers have divided into two camps with respect to their treatment of the influence of oral language ability on reading and writing acquisition.

**Grapho-Phonological Processing**

Some researchers (e.g. Ehri, 1980) have elaborated on the cognitive processing requirements involved in written language acquisition. This area of research has focused almost exclusively on the grapho-phonological nature of learning to read and spell, in the absence of the contributing factors of context and meaning. Chomsky and Halle (1968) described a learner's mental lexicon as comprised of abstract word units with information in the mental lexicon arising from knowledge of phonological, syntactic, semantic and orthographic aspects of words. Their detailed analysis schemes, however, pertained only to the phonological aspect. Researchers in the area of spelling have made use of Chomsky and Halle's rich description in studying literacy learning. Ehri (1980) stated that beginning readers and writers must assimilate the word's printed form to its phonological structure. This task is said to be accomplished by associating at least some graphemes to phonemic segments detected in a word. Ehri suggested that phonemic segments function as "slots" in lexical memory which are "filled by images of letters seen in the word's spelling" (Ehri, 1980). Ehri describes the process of establishing a word's orthographic
representation in lexical memory as "amalgamation". Whereas phonological, syntactic and semantic information are acquired through the process of learning spoken language, amalgamation is necessarily a consequence of a child’s experience with print. Thus, literacy knowledge is gained through a grapho-phonological interface which mentally encodes print symbols for higher level grapheme to phoneme associations. Recalling the earlier discussion of theoretical positions, this view of written language acquisition would seem to be primarily parasitic. However, it is similar to the interactionist position in that both oral language competencies and experience with print contribute to a child’s understanding of orthography.

**Developmental Spelling**

A second group of literacy researchers (e.g. Gentry & Henderson, 1978; Zutell, 1979) have adopted the semiotic notion of "wholeness" inherent in the transactionist position. These researchers argue that the acquisition of spelling knowledge is a developmental process influenced by many variables, including oral language competency, early literacy experience and cognitive abilities. Further, spelling itself is thought to be a multifaceted area of knowledge, and emphasis is placed on the dynamic and interdependent nature of all language modalities.

Researchers in the developmental spelling camp have emphasized both the primacy of the communicative task and the role of meaning and context in learning to read and spell. Spelling development is said to progress "naturally" without the aid of formal spelling instruction, and consideration is given to children’s individual differences in ability along this developmental continuum. Thus, formal spelling instruction is de-emphasized in favor of purposeful writing
practise, and teachers are encouraged to modify spelling instruction according to a child's individual level of abilities and "readiness" for instruction.

Despite these general commitments, developmental spelling theorists propose that metaphonological ability plays a critical role in spelling development. Children's early misspellings are said to accurately reflect their understanding of the phonology of their language (e.g. Read, 1971). The spelling "strategies" children employ reflect their developing understanding of phonology, and serve to internalize their growing understanding of the regularities of English orthography.

THE CURRENT STUDY IN ITS HISTORICAL PERSPECTIVE

The idea that metaphonological ability might influence spelling ability can be seen to arise from the psycholinguistic perspective introduced in the 1960's, when psycholinguistic theorists first proposed that a relationship exists between oral and written language knowledge.

Current psycholinguistic theories of spelling acquisition have adopted either an interactionist position, which focuses on the differing cognitive processes involved in oral and written language acquisition (e.g. Ehri, 1980), or a transactionist position, which emphasizes the dynamically interdependent and developmental nature of both oral and written language knowledge.

In relation to the current study, the relevant points of departure between these two perspectives arise from their differential treatment of the relationship between oral and written language knowledge and, hence, the relationship between metaphonological awareness and
literacy knowledge, and in the instructional models supported by either a "part to whole" (interactionist) or "whole to part" (transactionist) philosophy of literacy learning.

The interactionist view of literacy acquisition has integrated the parasitic assumptions that different language modalities use differing cognitive operations, thus, language learning can be analyzed into discrete components, and that literacy learning occurs by superimposing a new symbol code (graphemes) upon an already acquired written language code (phonemes). Interactionism differs from parasitism in its recognition of the importance of semantic, syntactic and textual knowledge, in addition to grapho-phonological knowledge, in the processes of reading and writing acquisition.

Interactionist theory also recognizes the role of metaphonological ability in literacy acquisition. This area of psycholinguistic research has provided a substantial body of literature that indicates metaphonological ability is a critical skill in reading acquisition (e.g. Ehri, 1979, Liberman, 1982, Stanovich, 1986, in Lundberg, Frost & Peterson, 1988). However, the role of metaphonological awareness is induced at the level of the grapho-phonological interface that is said to exist between the oral and written language domains.

This view of literacy development supports a "part to whole" instructional model of literacy learning such as the phonics-based approach, which emphasizes code analysis and the sequential mastery of subskills.

Developmental spelling theorists, who have adopted a more transactional view of language learning, believe that language is best understood in its communicative context. All language modalities, including listening, speaking, reading and writing, are thought to be dynamically interdependent. Thus, different language modalities cannot be discretely analyzed. Both oral and
written language acquisition are said to be developmental processes which occur independent of direct instruction.

Researchers who emphasized the importance of meaning and context in literacy acquisition were the forerunners of today's "whole language", or meaning based, approach to learning and teaching literacy skills. Unlike interactionists, developmental spelling theorists support a whole language (meaning based) approach to literacy learning rather than a phonics-based (code emphasis) approach.

Like the interactionists, developmental spelling theorists have emphasized the importance of metaphonological awareness. However, rather than theorize about the various mental processes involved, developmental spelling theorists have contributed to our understanding of the role of metaphonological ability in spelling development by describing consistent and observable patterns in children’s early misspellings that reflect their understanding of the phonological structure of their language. Metaphonological abilities are thought to play a critical role in children’s early literacy acquisition.

With this background, we can see that the current research question is a product of various historical research currents. These include the attention to the general relationship between oral and written language ability, the specific relationship between metaphonological ability and literacy development, and the practical implications of theory to instructional models.

First, it is clear that in asking the question about the relationship between metaphonological awareness and spelling ability this study is addressing one concern within the larger area of research on the relationship between oral and written language abilities. This larger
issue has been debated in the literature since the 1960's, when the field of psycholinguistics first entered the research domain.

Second, by focusing on metaphonological ability this study addresses a topic of high current interest to researchers in literacy development. Note, for example, the "grapho-phonological" link proposed by researchers such as Ehri (1980). Also note the claims by developmental spelling theorists that metaphonological ability is critical to the acquisition of early spelling abilities, and is evidenced by children's early "invented" spelling strategies.

Third, the current study looks at children's spontaneous spellings rather than their ability to spell words to dictation. This procedure reflects the belief of writers such as Gentry and Henderson (1978) and Read (1971,1973,1975) that children's everyday, invented spellings evidence their developing phonological and orthographic knowledge.

Having reviewed the general literature on the relationship between oral and written language knowledge, we turn now to two more specific bodies of literature that discuss the relationship between metaphonological ability and literacy development, and the natural development of spelling knowledge.
CHAPTER THREE

METAPHONOLOGICAL AWARENESS

The question of the role of metaphonological awareness in literacy development arises out of the larger area of research in the relationship between oral and written language competencies.

The current interest in this relationship has been motivated by preliminary research findings that consistently report that children who demonstrate a delay in acquiring oral language will likely have difficulty acquiring written language as well (Johnston, 1988). This generalization is based on group data of individual children who follow this trend to greater or lesser degrees. Researchers have subsequently addressed the question of whether specific aspects of oral language ability are related to literacy acquisition, and as a corollary, whether preschool children who are at risk for reading and writing difficulties can be identified on the basis of their specific oral language abilities.

Identifying oral language competencies that relate to literacy acquisition is a complex task. This task is particularly difficult with respect to language and literacy disordered populations, in that not all language disordered children become poor readers and spellers, and some literacy disordered children demonstrate normal oral language abilities. The likely reason for this imperfect correlation is that both oral and written language knowledge are
multidetermined abilities. As researchers have explored various possible strands of relationship, one aspect of oral language knowledge that has appeared to be related to literacy acquisition is that of metalinguistic awareness.

METALINGUISTIC AWARENESS

Metalinguistic awareness refers to the ability to make explicit one's tacit understanding of language as an "object". The metalinguistic knowledge children gain through listening and talking is evidenced by their ability to reflect consciously on the nature and properties of their language. For example, self-correction, word play and explicit judgements of grammaticality are all behaviors which reveal metalinguistic awareness. Children's ability to reflect consciously upon language is believed by some researchers to be crucial to the discovery that properties of spoken language correspond to the written form (Kamhi & Koenig, 1985).

Considerable evidence exists to indicate that metalinguistic awareness plays an important role in literacy acquisition (Lundberg, Frost & Peterson, 1988). Metalinguistic abilities in the semantic, syntactic and phonological domains appear to be strongly correlated to reading ability (Gillam, 1989). Further, studies have indicated that reading disordered children are less able to demonstrate metalinguistic abilities than their literacy normal peers (Wagner, 1986).

Recent interest in the metalinguistic abilities of language normal and language or literacy disordered children has been motivated by both theoretical and practical concerns. Of theoretical importance is the specification of the role of metalinguistic abilities in literacy learning. Of practical importance is the role metalinguistic knowledge plays in language assessment procedures, and the possible role of metalinguistic objectives for intervention with
literacy disordered children. Further, understanding how metalinguistic knowledge influences reading and writing development has implications for instructional models for both language normal and language disordered children. With these considerations in mind, researchers have begun to examine the relationship between literacy acquisition and metalinguistic abilities in various domains. The following review will focus on the portion of this literature that deals with phonology.

METAPHONOLOGICAL AWARENESS

Metaphonological awareness refers to the ability to access and make explicit one’s tacit understanding of the speech sound structure of language. Behaviors which reveal phonological awareness imply the conscious manipulation of phonemes. For example, phonological awareness is called into play in spontaneous occurrences of word play, self-correction, alliteration and rhyming that specifically involve phoneme manipulation (e.g. "I mood...I moved it", "Deanut dutter dandwich, I want a reanut rutter randwich, rease", van Kleeck & Schuele, 1987, p.25). Experimental tasks which measure phonological awareness typically require the conscious manipulation of phonemes. These include phoneme analysis tasks such as segmentation ("Say just a little bit of DOG") and deletion ("Say BOAT, but don’t say T"), and phoneme synthesis or "blending" tasks.

Like other language abilities, phonological awareness evidences a protracted period of development between emergence and mastery. Spontaneous occurrences of language use which reflect metaphonological ability have been observed in children as young as two and three years (Fox & Routh, 1975; Van Kleeck & Schuele, 1987). Such occurrences include
phonological corrections ("I mood...I moved it"), play with language ("Tri-ya-ya-ya-yangle"),
play with word pronunciation ("Kankakes, kanpakes, pancakes"), and adding endings ("Can I
lick the spoonie?") (van Kleeck & Schuele, 1987, p.25). The ability to rhyme, or comment on
the fact that words rhyme ("Annie, Mannie, that's the same kind"), and the ability to
comment on a new sound or on pronunciation ("Ukelele, that's hard to say") is a
metaphonological ability that emerges somewhat later (van Kleeck & Schuele, 1987, p.26).
Metaphonological ability is thought to be fully acquired around age eight, when most children
are in Grade Two (Hakes, 1980, in van Kleeck & Schuele, 1987). This mastery of
phonological awareness is evidenced by the ability to analyze words into their constituent
phonemes (the word CAT is analyzable into three constituent sounds: /k/, /æ/, /t/) and
synthesize phonemes in words (/k/, /æ/, /t/ are the sounds which comprise the word CAT).
Judging from this picture of metaphonological learning, by the time children enter
kindergarten at age five, most are able to demonstrate an initial awareness that language is
comprised of words, and that words share sound segments.

Metaphonological ability is comprised of different aspects of linguistic knowledge.
Researchers have found that certain metaphonological abilities emerge earlier than others (van
Kleeck & Schuele, 1987). For example, the ability to segment words into syllables precedes
the ability to segment words into phonemes. Further, segmentation of initial phonemes is
easier than segmentation of final phonemes, and both these tasks are easier than segmenting a
word into its constituent phonemes.
METAPHONOLOGICAL AWARENESS AND READING ABILITY

The proposed relationship between metaphonological awareness and reading ability is based on the fact that the English writing system makes use of an alphabetic orthography which represents, at least approximately, the phonology of the language (Liberman & Shankweiler, 1985). Beginning readers must presumably comprehend that a relationship exists between units of spoken language (phonemes) and units of written language (graphemes). Thus viewed, the task of learning to read requires the explicit awareness that words can be analyzed into discrete phonemic units (Kamhi, Lee & Nelson, 1985).

A substantial body of literature supports the claim that phonological awareness is of critical importance in the acquisition of reading ability (e.g. Ehri, 1979; Liberman & Shankweiler, 1985). Research in this area has taken two directions. Some researchers have addressed the correlation between reading ability and metaphonological ability in reading normal and reading disordered school age children. Others have examined the relationship between metaphonological ability in language normal preschool children and subsequent reading and spelling abilities in grade school. This literature reports both longitudinal correlational studies and training studies. The findings from these two areas of research are reviewed below.

Metaphonological Ability and Reading Disorders

A large body of comparative research suggests that phonological awareness is an important factor in the successful acquisition of written language knowledge. These studies
have indicated that reading disordered children perform more poorly than average or good readers on a variety of measures of phonological awareness.

Fox and Routh (1980) reported that "severely reading depressed" children in grade one were less able to segment phonemes than either "mildly reading depressed" or reading normal first grade children.

Katz (1986, in Catts, 1989) determined that reading disordered children in grade three were less aware of word length than average readers, when asked to determine if the names of pictured objects had the same number of syllables.

Bradley and Bryant (1978) compared the performance of reading disabled children to those of a control group of average readers matched on I.Q. and reading level, on a task involving the detection of rhyme and alliteration. Reading disabled children were found to perform significantly more poorly than the control group, in spite of being older and having more reading experience.

Finally, in a study which examined the differences between average and disordered readers in grades two and three on various measures of phonological awareness, sequential memory and auditory discrimination, Shapiro, Nix and Foster (1989) found that phonological awareness abilities most reliably discriminated between the two groups (see also Magnusson & Naucler, 1989).

Taken together, the findings that reading disordered children perform poorly on metaphonological tasks in comparison to reading normal children, support the claim that phonological awareness is related to reading ability. However, because the design of these studies is correlational, the findings are open to alternative interpretations. It is equally likely that reading ability contributed to metaphonological knowledge as it is that metaphonological
ability influenced reading ability. Longitudinal and training studies of the relationship between early metaphonological awareness literacy skills in grade school have to some extent helped clarify this issue.

**Longitudinal Studies: Early Metaphonological Ability and Literacy**

The relationship between early metaphonological awareness and later literacy knowledge has been addressed by a number of longitudinal studies. Most studies have reported significant correlations between measures of phonological awareness in language normal preschool or kindergarten children, and later measures of reading and spelling ability.

Two of these studies (Mann and Liberman, 1984, Mann, 1984, in Wagner, 1986) examined the relationship between non-reading kindergarten children’s metaphonological performance on tasks involving counting syllables, reversing the order of syllables, and reversing the order of phonemes, and measures of their first grade reading ability. Both studies obtained reliable correlations between two of the three metaphonological tasks - counting syllables and reversing the order of phonemes - and grade one reading ability. Partial correlations were reported as .40 for counting syllables and .75 for phoneme reversals. Bradley and Bryant (1985, in Wagner, 1986) looked at the longitudinal relationship between preschool children’s performance on their sound categorization task (a measure of phonological awareness) and measures of reading, spelling and mathematics abilities three years later. Reliable correlations were obtained between measures of sound categorization and all three dependent measures. With I.Q., age, and simple memory span for words held constant, sound categorization accounted for 4 to 10 percent of the reading variance, 6 to 8 percent of the spelling variance and 1 to 4 percent of the variance in mathematical
performance. Although the authors reported a reliable correlation between early phonological awareness and later reading and spelling ability, the magnitude of this relationship was in fact small. These same researchers also suggest that the strength of these correlations may vary with age (Bryant, Maclean & Bradley, 1990).

Other longitudinal studies seem to report a stronger relationship between early metaphonological ability and later literacy skills. Lundberg, Oloffson and Wall (1980, in Wagner, 1986) examined the correlations between a variety of measures of phonological awareness given to kindergarten children and their performance on reading and spelling ability 12 to 18 months later. A reliable and moderately strong correlation (.45) was obtained between the measures of metaphonological awareness and reading ability one year later. A similar correlation was obtained for metaphonological ability and spelling ability. However, critics have noted that some children had acquired reading skills before the study began. With initial reading ability held constant, no reliable correlations are obtained (Wagner, 1986).

In a study comparing the performance of non-reading kindergarten children on ten tasks of phonological awareness to their reading ability in first grade, Stanovich, Cunningham and Cramer (1984, in Wagner, 1986) obtained reliable correlations between seven of the ten measures of phonological awareness and later reading ability. The median correlation was reported as .41.

Magnusson and Naucler (1989) examined the relationship between various metalinguistic abilities and reading and spelling ability in both language disordered and language normal children from preschool to first grade. Measures of metalinguistic ability included three tests of phonological awareness (identification of rhyming words, segmentation of syllables and phonemes in words, and identification of similar phonemes in words), and
one test of morpho-syntactic awareness (the ability to identify and revise morpho-syntactically anomalous sentences). Test performance was recorded during the preschool year, when children were, on average, six years old, and also at the beginning and end of first grade. The major findings from this study are twofold. First, the rank order of metalinguistic tests according to level difficulty was the same for both groups, with identification of rhyming words as the easiest, and phoneme segmentation as the most difficult. This finding suggests that some metaphonological abilities emerge and are acquired earlier than others. Second, different aspects of metaphonological ability were found to be more strongly related to either reading or spelling ability than were others. For both the language disordered and language normal groups of children, the highest correlation between reading ability and the different measures of metalinguistic awareness was obtained between reading ability and rhyme identification. In contrast, the highest correlation between spelling ability and the various measures of metalinguistic awareness was obtained between spelling ability and phoneme segmentation ability. The strength of the relationship between reading ability and rhyme identification was moderate, while the relationship between spelling ability and phoneme segmentation was moderately strong. This finding suggests that certain aspects of metaphonological awareness play an important role in the acquisition of reading ability, while spelling knowledge may rely on other aspects of metaphonological ability. Further findings indicated that both reading and spelling ability in language normal children had their highest correlation with phoneme segmentation ability at the preschool level. In contrast, reading and spelling ability were most highly correlated with phoneme segmentation for the language disordered group of children at the end of first grade.
Magnusson and Naucler (1989) concluded that a relationship exists between linguistic awareness and literacy knowledge, in particular between metaphonological awareness and spelling ability. Further, the authors suggest that, although language disordered children tended to demonstrate metalinguistic deficits in comparison to their language normal peers, that language disordered children who are linguistically aware before they start school may become good readers and spellers in spite of their linguistic and metalinguistic handicaps.

In summary, findings from longitudinal studies have indicated that some aspects of early metaphonological ability are reliably but modestly related to later reading ability. Findings from Magnusson and Naucler (1989) indicated that certain aspects of metaphonological ability predict reading and spelling ability to different degrees. Some researchers have described metaphonological awareness as necessary but not sufficient for literacy acquisition (Lundberg, Frost & Peterson, 1988).

Training Studies

In an attempt to further clarify the relationship between metaphonological ability and both reading and spelling acquisition, researchers have used training study paradigms. This research has addressed two questions. First, can metaphonological abilities be "trained" in non-reading preschool and kindergarten populations? Second, does metaphonological training have an effect on the acquisition of reading and spelling abilities? Some recent studies have attempted to measure the specific effect of training phonological awareness on reading and writing abilities. Bradley and Bryant (1983) conducted a longitudinal and experimentally designed training study of 400 children, who were followed over a 4 year period. Children in
the experimental group began a two year training period in metaphonological abilities at age 6. One experimental subgroup of children received phonological awareness training in a particular sound categorization task (identifying the odd member in a word group such as "bun, hat, gun, sun"). Findings from this study indicated that performance on this task was a strong predictor of later reading achievement, and that training had a positive effect on measures of later reading ability.

Bradley and Bryant (1985, in Wagner, 1986) conducted a second study, in which they implemented a training program in sound categorization in a group of children who ranged in age from 5 to 7 years. The children were chosen on the basis of their poor performance on the sound categorization task used in the 1983 study. Children were assigned to one of four groups, each group matched as closely as possible on measures of sound categorization ability, age, sex and I.Q. Metaphonological training took place over a two-year period. Group one received phonological awareness training in activities designed to focus the children’s attention on the categorization of sounds in words. Group two received the same sound categorization training plus concrete demonstrations of shared sound characteristics as depicted by plastic letters. The third group were control subjects who received training in categorizing words according to conceptual categories. The fourth group were control subjects who received no training at all. At the end of the training period, measures were taken of reading, spelling and mathematic abilities. Groups did not differ on mathematical ability, and both the experimental groups and the conceptual categorization control group performed significantly better on reading and spelling than did the fourth control group, who received no training. The findings of interest concern the comparative performances of the first three groups. Reliable differences were found between the concrete sound categorization group (2)
and the control group (3) on measures of later reading and spelling ability. There were no reliable differences on these measures between the sound categorization group (1) and the control group (3). The finding that the group trained in concrete sound categorization performed significantly better than other groups in reading and spelling ability suggests that the results may be due to spelling practise, rather than to phonological awareness (Wagner, 1986). Training in concrete sound categorization involved pairing plastic alphabet letters to speech sounds. Thus, an increased awareness of letter-sound correspondences rather than phonological awareness may account for this result.

Treiman and Baron (1983) conducted a study to determine if training in phoneme analysis helps children benefit from spelling-to-sound rules in learning to read. Prereading preschool and kindergarten children participated in two experiments over four test days. The first phase of Experiment 1 involved both an experimental condition - the "analysis condition" - and a "control condition". In the analysis condition, children were trained in phonemic segmentation of four single syllable spoken words. For example, HEM was segmented into H plus EM, and LIG was segmented into L plus IG. In the control condition, children simply repeated four different single syllable words, for example DIZ and VOK. The second phase of the experiment involved a reading task, which was the same for both conditions and served as the dependent measure. Subjects were trained to read four items that corresponded to the spoken syllables with which they had worked in phase one. Following the example from the analysis condition, four such items were H, EM, HEM and LIG. Similarly, an example from the control condition was D, IZ, DIZ and VOK. The words HEM and DIZ are referred to as "related" words, and the words LIG and VOK are referred to as "unrelated" words. The authors hypothesized that children would learn to read the related item more easily than the
unrelated item because the learning of spelling-to-sound correspondences for the two smaller items would generalize to the reading of the related item but not the unrelated item. The authors compared children’s performance on the reading task with respect to both item type and condition. The findings from Experiment 1 indicated a significant interaction effect between condition and item type. In the control condition, there were significantly more errors on related items than on unrelated items. However, in the analysis condition, there was no significant difference between errors on related items and errors on unrelated items, though a trend toward fewer errors on the related items was noted. The authors interpreted these findings to mean that without phonemic analysis training, children’s reading performance on similar looking items was impaired by the items’ shared spelling-to-sound relations (the related item and the two small items were similar by virtue of their shared spelling rules). In contrast, phonemic analysis training was said to help children overcome the interference caused by repeated spelling-to-sound rules. Thus, the major effect of phonemic analysis training was the reduction of a negative effect rather than the production of a positive one (Treiman & Baron, 1983).

Experiment 2 was essentially a replication of Experiment 1 with two differences. First, the analysis condition included phonemic "blending" as well as phonemic segmentation training. Second, the reading task was modified so that the children were first taught the two smaller items in both conditions (e.g. H and EM, Z and IZ) to criterion, after which the related and unrelated items were taught. Findings from Experiment 2 also indicated significant interaction effects between condition and item type. In contrast to Experiment 1, no reliable difference was found between related and unrelated item errors in the control condition. However, in the analysis condition, children made reliably fewer errors on related
items than on unrelated items. Thus, it was only in the analysis condition that children
derived benefit in reading ability from the spelling-to-sound relations between the two smaller
items and the related item. The authors note that no main effects were obtained between
phonemic analysis training and total number of reading errors. However, the importance of
the findings from both experiments is in the pattern of reading performance on both related
and unrelated items (Treiman & Baron, 1983). The combined results from both studies were
interpreted to support the hypothesis that phonemic analysis training helps children take
advantage of spelling-to-sound rules in learning to read (see Content, Morais, Alegria &
Bertelson, 1982, in Lundberg, Frost & Peterson, 1988, for another example of short term
training effects, this time on metaphonological ability alone).

The finding that early training in metaphonological ability has a positive effect on
subsequent reading and spelling acquisition supports the claim that certain aspects of
metaphonological ability are prerequisite skills in literacy acquisition. However, training
studies to date evidence some important limitations. For example, in Bradley and Bryant’s
(1983) study, phonological awareness training occurred while children were receiving formal
reading instruction, thus the interaction between the training program and other instructional
variables was unknown. Further, metaphonological tasks within any one study were limited in
scope. Finally, where long term effects on reading ability are reported, these effects are small.

In an effort to overcome some of the limitations in other training studies, Lundberg, Frost
and Peterson (1988) conducted a longitudinal training study, involving 400 children in grades
Kindergarten (in Denmark the "preschool" year) to Grade Two, on the effect of extensive
preschool training of metaphonological abilities on subsequent reading and spelling acquisition.

Children in the experimental group received preschool training in a variety of metalinguistic skills designed to stimulate attention to and discovery of the phonological structure of language. A control group followed a regular preschool program. Neither group received reading instruction either prior to or during the preschool training period. The preschool children were, on average, 6 years old. Pretest measures of a number of linguistic and metalinguistic abilities were recorded at the beginning of the preschool year, and posttest measures were recorded at the end of the preschool year and again at the beginning of Grade One. Reading comprehension and spelling ability were tested about 7 months into first grade and again at the beginning of Grade Two. Control measures, involving both cognitive and mathematical tests, were administered toward the end of grade one.

The findings from Lundberg et al. indicated that, during the preschool years, metalinguistic training had no significant effect on functional linguistic skills, vocabulary, or the acquisition of letter-name knowledge. However, significant and dramatic group differences were found in metaphonological ability. At the pretest level, the control group obtained a significantly higher composite score for metaphonological tests than did the experimental group. At the posttest level, the experimental group significantly outperformed the control group on the metaphonological score. Differences between groups were particularly strong for the three subtests requiring phoneme segmentation. Findings also indicated that training in phonological ability had a facilitating effect on subsequent reading and spelling abilities up to the Grade Two level. Results of a multiple regression analysis, with reading in Grade Two as the criterion, indicated that the combined performance on the three phonemic awareness tasks
was associated with reading ability at the $R=.58$ level. With the posttest language comprehension score entered as step two, the $R$ increased to .60. A similar analysis, with spelling in Grade Two as the criterion, indicated that the combined score on the three phonemic awareness tasks were associated with spelling ability at the $R=.61$ level, accounting for 37 percent of the spelling variance. No other variables entered the equation.

Lundberg et al.'s findings indicate, first, that phonological awareness can be developed in preschool children outside the context of written language acquisition, and second, that preschool training in metaphonological ability can facilitate later reading and spelling abilities.

**SUMMARY**

The recent literature on the role of metalinguistic abilities in literacy development has shown consistently that metaphonological ability is reliably related to reading and spelling acquisition. However, the reported strength of this relationship varies considerably from study to study.

While the findings of Lundberg et al. (1988) support a causal role of metaphonological ability in early reading and spelling acquisition, arguments of this sort must still be considered premature. It may be too categorical to view the role of metaphonological ability as either antecedent to or a consequence of reading and spelling abilities. Some researchers have suggested that metaphonological ability and literacy knowledge share a reciprocal relationship (Ehri, 1984). Certain rudimentary metaphonological abilities may precede initial reading and spelling acquisition, and literacy experience and instruction may, in turn, enhance the development of metaphonological awareness. In addition, one must consider the multidetermined and multifaceted natures of both literacy learning and metaphonological
ability. Certainly, factors other than metaphonological awareness are involved in the acquisition of reading and spelling knowledge. Further, certain aspects of metaphonological awareness may be involved in literacy acquisition to differing degrees at different ages (e.g. Byrant, Maclean & Bradley, 1990).

As can be seen in the above review, most of the literature on the relationship between metaphonological awareness and literacy has focused on reading measures. When spelling ability has been included in the reading literature, the relation between metaphonological ability and spelling ability has been reported as similar to that between metaphonological ability and reading ability. Echoing the arguments given earlier, we can imagine that beginning spellers, like beginning readers, must comprehend that a relationship exists between units of spoken language and units of written language. Thus, learning to spell, like learning to read, requires the explicit awareness that words can be analyzed into discreet phonemic units.

The relationship between metaphonological awareness and spelling ability has been vigorously discussed in the "developmental spelling" literature. We turn now to a review of this literature, and consideration of the role of metaphonological ability in spelling development.
CHAPTER FOUR

DEVELOPMENTAL SPELLING

The view of spelling acquisition as a developmental process began in the early 1970's, with Read's (1971,1973,1975) seminal studies of children's spontaneous spelling. Read's (1971) landmark study of the error patterns evidenced by preschool children's misspellings is widely referred to in the developmental spelling literature. He found that children demonstrated consistent and predictable error patterns in their misspellings. Read concluded that children develop their own strategies for spelling based on their knowledge of the phonological structure of language before formal literacy instruction begins. Read continued his investigation of children's spelling strategies by comparing the categorization of vowels by adults and children ages 6 to 7 (1973). Read found that children's categorization of vowel sounds was consistent, though they differed from those of adults. This finding confirmed Read's earlier thesis that children have a consistent and systematic categorization scheme for speech sounds which is reflected in their invented spellings. In short, invented spellings are congruent with the child's perception and knowledge of the phonological structure of language, though they differ from conventional adult spellings. In a closer analysis of these error patterns, Read (1975) found that children's spelling errors reflect a systematic categorization of speech sounds according to acoustic and articulatory properties. Children's
early misspellings were referred to as "invented spellings", in contrast to memorized wholes and conventional spellings.

In summary, Read found that the error patterns in children's misspellings are consistent and predictable. Further, he proposed that children's spelling errors are congruent with their knowledge of the phonological structure of language, and that error patterns reflect children's systematic categorization of speech sounds according to acoustic and articulatory properties.

DEVELOPMENTAL SPELLING STRATEGIES

Based on Read's preliminary findings, other researchers focused their attention on refining the description of children's spelling strategies. In an informal study of children's spelling errors in first through fourth grade children, Beers, Beers and Grant (1977) identified three common spelling strategies for vowel representation. One strategy was the use of vowel letter-names to represent vowels (e.g. BOT for BOAT, U for YOU). Vowels were represented by the letter-name that sounded the closest. A second strategy was the use of extra vowels following correct ones, (e.g. TIAME for TIME). Finally, a third strategy was the incorrect use of short vowels (e.g. SAM for SOME, THES for THIS). The authors proposed that many of these spelling errors were based on "aural or visual miscues". Younger children in the study evidenced more of these strategies, as more of their spellings were unconventional. Older children tended to revert to these strategies when faced with the task of spelling novel words. Beers et al. (1977) concluded that the use of these three strategies indicated a lack of "word
attack" skills (knowledge of spelling-to-sound rules), and advocated the delay of formal spelling instruction until such skills had been adequately developed.

Beers and Henderson (1977) examined the spelling errors of first grade children over a period of six months, in an effort to determine the progressive nature of spelling strategies. Three progressive levels of spelling strategies were identified. At the first level, children used a letter-name strategy to spell both vowels and consonants (e.g. HAB for HAPPY, LEFT for elephant). The use of this strategy for spelling short vowels was thought to reflect a reliance on articulatory properties. At the second level, children used an increasing number of correctly spelled vowels and consonants, though for the most part, spelling was not yet conventional. This progressive use of correct letter representation was thought to reflect children’s understanding that letters are used as sound symbols rather than as strict representations of letter-name sounds. At the third level, children move beyond phonetic spelling (spelling as it sounds) toward correct representation of vowel digraph patterns and morphological endings. At this third level, children are thought to draw on information from various sources, including morpho-syntactic information gained through visual experience with print. The authors concluded that children progressively assimilate new information, and use it to refine their own spelling systems.

Taken together, the above findings indicate that children employ consistent spelling strategies, and that these are observable in their spelling error patterns. Further, as children progress from "invented" spelling toward conventional spelling, they begin to assimilate different kinds of spelling knowledge, as reflected in their increasing reliance on visual-
orthographic strategies, and their lessening reliance on "invented" acoustic-articulatory strategies.

DEVELOPMENTAL SPELLING STAGES

The view that children progress along a developmental continuum from "invented" spelling toward conventional spelling prompted some researchers to propose that spelling ability may be described according to arbitrarily designated divisions, or stages, along this developmental continuum.

Gentry (1981) investigated the progressive nature of spelling acquisition by looking at children’s spelling errors in the early primary grades. He identified five stages in developmental spelling based on analysis of children’s spelling errors. Stage one is "Deviant" spelling, and is characterized primarily by random symbol representation, including letters, numbers and "scribble writing". Stage two is "Prephonetic" spelling. At this stage, children’s spellings evidence rudimentary letter-sound correspondences. Children may represent a word by one or two letters (e.g. W for WITCH, HS for HOUSE). However, one-to-one representation of speech sounds is not evidenced, and vowels are typically omitted. Stage three is "Phonetic" spelling. A phonetic speller assigns letters strictly on the basis of sound, without regard to acceptable sequence (e.g. THRD for THIRD). This type of spelling error evidences some understanding of letter-sound correspondences. Children at this stage tend to represent sounds according to the letter-name that sounds the closest. One-to-one sound symbol correspondence is evident except for some vowels, which may still be omitted. The fourth stage is "Transitional" spelling. At the transitional stage, children’s spellings more
closely resemble standard English orthography. Spelling errors frequently include a mismatch between what "looks right" and what "sounds right" (e.g. OPNE for OPEN). Stage five is "Correct" spelling. Children at this stage spell words correctly at grade level, though errors occur for unfamiliar words. Gentry proposed that children naturally progress through the five stages of spelling development as they refine their knowledge of English orthography. Gentry advised that children are not ready for formal spelling instruction, which draws heavily on visual-orthographic information, until they have reached the fifth stage of spelling development. Further, he suggested that teachers may encourage "spelling consciousness" by independent writing practise in combination with other language experiences, and by accepting, rather than correcting, children's developmental spelling errors.

Gentry (1982) investigated the validity of his stage-like characterization of children's early spelling abilities by applying his findings to Bissex's (1980) case study of her son's spelling development. Gentry refined his five stages of spelling development in terms of specific skill areas by using examples from Bissex. In addition, he changed the name "Deviant" to "Precommunicative" to describe stage one, and "Prephonetic" to "Semiphonetic" to clarify stage two. Gentry found that Bissex's son moved unusually quickly through the five developmental spelling stages. Gentry attributed this rapid progression to Bissex's emphasis on creative writing experiences and de-emphasis of spelling mechanics, such as the application of sound-to-symbol "rules". Thus, Gentry advised teachers to follow similar guidelines for spelling instruction.
RELATION OF EARLY WRITING AND SPELLING EXPERIENCE TO READING

The importance of early writing experience in the acquisition of both spelling and reading knowledge has been proclaimed by a number of researchers (e.g. Chomsky, 1970, 1971, 1979; Clay, 1985). Chomsky (1979) elaborated on Read's (1971, 1973, 1975) work to include commentary on first, the transition from invented to conventional spelling, and second, the relationship between spelling and reading. Chomsky (1971) suggested that the presence of "invented" spelling in children's early writing does not rely on children's "creative" abilities, but rather on a learning environment conducive to experimentation. Further, Chomsky argued that teachers' acceptance of children's "invented" spellings does not hinder the acquisition of conventional spelling knowledge. In fact, she claimed that children who are able to "invent" their own spelling system can more readily adapt to a standard system. This hypothesis is based on the assumption that children who are active participants in their own learning more readily trust their abilities, and thus, make a smoother transition from "invented" to conventional spelling.

Chomsky (1979) suggested that learning to write is not a process that is dependent on first learning to read. Rather, experimentation with writing and spelling was said to naturally facilitate the acquisition of reading ability. Chomsky argued that children should learn to write before learning to read. She suggested that children learn to read by "interpreting" their own early creative writing attempts.

throughout the school year. All children were encouraged to produce spontaneous writing samples throughout the kindergarten year. Paul examined children’s spellings to determine their readiness for reading instruction. Paul identified four "stages" in children’s spellings. At the first stage, children spelled primarily initial letters in words and syllables. At stage two children also spelled final letters in words and syllables. Stage three included attempts at short vowel spelling in syllables. Finally, at stage four, children used primarily standard spelling. Paul’s findings supported the view of Chomsky (1970,1971) that early "invented" spellings do not inhibit the acquisition of correct spelling forms.

The above researchers make two important points regarding the developmental acquisition of spelling knowledge. First, the use of "invented" spelling in children’s early writing does not appear to hinder the acquisition of conventional spelling, and may, in fact, enable children to make a smoother transition from "invented" spelling to standard orthography (Chomsky,1971; Paul,1976). Second, early writing experience may facilitate learners’ acquisition of reading skills. Thus, classroom writing experience should not be postponed until children have acquired reading ability (Chomsky,1979).

DEVELOPMENTAL SPELLING THEORY AND INSTRUCTION

Developmental spelling theory carries implications for traditional models of spelling instruction first, by claiming that children develop their own system for spelling based on their individual knowledge of the phonological structure of language, and second, by proposing that children naturally and progressively acquire an understanding of the orthographic nature of written language through their experience with and exposure to print.
Beers and Beers (1981) commented on a number of assumptions inherent in traditional spelling instruction that seemed to be incongruent with findings on the developmental nature of spelling knowledge. First, the authors challenged the traditional phonics approach to spelling instruction. In support of Read's thesis, the authors argue that children's misspellings accurately reflect their perception of speech sounds. Thus, spelling knowledge can be said to be based on phonetic principles rather than understanding of spelling-to-sound rules. Second, Beers and Beers (1981) take issue with the assumption that rote memorization of words will lead to correct spelling. The author's argue that rote memorization neither reflects nor contributes to spelling knowledge. Instead, children's application of their own spelling system to written language helps them to further their knowledge of letter-sound correspondences and orthographic regularities. Finally, the traditional practice of delaying creative writing practice until conventional spelling has been acquired is challenged. Beers and Beers echo Chomsky's (1979) argument that early experience in purposeful and creative writing develops both spelling and reading knowledge, and that all areas of language learning in grade school, including reading and writing, should be experienced in tandem.

The proposed changes in traditional methods of spelling instruction suggested by Beers and Beers (1981) are based on theoretical insights into the acquisition of spelling knowledge offered by developmental spelling theory. These proposed changes are congruent with suggestions made by other developmental spelling researchers. For example, Gentry (1978, 1981, 1982) acknowledged that children's early spellings reflect their understanding of the phonological structure of language, rather than of spelling-to-sound rules. Thus, he advised teachers to consider children's individual levels of developmental spelling in order to
plan appropriate formal spelling instruction. Gentry (1982) encouraged teachers to accept, rather than correct, children’s spelling errors. Further, he suggested that teachers may facilitate children’s knowledge of print by engaging students in purposeful and creative writing practise, in conjunction with other areas of language learning. Additionally, Beers et al. (1977) advocated both the de-emphasis of spelling mechanics and the delay of formal spelling instruction until children have acquired "word attack" skills, which were said to be necessary for the application of visual-orthographic information to spelling-to-sound rules. The authors argued that exercises in spelling mechanics, such as the rote memorization of spelling word lists and spelling-to-sound rules are not the key to spelling knowledge. Rather, "invented" spelling serves to encourage children to hypothesize, revise, and test their knowledge of the regularities of English orthography.

In a review the developmental spelling literature, Hodges (1982) arrived at four conclusions regarding the implications of this area of research for instruction. First, Hodges concluded that spelling knowledge should be viewed from the child’s perspective rather than from adult expectations regarding what is and is not "correct". Second, while Hodges supported Read’s claim that children’s spelling errors are an accurate reflection of their phonological knowledge, he stressed that children use a variety of cues, including visual-orthographic information and phonological information, to spell unfamiliar words. Third, Hodges concluded that learning to spell is an integral component of the larger area of language learning. Hodges emphasized that all language modalities are interdependent, and that the language arts curricula should reflect this understanding. Hodges’ final conclusion was that children’s spelling development is individually determined, and that children’s
individual differences in spelling ability should be a primary consideration in the teaching of literacy skills. Thus, Hodges advised teachers to develop individualized lessons based on children's level of spelling ability and their readiness for instruction.

INVENTED SPELLING AS A DIAGNOSTIC TEACHING TOOL

Children's "invented" spellings reflect their spelling strategies for unfamiliar words, and provide insight into their level of word knowledge. Teachers' observations of children's "invented" spelling can be a valuable diagnostic tool for determining individual children's spelling ability and their readiness for formal spelling instruction. Some researchers have investigated the underlying processes involved in children's spelling strategies with the aim of guiding teachers in their timing and planning of individualized lesson plans for formal spelling instruction.

Zutell (1978) suggested that cognitive processes involving testing hypotheses and constructing theories are involved in children's developmental spelling strategies. Based on Read's (1971,1973,1975) findings regarding children's own spelling systems and strategies, Zutell proposed that children employ different aspects of rule generalization at the various stages in developmental spelling. Zutell argued that children's invented spelling strategies serve to internalize the orthographic regularities of English spelling. Children are said to generalize information regarding the spelling of specific words to the spelling of novel words. This process results initially in overgeneralization of spelling "rules". For example, children may overgeneralize the "e-marker" rule (e.g. PUTE for PUT). Finally, children are able to correctly apply their understanding of orthographic spelling principles. Zutell advised that
teachers may use a child’s developmental spelling errors as a diagnostic tool for determining his level of spelling ability and readiness for instruction. Although Zutell concurred with other researchers that spelling mechanics should be de-emphasized in favor of purposeful writing practise, he suggested that conventional spelling forms be made available to children for comparison purposes.

SUMMARY

In reviewing the developmental spelling literature, it becomes clear that researchers (e.g. Gentry, 1981) have progressively refined the description of the five stages of developmental spelling. First, a number of critical features at each stage of spelling development have been identified. Second, the description of these various features indicate that spelling ability at any stage of development is comprised of different aspects of spelling knowledge. For example, knowledge of letter-sound correspondences and knowledge of directionality of letters in words and words in sentences are two different aspects of spelling ability.

Earlier studies that have reported a moderate to strong relationship between metaphonological awareness and spelling ability have recorded children’s spelling responses to orally dictated word lists as a measure of spelling ability. It is interesting to consider how measures of children’s spontaneous spelling might influence this relationship. The stages of spelling acquisition described in the developmental spelling literature (e.g. Gentry, 1982) provide a framework within which to examine the relationship between children’s metaphonological ability and their spelling ability as measured by spontaneously generated
spelling samples. In the current study, children's spontaneously generated spelling samples were assessed according to a scheme based on the description of features at five stages in developmental spelling described by Beers and Beers (1981) and Gentry (1982). In this way, both the developmental aspect of spelling acquisition and the multifaceted nature of spelling ability is taken into account.

The following chapter details the procedures used in this study for obtaining measures of both metap phonological awareness and spelling ability.
CHAPTER FIVE

METHOD

SUBJECTS

Subjects were 25 normally developing children from a public school in a Vancouver, British Columbia School District. Included were 7 kindergarten children (4 males, 3 females), 11 grade one children (9 males, 2 females), and 7 grade two children (4 males, 3 females). Age of subjects ranged from 5 years, 6 months to 8 years, 2 months. Children were screened by their classroom teachers to be language normal, and had no history of learning disorders or hearing impairment. All children spoke English in the home.

MATERIALS

Each subject was individually presented with two tests of phonological awareness, and was asked to provide a spelling sample on an individual or small group basis.

Phonological Awareness Tests

The two tests of phonological awareness were chosen on the basis of findings by Yopp (1988) regarding the reliability and validity of tests typically used to operationalize the concept of phonemic awareness. In Yopp’s study, ten tests of phonemic awareness were
administered to 96 kindergarten children. A test that measured the rate of learning to identify artificial three-letter words following "sound and blending" instruction was also administered.

Principle factor analysis revealed that two highly related factors were underlying components in phonemic awareness tests. Tests that loaded highly on Factor I and minimally on Factor II were tests of phoneme segmentation, blending, isolation and counting. Tests that loaded moderately to highly on Factor II and minimally on Factor I were tests of phoneme deletion and word-to-word matching.

Yopp argued that tests in the first category were those which required the performance of one operation, specifically phoneme segmentation, blending or isolation, prior to a response. These tests were identified as tests of simple phonemic awareness. Tests in the second category required the performance of an initial operation (specifically, phoneme deletion), in addition to holding sounds in memory while a second operation was performed (specifically, recalling the remaining sounds-in-words and blending them), prior to a response. These latter tests were identified as tests of compound phonemic awareness. Thus, according to Yopp’s analysis, tests of simple and compound phonemic awareness may be differentiated by the requirement in tests of compound phonemic awareness that sounds be held in memory while a second operation is performed.

The test with the highest loading on Factor I was found to be the Yopp-Singer (Yopp, 1988) test of phoneme segmentation. The test with the highest loading on Factor II was the Rosner (1975) test of syllable and phoneme deletion. Thus, these two tests were found to be, respectively, the most valid tests of Yopp’s simple and compound phonemic awareness.
A stepwise regression analysis was conducted, with the learning rate test as the dependent variable and the ten tests of phonological awareness as the predictive variables. Yopp reports that one test of simple phonemic awareness (the Yopp (1988) modification of the sound isolation test), and one test of compound phonemic awareness (the Bruce (1964) phoneme deletion test, Yopp, 1988) contributed significantly to the learning rate variance.

The suggested importance of Yopp's findings is that a combination of two tests, one from each factor, held greater predictive validity for at least one aspect of reading acquisition - as measured by the learning rate test - than any one test alone.

In the present study, the tests used as measures of metaphonological ability were the Yopp-Singer (Yopp, 1988) test of phoneme segmentation and the Rosner (1975) Test of Auditory Analysis Skills. These two tests were chosen on the basis of Yopp's findings that they were the most valid tests of "simple" and "compound" phonological awareness, respectively. Yopp found that a combination of two tests, one a measure of "simple" phonological awareness and the other of "compound" phonological awareness, held greater predictive validity for one measure of reading ability, than any one test alone. Phonological awareness can be expected to be related to other areas of language performance such as spelling ability. Thus, a combination of two tests, one of simple phonological awareness and one of compound phonological awareness, may hold greater predictive validity for spelling ability than any single measure of metaphonological ability. Although Yopp's data were drawn only from kindergarteners, the merits of incorporating his dimensional structure into the current study seemed to outweigh concerns about age related shifts in correlational strength. (But see also Bryant, Maclean & Bradley, 1990.)
Spelling Samples

Materials for the elicitation of spelling samples from each subject included only drawing paper, and writing, drawing or colouring materials (pencils, pens, and "special" scented felt pens). Prior to the picture drawing task, subjects were engaged in a brief informal discussion of their school interests and/or interests outside of school, to encourage ideas for picture representation and topics for spelling samples. The procedure for the collection of spelling samples was designed to produce the most spontaneous spelling samples afforded by the subjects.

PROCEDURES

Phonological Awareness Tests

The first test of phonological awareness administered was the Yopp-Singer (Yopp, 1988) test of phoneme segmentation (Y-S). The purpose of this test is to measure a child’s ability to produce sounds in words separately and in order. The word list for this test takes both feature analysis criteria and word familiarity into account. The listed words include all commonly occurring places and manners of articulation of English consonants, and all heights and locations of English vowels. All words are common nouns, verbs and modifiers familiar to young children. Subjects were presented with the following instructions:

Today we’re going to play a word game. I’m going to say a word, and I want you to break the word part. You are going to say each sound in the word, in order. For example, if I say "old", you will say
"o-l-d". Let's try a few words together.

Three more demonstration items were given. These were "ride", "go" and "man". The test proper, consisting of 22 items, was then administered. All responses were acknowledged in a positive manner by the examiner. Feedback was not given regarding whether or not the responses were correct. Words were scored as correct if a child responded accurately and on his/her own, one point per item. As no standard scores are available for this test, raw scores were used in subsequent analyses. The test took approximately 10 minutes to administer.

The second test of phoneme segmentation administered was Rosner's (1975) Test of Auditory Analysis Skills (TAAS). This test measures a child's ability to delete syllables and phonemes in words upon production. The test begins with simple syllable deletion in a compound word, and progresses to more difficult items involving deletion of phonemes in different positions in single syllable words. Items in the word list were selected on the basis that the deletion of a syllable or phoneme would result in another English word when produced. Six categories of progressive difficulty were designated:

1. Deletion of a whole word from a compound word (one item),
   e.g: SUN(SHINE)

2. Deletion of the initial syllable in a two-syllable or three-syllable word (two items), e.g: (PIC)NIC

3. Deletion of the initial phoneme in a CVC syllable structure (three items), e.g: (C)OAT

4. Deletion of the final phoneme in a CVC syllable structure (three items), e.g: WRO(TE)
5. Deletion of the initial phoneme in a CCVC syllable structure (two items), e.g: (P)LAY

6. Deletion of the second phoneme in a CCVC syllable structure (two items), e.g: S(T)ALE.

Subjects were presented with the following instructions:

Now we’re going to play a different word game. I’m going to say a word and you are going to say it after me. Then you are going to say just a little bit of the word. Let’s try one. Say "cowboy". (Allow child time to respond). Now say it again but don’t say "boy".

A second demonstration item was given: "Say 'steamboat'. Now say it again but don’t say 'steam'". If a child did not respond correctly to both demonstration items, no further items were administered. If both demonstration items were responded to correctly, the test proper, consisting of 13 items, was then administered. Testing was discontinued after two consecutive errors. The subjects score was the number of correct responses. Raw scores were again used in the absence of available standard scores. The test took approximately 10 minutes to administer.

In addition to the Y-S and TAAS scores, a composite metaphonological score (CMPS) was used in subsequent data analysis. The CMPS was derived from addition of the TAAS score to one half of the Y-S score for each subject. This weighting took into account the
unequal number of items in the two tasks and had the effect of assigning equal value to each test in the composite score. The possible range of scores for the CMPS was 0 to 24.

Spelling Samples

The procedure for collecting spelling samples involved two steps. In the first step, subjects were asked to draw and colour a picture of their own choosing. This took approximately 15 minutes. Subjects were then asked to write or print some words or a short story that would describe their picture. Younger children who claimed they could not write or print were encouraged to label items in their pictures, write their names, and try "pretend writing". Children were asked to tell verbally what their spellings "said". This part of the task took from 5 to 15 minutes to complete.

Once they were collected, the spelling characteristics of each sample were analysed, using a scoring system developed for the current project. The scoring system was developed in part by observations of spelling errors in the data, and in part from references in the literature to developmental stages in spelling performance (e.g. Beers & Beers, 1981; Gentry, 1982).

Six parameters of spelling knowledge were identified:

1. Sound-symbol correspondence
2. Directionality
3. Vowel sound representation
4. Upper and lower case
5. Word segmentation
6. Type of spelling strategy evidenced by spelling errors:

"invented" acoustic-articulatory versus visual-orthographic strategies.

Each of these parameters represents a different aspect of spelling knowledge. Within each of these parameters, development is observed as children progress from a rudimentary knowledge of spelling to spelling mastery. For example, children gradually learn the concept and application of left to right and top to bottom directionality in print. It appears from the literature on spelling development that very young children do not demonstrate any attention at all to directionality. As children learn to read and write, they acquire an understanding of the left to right and top to bottom directionality which is appropriate for English text.

Development of spelling knowledge occurs simultaneously along the six different parameters. It is possible to describe this whole course of development by creating arbitrary divisions which can be called stages. Within each stage of spelling development, it is possible to characterise a child's performance according to each of the six parameters. In this scoring system, each parameter is represented by a feature at each stage of spelling development.

**STAGE I: Precommunicative Spelling**

PAR.1) No apparent sound-symbol correspondence exists for most or all letters in words.

PAR.2) Directionality of symbols is absent or inconsistent.

Directionality includes that for individual symbol representation, left to right for symbols in words, and top to bottom for words in phrases.

PAR.3) Vowel sounds are not represented in most syllables.
PAR.4) Upper and lower case letters are indiscriminately mixed.

PAR.5) Word segmentation is absent or inconsistent.

PAR.6) No spelling strategies are evident. Symbols (including letters, numbers, and "scribble writing") are randomly strung together.

**STAGE II: Semi-Phonetic Spelling**

PAR.1) Sound-symbol correspondence is evident in some 1, 2 or 3 letter combinations, though all surface sounds are not necessarily represented (e.g. OD/old, HAB/happy).

PAR.2) Left to right directionality is established: letter reversals do not occur, and letters in words and words in sentences progress from left to right.

PAR.3) No changes: omission of vowel sound representation in most syllables continues.

PAR.4) No changes: upper and lower case letters continue to be mixed.

PAR.5) Word segmentation emerges, either correctly by spacing, or incorrectly by punctuation.

PAR.6) "Invented" spelling strategies become evident: systematic representation of speech sounds according to articulatory and/or acoustic properties.

i) Both vowels and consonants are represented by a letter-name strategy. Children spell by the phonemic feature that is emphasized in the name of the letter.

a) Long vowels are misrepresented by matching the letter-name to the sound (e.g. BOT/boat, FEL/feel)

b) Short vowels are misrepresented by the letter name that sounds the closest to pronunciation (e.g. BAD/bed, FES/fish)
c) Consonants are misrepresented according to the sound of the letter name (e.g. NHR/nature, LEFT/elephant)

ii) Nasals before same place-of-articulation consonants are omitted (e.g. PLAT/plant, AGRE/angry)

iv) R, L, M, N are used to represent syllables (e.g. TIGR/tiger, WAGN/wagon)

v) Both /s/ and /z/ are represented by S

vi) TR and DR consonant clusters are represented by CHR and JR respectively (e.g. CHRIE/try, JRGIN/dragon)

vii) -ING verb endings are represented by either IG or EG (e.g. FEHEG/fishing, SOWEMEG/swimming)

viii) Past tense -ED endings are represented by either D or T (e.g. WAKD/walked, HALPT/helped)

ix) Consonants may be spelled in accordance with developmental articulation errors (e.g. WEF/with).

**STAGE III: Phonetic Spelling**

PAR.1) One to one sound-symbol correspondence (not necessarily by correct letters) is evident in most words spelled.

PAR.2) Directionality (including top to bottom for sentences) is established.

PAR.3) Vowel sounds are represented, either correctly or incorrectly in most syllables.

PAR.4) Upper and lower case letters are used more consistently, though not necessarily correctly (e.g. upper case at all word beginnings).
PAR.5) Word segmentation via spacing is established.

PAR.6) Visual/orthographic strategies for vowels emerges at Stage III, where we see the following kinds of spelling errors:

i) Incorrectly spelled vowel digraph patterns (e.g. YOOS/use, CLAUD/cloud)

ii) Short vowel substitution by using the letter which typically represents the sound, rather than by using the letter-name strategy (e.g. SAM/some, LANDID/landed).

Reduction of invented articulatory/acoustic strategies is evident as new visual/orthographic strategies for spelling emerge, but strategies noted in Parameter 6, Stage II continue to be used.

STAGE IV: Transitional Spelling

PAR.1) One to one-sound symbol correspondence is evident for all words spelled. Words are not necessarily conventionally spelled.

PAR.2) No further change possible.

PAR.3) Vowel sounds are represented, typically correctly, in all syllables.

PAR.4) No changes: upper and lower case letters continue to be used more consistently, though not necessarily correctly.

PAR.5) No further change possible.

PAR.6) Visual/orthographic strategies rather than invented articulatory/acoustic strategies are evident in most spelling errors. The letter-name strategy is absent. New visual/orthographic strategies include:

i) Overgeneralisation of punctuation (e.g: CONE’s/cones, ROBOT’s/robots)
ii) Overgeneralization of word segmentation (e.g. LIFT IT/lifted, A GO/ago)

iii) Surface sounds represented by commonly occurring English letter sequences (e.g. SPASHUTUL/spaceshuttle, PICHER/picture)

iv) E-marker incorrectly used (e.g. CLIME/climb, PUTE/put)

v) E-marker omitted in otherwise correctly spelled words (e.g. THER/there, WHER/where)

vi) Reversal of commonly occurring English letter sequences (e.g. OPNE/open, TIGRE/tiger).

STAGE V: Correct (Conventional) Spelling

PAR.1) No further change possible.

PAR.2) No further change possible.

PAR.3) No further change possible.

PAR.4) Upper and lower case letters are used correctly.

PAR.5) No further change possible.

PAR.6) Visual/orthographic strategies are evident for unfamiliar words. Conventional spelling is evident for familiar words. Invented articulatory/acoustic strategies are not evident.

By Stage V, all parameters except parameter 6 are established. Whereas parameters 1 through 5 represent the conventions of English orthography, parameter 6 instead refers to the spelling strategies evidenced by spelling errors. Unlike the other parameters, we cannot argue that parameter 6 is mastered at any given stage. The use of strategies to spell unfamiliar words continues into adulthood.
In this assessment scheme, spelling knowledge at any one stage of development differs from spelling knowledge at any other stage of development. For example, children at Stage II demonstrate sound-symbol correspondence in 1, 2 or 3 letter combinations, but inconsistently represent all surface sounds (e.g., OD/old). This is very different from children's ability at Stage III to demonstrate one-to-one sound-symbol correspondence for most words spelled. In most cases, the criterial feature of a given parameter at any stage differs from the criterial feature for that parameter at the previous stage. Such features can be thought of as Replacement Features (RF). In some cases, however, features along a parameter did not differ significantly from one stage to the next. A feature that carried over into the next stage, but was eventually replaced at yet a later stage, was termed a Continuing Feature (CF). A feature that carried over into the next stage with no further changes at higher stages was termed an Established Feature (EF).

The scoring system described above was used in the present study for spelling sample analysis. Every parameter evidenced in a given spelling sample was assigned a stage value. The number of features present at each stage level was determined, and a modal stage was assigned for each subject. The modal stage is hence referred to as the modal spelling score. In determining the modal spelling score, Continued Features were counted at every stage in which they occurred. For purposes of subsequent statistical analyses, a Continued Feature within a parameter was assigned its highest stage value. Features already Established at some level below the apparent modal stage were counted in the modal stage. A minimum number of two features at a stage was required for a modal spelling score to be assigned.
Spelling sample size varied between subjects. On average, children in Kindergarten spelled 4 words per sample. Random letter groupings were counted as a single word, regardless of how many words were included in the verbal retelling. One Kindergarten subject spelled no words. Children in Grade One spelled on average 13 words per sample. Grade Two children spelled on average 18 words per sample.

SUMMARY

All twenty five children, ranging in age from five years, six months to eight years, two months, were administered two tests of phonological awareness. Three measures of metaphonological ability were used in subsequent data analyses: an individual score for each test (the Y-S and the TAAS), plus a composite metaphonological score (the CMPS) derived from a weighted combination of Y-S and TAAS scores.

All children provided an original spelling sample. Each spelling sample was analyzed on the basis of a scoring system developed for this project. Spelling sample analysis involved assigning a stage value (I through V) to any and all of the six different parameters of spelling knowledge evidenced by the samples. A modal spelling stage for each child was determined by examining stage assignments earned on each spelling parameter. The modal spelling score was used in subsequent data analyses as a measure of spelling ability.

The following chapter looks at children’s metaphonological performance and spelling ability, and at the relationship between these two variables.
CHAPTER SIX

RESULTS

The primary goal of this research project is to investigate the relationship between metaphonological awareness and spelling development. In order to meet that goal, it is first necessary to characterize the subjects' performance on each of the tasks, independently.

METAPHONOLOGICAL ABILITY

The first analysis examined the children's performance on the three measures of metaphonological ability, both to describe the distribution of scores and to determine any relationships between these scores and the developmental variables of grade and age.

The Yopp-Singer Test (Y-S)

The mean score for the Y-S was 11.2, with a standard deviation of 7.22. Individual subject scores ranged from 0-21 (possible range of scores was 0-22). All but 5 of the children in this study were able to respond correctly to at least some of the test items. These five children were at the kindergarten level.

A simple regression analysis, with Y-S as the dependent variable and grade level as the independent variable, determined that grade level was significantly related to Y-S at the
P<.025 level (R=.53, df=1,17, F=6.59). The strength of the relationship between Y-S and grade was modest; with grade level accounting for 28 percent of the variance in the subject’s scores on the Y-S.

A similar analysis was conducted to determine the predictive value of age for Y-S scores. Age was significantly related to Y-S at the p<.01 level (R=.69, df=1,23, F=21.32). Age accounted for 48 percent of the Y-S variance. Thus, the relationship between Y-S and age was stronger than that between Y-S and grade.

Observational analysis of error responses on the Y-S indicated that the most difficult test item was the word "GREW", one of two test items with a CCV syllable structure. Three other test items with frequent error responses were the words "KEEP" (CVC), "JOB" (CVC), and "THREE" (CCV). No consistent pattern was identified with respect to syllable structure of test items and error responses.

The Test of Auditory Analysis Skills (TAAS)

On the TAAS, subjects obtained a mean score of 8.8, with a standard deviation 3.62. The range of individual subject scores was 2-13 (possible range of scores was 0-13). All of the children in this study were able to respond correctly to at least some of the test items. Three subjects responded correctly to all test items. A simple regression analysis, with TAAS as the dependent measure and grade level as the independent measure, determined that grade level was significantly related to TAAS scores (R=.56, p<.01, df=1,22, F=10.1). The percent of TAAS variance accounted for by grade was 31.
The variable age was also significantly correlated to TAAS at the p<.01 level (R=.61, df=1,23, F=13.46). Age accounted for 37 percent of the variance in TAAS scores. The relationship between age and TAAS was thus determined to be only marginally stronger than that between grade and TAAS.

Observational analysis of TAAS error responses indicated a progressive level of difficulty in test items 1 through 13. The most difficult items (12 and 13) were those which required deletion of the second consonant in a CCVC syllable structure.

Composite Metaphonological Score (CMPS)

The composite score was derived to examine the children’s overall metaphonological ability as measured by both tests of phonological awareness. Equal value for the Y-S and TAAS was assigned in the CMPS. The mean score for subjects on the CMPS was 14.4, with a standard deviation of 6.62. Individual subject scores ranged from 2-22 (possible range of individual subject scores was 0-24). Simple regression analysis, with CMPS as the dependent variable and grade level as the independent variable, determined that grade level was not significantly correlated to the CMPS at the p<.01 level (R=.45, P<.10, df=1,17, F=4.22). Grade level accounted for 20 percent of the variance in CMPS.

Analysis of the predictive value of age to CMPS determined that age was significantly correlated to CMPS at the p<.01 level (R=.71, df=1,23, F=23.42), and that age accounted for 50 percent of the variance in CMPS.
Summary

The strength of the relation between grade and the two tests of metaphonological ability was modest, with grade accounting for 28 percent of the Y-S variance, and 31 percent of the TAAS variance. The correlation between grade and CMPS was not significant, with grade accounting for only 20 percent of the CMPS variance.

Age proved to be a more powerful predictor of all three measures of metaphonological ability than was grade, with age accounting for 48 percent of the Y-S variance, 37 percent of the TAAS variance, and 50 percent of the CMPS variance.

Some children in this study showed considerable ability to apply metaphonological schemes to test items, as indicated by perfect performance scores on the TAAS, and high performance scores on the Y-S. Most of the children were able to respond correctly to at least some of the test items for both metaphonological tasks. Some children in Kindergarten were unable to respond correctly to any of the Y-S test items.

SPELLING ABILITY

The second set of analyses looked at children's spelling ability, as measured by stage assignment, in relation to the six identified parameters of spelling knowledge.

Stage Level Distribution Within Parameters

The first analysis looked at the range of children's spelling abilities within parameters. The distribution of stage assignments across subjects for each of the six parameters is portrayed in the following tables. Asterisks indicate that no further changes are possible
within a parameter. Combined stages reflect the presence of a feature continued from one stage into the next. The total number of stages credited in the following charts does not necessarily equal the number of subjects, since not all subjects were scorable on all parameters. Scores are summarized in Table 6.1.

Parameter 1: Sound-Symbol Correspondence. The distribution of performance for the Sound-symbol Correspondence parameter indicates that many children in the study were able to represent all surface sounds in all spelled words, either by correct letter representation or by substitution of letters which corresponded to the represented sounds (Stage IV). A slightly lesser number of children were able to represent all surface sounds in most words spelled (Stage III). Very few of the children failed to represent surface sounds in spelled words (Stages I and II).

Parameter 2: Directionality. Performance distribution for the Directionality parameter indicates that more than half the children in the study demonstrated a knowledge of left to right directionality for letters in words, left to right directionality for words in sentences, and top to bottom directionality for sentences on a page (Stage III). Children who did not achieve this level were observed to do one of the following. Some children failed to represent top to bottom directionality, while evidencing left to right directionality for letters in words and words in sentences (Stage II). Others failed to produce left to right directionality for letters in words (Stage II). Still others demonstrated letter reversals (Stage II). For a small number of children, directionality of any kind was absent in spelling samples (Stage I).
Parameter 3: Vowel Representation. The distribution of performance for the Vowel Representation parameter indicates that many children were able to represent vowel sounds, either correctly or incorrectly, in all syllables in spelled words (Stage IV). Some children failed to represent vowel sounds in most syllables (Stage II). A smaller number of children were able to represent vowel sounds in most syllables in words (Stage III).

Parameter 4: Upper and Lower Case. The distribution of performance for the Upper and Lower Case parameter indicates that more than half the children in the study used upper and lower case letters consistently, though not necessarily correctly for all words spelled (Stages III-IV). A smaller number of children used upper and lower case letters mixed indiscriminately (Stages I-II) . Only a few children demonstrated correct use of upper and lower case letters (Stage V).

Parameter 5: Word Segmentation. Performance distribution for the Word Segmentation parameter indicates that a large number of children were able to correctly segment words by spacing (Stage III). For a smaller group of children, word segmentation was inconsistent or absent (Stage I). One child used punctuation to segment words (Stage II).

Parameter 6: Type of Strategy Evidenced by Spelling Errors. Performance distribution for the Type of Strategy Evidenced by Spelling Errors parameter indicates that an equal number of children were using either primarily "invented" acoustic-articulatory spelling strategies and some visual-orthographic strategies (Stage III), or primarily visual-orthographic strategies and
some "invented" acoustic-articulatory spelling strategies (Stage IV). A smaller number of children were using "invented" acoustic-articulatory spelling strategies only (Stage II). Very few children were using random symbols to represent words (Stage I). One child used visual-orthographic strategies only (Stage V).

Table 6.1
Distribution of Stage Level Assignment for All Subjects across Parameters.

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Grade Level and Parameters

The above analysis of stage assignment within parameters shows that the children in this study, grades Kindergarten to 2, demonstrated a wide range of spelling abilities. The next analysis investigated one source of this variance, namely grade level.
Spearman rank order correlations indicated that spelling performance in all of these parameters, except Parameter 4 (correct use of upper and lower case) was strongly related to grade level, with coefficient values ranging from .63 to .79. On average, grade level accounted for 47 percent of the variance in performance on the various parameters of spelling.

Spelling Mastery in Parameters

The preceding description of spelling abilities raises a question about children's relative abilities in these various aspects of spelling knowledge. This question can be addressed by looking at the percent of children who demonstrated mastery in each of the six parameters. This relationship is summarized in Table 6.2. Parameter 6 (type of spelling strategy evidenced by spelling errors) was omitted because this parameter was not established by Stage V for any subject. Indeed, this particular aspect of spelling knowledge may continue to develop long past elementary school years.

As predicted by the assessment scheme, some aspects of spelling knowledge are acquired earlier than others. The parameters Directionality (5) and Word Segmentation (2) are the earliest acquired aspects of spelling knowledge, and the correct use of upper and lower case letters (Parameter 4) is one of the latest acquired aspects of spelling ability.
Validity of Stage Assignments

The next question that was addressed had to do with the meaning of stage assignments. Did the spelling sample data suggest that there was any validity to the notion of stage assignment with respect to spelling abilities? Operationalized, this question becomes: Did children tend to obtain the same level of stage assignment for all six parameters?

The degree to which the children obtained the same stage assignment for all parameters was tested by a Kendall Coefficient of Concordance statistic. This statistic tests the extent to which members of a set of distinct rank orderings of N things tend to be similar. In this case, the 24 subjects were ranked according to their performance on each of the 6 spelling parameters, and these rank orderings were compared. The degree to which these rank orders show concordance is given by the coefficient W, which may be interpreted as an average correlation over all pairs of orderings. The coefficient of concordance obtained for the spelling data was $W = .69$. This value indicates a reasonably strong degree of concordance.
among stage assignments for each subject along each parameter (Note 1). A Chi-square test of the null hypothesis proved a level of significance was met at p<.01.

The number of subjects with perfectly consistent stage assignments was 3. 13 subjects had parameter scores ranging across 2 stages, and 8 subjects had parameter scores ranging across 3 stages. Further analysis indicated that even those subjects with parameter scores ranging across 2 or more stages showed a strong central tendency in performance level. On average, 4 out of 6 stage assignments were at a single level.

Both statistical and observational analysis of the spelling sample data thus support the validity of the present stage-like characterization of early spelling abilities.

**Modal Spelling Score and Grade**

The final set of spelling analyses looked at the children’s overall spelling ability as derived from their performance on the six parameters. A modal spelling stage for each child was determined by inspecting stage assignments earned on each parameter of spelling. This modal spelling score was then analyzed for its relationship to grade level. This two-way distribution is summarised in Table 6.3. Modal spelling scores ranged from Stage I to Stage V, and were distributed across all three grade levels, Kindergarten, 1 and 2. Spearman rank order correlations, corrected for ties, indicated a strong correlation between grade level and modal spelling score (R=.77, df=22, T=3.8, p<.01). Grade accounted for some 59 percent of the variance in modal spelling score.
Table 6.3
Modal Spelling Score Across Grade Levels

<table>
<thead>
<tr>
<th>Stage</th>
<th>Grade</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Kindergarten</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>One</td>
<td>7</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Two</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Gender and Modal Spelling Score

The variable of gender did not contribute significantly to the performance on modal spelling score ($X^2 = 4.3$, df=4, $p<.05$).

Summary

The analysis of stage assignment within each parameter showed that children in this study demonstrated a wide variety of spelling abilities. One source of this variance was determined to be grade level. Spelling performance in all parameters except parameter 4 (correct use of upper and lower case) was strongly related to grade level, as indicated by Spearman rank order correlations. On average, grade level accounted for 47 percent of the variance on the various parameters of spelling ability.
As predicted by the spelling assessment scheme, some aspects of spelling knowledge were shown to be acquired earlier than others. Both directionality (parameter 5) and word segmentation (parameter 2) were the earliest acquired aspects of spelling ability. The correct use of upper and lower case (parameter 4) was the latest acquired parameter of spelling knowledge. The particular aspect of spelling knowledge characterized by parameter 6 (type of spelling strategy evidenced for spelling errors) does not lend itself to the concept of "mastery", as spelling strategies continue long past the elementary school years.

Children tended to obtain the same level of stage assignment for all six parameters. The coefficient of concordance obtained for the spelling data (W=.69) indicated a reasonably strong degree of concordance among stage assignments for each subject along each parameter. Further, observational analysis indicated that even those subjects with parameter scores ranging across two or more stages showed a strong central tendency in performance level. These analyses support the current stage-like characterization of children’s early spelling abilities.

Modal spelling score, as determined by stage assignments earned on each parameter, was shown to be strongly correlated to grade level, as indicated by Spearman rank order correlations. Gender was not reliably correlated to modal spelling score.

METAPHONOLOGICAL PERFORMANCE AND MODAL SPELLING SCORE

Having looked at the children’s overall performance on the three measures of metaphonological ability, and at their overall spelling abilities, we can return to the question of the relationship between metaphonological performance and spelling ability.
The first analysis addressed the relationship between met phonological performance as measured by the Y-S test and obtained modal spelling score. Spearman rank order correlations (R=.49, df=22, T=2.58, p<.05), indicated a moderately strong correlation between Y-S and modal spelling score. This test of met phonological ability accounted for 25 percent of the variance in spelling ability.

The next analysis addressed the strength of the relationship between met phonological performance as measured by the TAAS and obtained modal spelling score. A correlational value of .45 was obtained by Spearman rank order correlations (df=22, T= 2.40, p<.05), again indicating a moderately strong correlation between TAAS and modal spelling score. The TAAS accounted for 20 percent of the spelling variance.

The third analysis addressed the strength of the relationship between the composite met phonological score and modal spelling score. Again, Spearman rank order correlations indicated a moderately strong correlation between this measure of met phonological ability and modal spelling score (R=.50, df=22, T=2.47, p<.05). The composite met phonological score accounted for 25 percent of the variance in spelling ability.

The final analysis looked at the relative importance of met phonological abilities, grade and age as predictors of spelling abilities. Although the modal spelling score does not meet the level of measurement usually required for application of parametric techniques, a stepwise multiple regression procedure was used to investigate this question. The arguments of Cohen and Cohen (1983) in regard to rating scales seem appropriate to the current data: "Such scales have equal enough intervals for most purposes. Subjectively, approximately equal intervals have been found to behave more like equal than unequal intervals" (p.273).
With this possibility in mind, a stepwise regression was performed, with independent variables entered in the order: composite metaphonological score, grade and age. This order was specified out of the beliefs (1) that neither grade nor age cause metaphonological abilities, though they may provide occasions for the acquisition of such abilities, and (2) that grade as an index of instruction, and age as a rough index of cognitive maturity may have contributions to spelling ability beyond the mere facilitation of metaphonological abilities.

The results of this parametric analysis indicated that the CMPS was associated with the modal spelling score at the \( R=.7 \) level, accounting for some 50 percent of the variance in the spelling variable. An additional 17 percent of the variance in spelling ability could be attributed to the effects of grade level, but once these two variables were entered into the predictive equation, age made no further independent contribution (Multiple \( R=.82, F=21.54, df=2,21, p<.01 \)). While the result of this analysis should not be taken too literally, it does suggest that the magnitude of the association between metaphonological knowledge and spelling ability may be somewhat stronger than that indicated by the nonparametric Spearman rank order correlations, and that grade level continues to be associated with spelling ability even when metaphonological abilities are controlled.

**Summary**

The relationship of each of the three measures of metaphonological ability to spelling ability was determined to be moderately strong. Spearman rank order correlations indicated that the Y-S accounted for 25 percent of the spelling variance, the TAAS accounted for 20
percent of the spelling variance, and the CMPS accounted for 25 percent of the variance in spelling ability.

The relative contributions of metaphonological ability, grade and age in predicting spelling ability, as tested by a multiple regression analysis, indicated that the CMPS, as step one, accounted for some 50 percent of the spelling variance, grade level accounted for a further 17 percent of the variance, and age contributed no further predictive power.

The findings from the parametric multiple regression analysis suggested that the magnitude of the relationship between metaphonological ability and spelling ability was somewhat greater than that indicated by nonparametric Spearman rank order correlations. Further, grade level was shown to be associated with spelling ability even when metaphonological ability was controlled.
SUMMARY OF FINDINGS

Metaphonological Ability

1. **GRADE X Y-S:** The strength of the relationship between Y-S and grade level was significant but modest, with grade level accounting for 28 percent of the Y-S variance.

2. **AGE X Y-S:** Age was significantly and moderately associated with the Y-S variable, accounting for 48 percent of the variance in Y-S scores.

3. **GRADE X TAAS:** The relationship between TAAS and grade level was significant but modest, with grade level accounting for 31 percent of the variance in TAAS scores.

4. **AGE X TAAS:** The relationship between age and TAAS was marginally stronger than that between grade and TAAS, with age accounting for 37 percent of the TAAS variance.

5. **GRADE X CMPS:** The relationship between CMPS and grade was not significant, with grade level accounting for 20 percent of the CMPS variance.

6. **AGE X CMPS:** Age was significantly and moderately correlated with the CMPS, with age accounting for 50 percent of the variance in CMPS.

Spelling Ability

1. Overall, children demonstrated a wide range of spelling abilities, as indicated by stage assignments within each parameter.

2. Grade level was strongly related to spelling ability in all parameters except one (Parameter 4: Use of Upper and Lower Case). On average, grade level accounted for 47 percent of the variance on the various spelling parameters.
3. Some aspects of spelling knowledge were acquired earlier than others.

4. Children tended to obtain the same level of stage assignment for all six parameters. A reasonably strong degree of concordance \((W=.69)\) among stage assignments for each subject along each parameter was obtained.

5. Modal spelling score was shown to be strongly correlated to grade level. Grade accounted for 59 percent of the spelling variance.

6. Gender was not reliably correlated to modal spelling score.

Metaphonological Ability and Spelling Ability

1. All three measures of metaphonological ability were moderately related to modal spelling score. The Y-S accounted for 25 percent of the spelling variance, the TAAS accounted for 20 percent of the spelling variance, and the CMPS accounted for 25 percent of the variance in modal spelling score.

2. A multiple regression analysis determined that the relative contributions of CMPS, grade and age in predicting spelling ability were as follows: CMPS accounted for 50 percent of the spelling variance; grade accounted for a further 17 percent of the spelling variance; age added no further predictive power.
The purpose of the current investigation was to determine the strength of the relationship between metaphonological ability and early spelling abilities, and to examine the nature of this relationship.

METAPHONOLOGICAL ABILITY AND SPELLING ABILITY

Results of this study indicated that metaphonological performance had moderate predictive strength in relation to spelling ability. All three measures of metaphonological ability were found to be reliable and moderately strong predictors of spelling ability.

Most evidence to date on the relationship between phonological awareness and literacy acquisition has come from correlational studies which have reported reading ability as a measure of literacy acquisition. These studies have consistently reported a reliable correlation between certain measures of phonological awareness and reading ability. As discussed earlier, this finding is open to a number of interpretations with respect to the direction of causality between these two variables. As Ehri (1979) has pointed out, one possible interpretation is that either phonological awareness may be prerequisite to reading ability, or reading ability may be prerequisite to phonological awareness. A second interpretation is that phonological
awareness may enhance reading ability or reading ability may enhance phonological awareness. A third interpretation is that phonological awareness may be a consequence of becoming literate, or becoming literate may be a consequence of developing phonological awareness abilities. Finally, both factors may be indirectly related to a third, as yet unknown, factor.

The issue of the direction of causality between the variables phonological awareness and reading ability has been addressed by a small number of training studies. These studies have attempted to answer the question of whether phonological awareness can be trained, and more importantly, whether such training has an effect on the acquisition of reading skills. As discussed previously, most training studies have reported a significant effect of training in phonological awareness on later reading ability (e.g. Bradley & Bryant, 1983; Olofsson & Lundberg, 1983, in Lundberg, Frost & Peterson, 1988). As discussed earlier, these studies evidence methodological problems which make interpretation of findings difficult. The findings from Lundberg et al. (1988), however, seem to be a valid and important point of comparison. Recall from Chapter Three that these researchers conducted a longitudinal training study in which one group of preschool children received extensive training in metaphonological awareness, while a control group followed the regular preschool program. The average age of children in the study was 6 years. Findings indicated that the training group performed significantly better than the control group on posttest measures of metaphonological ability at the end of the preschool year. Findings also indicated that preschool training in metaphonological ability had a facilitating effect on subsequent reading and spelling abilities to Grade two. The experimental group of children performed
significantly better on posttest measures of reading and spelling ability in first and second grade than the control group of children. Metaphonological awareness was associated with spelling ability at the $R = .61$ level, accounting for 37 percent of the spelling variance.

Our finding that metaphonological ability is moderately predictive of spelling ability is consistent with Lundberg et al.'s finding that metaphonological performance accounted for some 37 percent of the variance in spelling ability in Grade Two.

Lundberg et al.'s finding that phonological awareness can be "trained" independently of formal, and perhaps informal, reading instruction, and independently of any measurable gains in the ability to identify alphabet letters, supports the position that phonological awareness precedes the initial acquisition of knowledge of letter-sound correspondences.

While the convergence of findings from preliminary research, in particular those of Lundberg, Frost and Peterson (1988), indicates that a significant and possibly causal relationship exists between phonological awareness and learning to spell, we cannot, as yet, regard these findings as conclusive. Experimental studies of the relationship between metaphonological ability and spelling ability are few. In addition, the variety of both subject ages and applied measures of phonological awareness and spelling ability make comparisons between studies difficult.

Ultimately, the results of the current study do not resolve the issue of causality. They are consistent with earlier studies that report a moderately strong relationship between metaphonological ability and spelling knowledge (Griffith, 1989; Magnusson & Naucler, 1989; Rohl & Tunmer, 1988), but there is still need for caution in interpreting the direction of causality. The current study makes a unique contribution to this literature by using informal
spelling assessment measures that emphasize the child’s evolving literacy skills rather than orally dictated word lists. It is important to learn that the correlations between metaphonological ability and spelling ability are maintained even with this very different methodology.

Future training studies may continue to indicate that metaphonological ability plays a causal role in the growth of spelling ability. It seems likely, however, that even if this role is convincingly established, the magnitude of the developmental relationships between these areas will remain moderate. In the first place, spelling abilities are likely to be determined by a number of different factors. These may include reading ability, experience and instruction in written language, socioeconomic status, cognitive maturity, metaphonological awareness and aspects of oral language learning other than metaphonological ability. The acquisition of any one of these contributing factors will not uniquely determine the acquisition of spelling ability.

In the present study, support for this view may be found in the results of the stepwise multiple regression analysis, which determined that the CMPS variable accounted for some 50 percent of the spelling variance, and that an additional 17 percent of the variance could be attributed to grade level. The indication that grade level continues to be associated with spelling ability even after metaphonological ability is controlled reflects the possibility that the variable grade subsumes both metaphonological ability and other factors such as literacy instruction and cognitive maturity. These other factors may have contributions to spelling ability beyond the mere facilitation of metaphonological abilities.
Second, spelling ability is not only multidetermined, it is multifaceted. The results of this study have made it clear that spelling ability comprises a number of different developmental aspects of knowledge. With this understanding, it is not surprising to find that metaphonological ability, as measured by children's performance on phoneme segmentation and phoneme deletion tasks, accounted for only 50 percent of the spelling variance. Metaphonological ability may be related to only some aspects of developing spelling knowledge.

The finding that metaphonological ability is moderately correlated to spelling development is, nevertheless, an important one. The predictive strength of the relationship between two variables is not necessarily an indicator of the importance of the relationship. While metaphonological ability does not uniquely determine spelling ability, it may be crucial to those aspects of spelling knowledge to which it does contribute.

SPELLING ABILITY

While it was not the primary consideration of this study to investigate children's early spelling abilities, in fact, the effort to develop a reliable scoring system for children's spelling abilities led to some important findings.

The term "invented spelling" was coined by Read (1971) to describe children's early, unconventional spellings and to distinguish these from memorized wholes and later acquired conventional spellings. Based on Read's (1971, 1973, 1975) landmark studies of young children's knowledge of the phonological structure of their language, other researchers (e.g., Beers & Beers, 1981; Chomsky, 1970; Gentry, 1982; Paul, 1976) sought to examine the
systematic way in which children discover the underlying regularities of language through spelling. The contributions of these researchers in the area of "invented" spelling ultimately led to a theory of spelling development which has challenged traditional theory and practice.

**Stages in Developmental Spelling**

Developmental spelling theorists view spelling acquisition as a developmental process based first of all, on children’s understanding of the phonological structure of their language, but also on the influence of both language and memory variables, the influence of learning to read, and the practice of spelling in purposeful writing (Morris, 1989). Primary emphasis is placed on children’s individual abilities in the nature and rate of spelling acquisition, and on the "invented" spelling strategies children use to spell words.

Researchers in developmental spelling (e.g. Forester, 1980; Gentry & Henderson, 1978; Read, 1971, 1975) have proposed that children’s growing differentiation of orthographic knowledge can be characterized by five developmental stage levels: Precommunicative, Semi-Phonetic, Phonetic, Transitional and finally, Correct (Conventional) spelling.

This view of spelling acquisition has been met with criticism. For example, Groff (1986) argued that no precise normative data has been made available for the stages at which children enter and leave any given stage level, and that parameters of the levels of developmental spelling appear to be indefinite and subjectively determined. It is true that the research to date on developmental spelling has tended toward the anecdotal, and there has been a need for empirical support.
The findings from this study help to ameliorate this situation. The scoring system used in the current study was based in part on the stage level features documented by Beers and Beers (1981), Gentry (1982) and Read (1971), and in part on observational analysis of our subject’s spelling errors.

In the current study, the spelling data were analyzed according to six parameters of spelling knowledge:

1. Sound-Symbol Correspondence
2. Directionality
3. Vowel Representation
4. Use of Upper and Lower Case
5. Word Segmentation
6. Type of Spelling Strategy Used.

Recall that in the assessment scheme used in this study, each stage was behaviorally characterized along each of these parameters.

Two examples of spelling samples taken from the data are reproduced here in order to illustrate how stage levels were assigned on the basis of parameter feature analysis.
Example 1: Stage I Spelling

(1) (2) (3)

In the verbal retelling, this spelling sample was revealed to depict (1) "sun", (2) "house", and (3) "Ants on a sidewalk". A one-to-one sound-symbol correspondence, even at the rudimentary level, is not apparent. Thus, Parameter 1 (Sound-Symbol Correspondence) was assigned a Stage I value. While at first glance, this child appears to be representing vowels, the proliferation of vowels makes it dubious that vowel sounds in words are represented. Thus, a Stage I level was also assigned to Parameter 3 (Vowel Sound Representation). In the case of random symbol representation, left to right directionality for letters in words may only be assumed. However, this subject was observed to write letters from left to right, thus a Stage I level was assigned to Parameter 2 (Directionality). Although no letter reversals occurred, the lack of word segmentation precluded any judgement of the left to right directionality of words in sentences. Thus, Parameter 2 was assigned a Stage I level. Inconsistent use of upper and lower case letters earned this subject a Stage I assignment for Parameter 4 (Use of Upper and Lower Case), plus a Continued Feature Stage II assignment. The absence of consistent word segmentation indicated a Stage I assignment for Parameter 5 (Word Segmentation). No spelling strategies were in evidence, and letters appear
to be primarily randomly strung together. Thus, Parameter 6 (Type of Spelling Strategy Evidenced by Spelling Errors) was also assigned a Stage I value. In total, six Stage I features and one Stage II Continued Feature are observed. Thus, the modal spelling score for this subject is Stage I.

**Example 2: Stage III Spelling**

```
Bat man  fut the
John . J.
```

In the verbal retelling, this example was said to depict "Batman fights the Joker". Parameter I (Sound-Symbol Correspondence) was assigned a Stage II value. This assignment was based on the fact that a one-to-one sound-symbol correspondence is evident for most, but not all, spelled words. For example, this child omitted the "s" sound in "fights" at the end of the word "Fut", and the vowel in the last syllable of "Joker", spelled "Jokr". A Stage III assignment (an Established Feature) was given for the Parameter Directionality (2), as both left to right and top to bottom directionality are evident. Vowel Sound Representation (Parameter 3) was also given a Stage III assignment. Most vowels in syllables are represented; the only exception to this is the vowel omission in the final syllable of "Jokr".
The use of upper and lower case letters (Parameter 4) is incorrect, but somewhat consistent, as evidenced by the upper case letter at the beginning of the word "Fut" in the middle of the sentence. Thus, Parameter 4 was assigned a Stage III value plus a Continued Feature Stage IV value. Word segmentation (Parameter 5) was judged to be inconsistent, based on the division of "Batman" into the two words "Bat" and "man", and the incorrect use of punctuation to separate the child's initial in his name (S.) from the rest of the sentence. Thus, Parameter 5 was assigned a Stage II value. In retrospect, it seems possible that this child overgeneralized both the use of punctuation and the principle of word segmentation, and thus, may have deserved a higher stage assignment for Parameter 5. However, this would not have affected the modal spelling score. Parameter 6 (Type of Strategy Evidenced for Spelling Errors) was assigned a Stage III value. The use of syllabic "R" in the spelling "Jokr" is consistent with "invented" acoustic-articulatory spelling strategies that emerge at Stage II and are carried into Stage III. The substitution of short vowels ("Fut" for "fight") is consistent with Stage III visual-orthographic strategies for vowel representation. The use the short vowel "u" in the spelling of "fights" as "Fut" seems to indicate that this child may have been spelling "fought", in which case the production of "u" may have been a visual strategy for remembering the "ou" digraph. However, this observation is merely speculation. In summary, this child obtained a total of five Stage III assignments, including one Established Feature, one Stage IV assignment for a Continued Feature, and one Stage II assignment. Thus, the modal spelling score for this child is Stage III.
As you can see from the above examples, children tend to demonstrate spelling abilities at more than one stage level. Even though it is true that individual children demonstrated spelling abilities across more than one stage level, the degree of variation was not great. In fact, some degree of variation in abilities is to be expected in any multifaceted and multidetermined area of child development. With this in mind, the findings from this study do seem to support the stage-like characterizations of early spelling abilities. Both statistical and observational analyses confirmed that subjects strongly tended to obtain the same level of stage assignment for all parameters. This finding is especially interesting given the wide range of spelling abilities evidenced by the children.

**Acoustic-Articulatory vs. Visual-Orthographic Spelling Strategies**

The apparent validity of the spelling assessment scheme suggests, first, that children’s early "invented" spellings evidence a progressive refinement toward conventional spelling, and that spelling errors may be characterized in terms of the type of strategy used. The spelling data clearly show that children from Kindergarten to Grade Two rely increasingly on visual-orthographic spelling strategies and less on "invented" acoustic-articulatory strategies for spelling unfamiliar words.

**Parameters of Spelling Development**

The validity of the stage-like characterization of spelling abilities further suggests that there are distinct aspects, or parameters, of spelling ability. These distinct aspects of spelling
ability have been documented in the developmental spelling literature and were represented as parameters in the scoring system used in this study.

The findings from this study support the view held by developmental spelling theorists that spelling ability is comprised of different aspects of knowledge, each of which follows its own developmental path. Further, the development of the scoring system used in this study leads to the speculation that some parameters of spelling ability are more closely tied to metaphonological knowledge than others.

Consider, first, the parameters related to knowledge of letter-sound correspondences: Sound-Symbol Correspondence (1) and Vowel Representation (2) (Note 2). The first stage of developmental spelling is characterized primarily by a lack of knowledge of phoneme-grapheme correspondences. At stage II, children’s spelling errors evidence a rudimentary grasp of sound-symbol correspondences. By stage III, children are able to map most or all sounds in words to graphemes. This particular aspect of spelling knowledge is mastered at stage IV. It seems likely that the acquisition of knowledge of letter-sound correspondences must rely to some degree upon children’s developing phonological awareness. When children learn to spell, they discover the principle that phonemes in spoken words roughly correspond to graphemes in written words. It seems logical that the ability to consciously segment words into phonemic units precedes the ability to spell individual sounds within words. As discussed above, some support for this position is found in the results of Lundberg, Frost and Peterson’s (1988) training study, in which spelling ability in Grade Two was facilitated by preschool training in metaphonological skills while the effect of formal reading instruction was
controlled. It is our position that phonological awareness may directly influence children's initial understanding of letter-sound correspondences.

In contrast to the two parameters representing knowledge of letter-sound correspondences, other aspects of spelling knowledge seem less closely related to phonological awareness. For example, the ability to correctly segment words by spacing is an ability that relies on the explicit knowledge that one specific spoken word corresponds to one specific written word. This knowledge would seem to entail "word awareness", that is, conscious attention to the nature and existence of words. Phonological awareness, on the other hand, refers to the explicit understanding that words can be analyzed into sounds, and that sounds can be synthesized to form words. Both areas of knowledge are metalinguistic and arise out of a child's developing oral language skills, but they are clearly distinct areas of learning. Finally, some parameters of spelling ability seem to be less reliant on any sort of prior oral language knowledge than they are upon knowledge gained through experience and instruction in written language. Consider the parameters Directionality (2) and the Use of Upper and Lower Case (4). Both these aspects of spelling knowledge are conventions of English orthography that may be strongly influenced by literacy experience and instructional factors. The left to right progression of letters in words, and words in sentences, and the top to bottom orientation of sentences on a page are conventions of English orthography that appear to rely on visual exposure to print, or on direct instruction. Similarly, the understanding of the correct use of upper and lower case letters is not an area of knowledge gained through oral language skills, but through experience and instruction in written language conventions.
It appears that some aspects of spelling ability, such as the knowledge of letter-sound correspondences, are to some degree reliant on metathronological ability. Other aspects of spelling ability, such as the use of upper and lower case letters, and knowledge of text directionality, appear to be more dependent upon literacy experience and instructional variables.

Future research may determine the magnitude of the relationship between metathronological ability and the various parameters of spelling ability identified in the present assessment scheme.

Early and Late Acquired Abilities

The apparent validity of the stage scheme used in this study suggests that some aspects of spelling knowledge are acquired earlier than others. Recall that the ability to correctly segment words by spacing (Parameter 5) is mastered at Stage III, whereas the ability to represent vowels in all syllables (Parameter 3), is not mastered until Stage IV. The earliest acquired aspects of spelling knowledge appear to be relatively simple in comparison to later acquired abilities.

In a different line of research, some authors have argued that different metathronological tasks may require differing cognitive operations (Lewkowicz, 1980, Backman, 1983, Stanovich, Cunningham & Cramer, 1984, in Lundberg, Frost & Peterson, 1988). Perhaps different aspects of spelling knowledge require similarly different cognitive capacities for the execution of metalinguistic operations upon the alphabetic code. Future research is needed to explore this possibility.
METAPHONOLOGICAL ABILITY

This study was not designed to explore the development of metaphonological ability, and few findings here are relevant to current issues in this domain. It is worth noting, however, that the findings from this study do not support that there are simple and compound aspects of phonological awareness, at least as evidenced by the children's performance on the two tests of metaphonological ability. Both tests predicted spelling ability to the same degree. Contrary to Yopp's (1988) suggestion that the Y-S is a test of simple phonological awareness and the TAAS a measure of compound phonological awareness, average test performance of subjects in this study was higher for the TAAS than for the Y-S. It is possible that test scoring on the Y-S differed between this study and Yopp's, in that this study may have employed stricter criteria for correct responses.

Another aspect of our results that is provocative and invites further research is the finding that age is a more powerful predictor of metaphonological ability than is grade level. This finding may merely reflect the fact that the age variable was more finely scaled than the grade variable. If confirmed by later research that avoids this problem, however, this finding would suggest that aspects of cognitive and linguistic growth that are unrelated to schooling may play a role in the acquisition of metaphonological skills.
IMPLICATIONS FOR INSTRUCTION

The Nature of Spelling Abilities

The results of this study have implications for instruction of two sorts. The first implications arise out of the essential validation of the position that the acquisition of spelling knowledge is a developmental process which involves various aspects of knowledge. If this position is a valid one, how should spelling instruction be implemented?

Read (1971,1973,1975) emphasized that children's misspellings are a valid reflection of their phonological knowledge, even though misspellings might not match adult's perceptions. Children's early "invented" spellings accurately reflect this knowledge. Developmental spelling theorists propose that children's misspellings should be accepted rather than corrected by teachers. If children are encouraged to generate "invented" spellings, how will they ever learn to spell correctly? The developmental spelling position is that, in the early stages of spelling development, children must be allowed to depict spelled words in accordance with their understanding of the phonological structure of their language. In this way, they become active participants in their own learning process. As children gain experience with written language, by both writing and reading, their knowledge of the orthographic principles of English spelling naturally broadens. Visual memorization and morphological knowledge begin to influence their capacity for conventional spellings. This new information is assimilated and used to refine their own spelling rules. The spelling data from this study clearly showed that children from Kindergarten to Grade Two rely
increasingly on the use of visual-orthographic spelling strategies rather than "invented" acoustic-articulatory strategies.

Developmental spelling theory also advocates the "natural" progression of spelling development without the aid of formal instruction. Why should children be encouraged to use spelling strategies when formal instruction can teach them spelling rules? Developmental spelling theorists believe that learning to spell is not a process of rote memorization, but a progressive development in understanding and mastering the properties of English orthography. Developmental spelling strategies are employed by children to internalize the regularities of English spelling. The de-emphasis of spelling mechanics and correction in favor of accepting children's "invented" spellings as part of their naturally developing knowledge of English orthography is advocated. Children are said to be ready for formal spelling instruction only after progressing through the five developmental spelling stages. Chomsky (1979) advised that students who are able to invent their own spelling systems can more readily adapt to a standard system.

This position is in contrast to the traditional phonics approach to teaching spelling. The assumption behind the phonics approach to teaching is that spelling can be learned by the application of a one-to-one phoneme-to-grapheme rule, and memorizations of the exceptions to this rule. Unfortunately, English orthography, for the most part, is not governed by one-to-one phoneme-to-grapheme correspondences, and there are many more exceptions than cases which fit this rule.

Although Zutell (1978, 1979) concurred with other researchers that spelling mechanics and correction should be minimized, he did suggest that the correct spelling form be available
to students for comparison purposes. In fact, in many "whole language" classrooms, children’s writings are translated by the teacher and the child for "publication". In this way, children are provided with a correct model of their spellings, and made aware that their spellings are not conventional, without their own spellings being corrected.

Developmental spelling theory emphasizes the importance of individual assessment to determine children’s readiness for formal instruction. The developmental position can be incorporated into classroom practice without abandoning all traditional methods of spelling instruction. A teacher who is aware of the developmental nature of spelling ability will understand why children vary greatly in their spelling abilities within grade levels. Although the findings from this study indicated that grade level was strongly related to spelling ability, children’s spelling abilities within grade levels ranged across two or three stage levels. Henderson (1985) has suggested that the order in which new spelling words are introduced should consider not only word frequency and orthographic patterning appropriate to grade level, but also a child’s individual level of ability along the developmental spelling continuum. For example, instruction in vowel diphthong patterns involving word sorts (e.g. sorting words under the headings "snow", "down", "cloud") may be most effective for children who have reached a Stage III level, where experimentation with diphthong patterns in their novel spellings is observed.

A developmental spelling assessment system, such as the one used in this study, can be a valuable diagnostic tool for teachers. In this way, teachers are provided with a systematic way of tracking spelling progress which allows them to individually assess children’s readiness for formal instruction. Teachers may fine-tune children’s individual instructional
needs by examining their misspellings to determine their both their readiness for instruction, and their level of word knowledge. A child's misspellings may provide teachers with insight into which area of orthographic patterning a child is learning, and instruction may be presented accordingly.

The Relationship Between Metaphonological Ability and Spelling Ability

The second set of instructional implications in this study have to do with the relationship between metaphonological awareness and spelling ability. Developmental spelling theory emphasizes the importance of phonological awareness in the acquisition of spelling knowledge. Read (1971) attempted to define the phonological knowledge children possess of their language by analyzing the error patterns observed in their misspellings. He concluded that children develop their own spelling strategies based on their phonological knowledge before any formal literacy instruction had begun. While no one would deny that children enter Kindergarten with some knowledge of the phonological structure of their language, the contribution of developmental spelling theorists has been in describing how children apply this knowledge in their discovery of the underlying regularities of English orthography.

Support for the critical role of phonological awareness in spelling development was discussed above, with specific reference to the training study by Lundberg et al. These authors found that children who received preschool training in phonological awareness performed significantly better on reading and spelling tasks in Grades One and Two than did a control group.
While phonological awareness may play a critical role in the acquisition of spelling knowledge, the findings from this and earlier studies suggest that the strength of the relationship between metaphonological ability and spelling ability is modest. As argued above, this finding is consistent with the view that the acquisition of spelling knowledge is dependent upon many factors, among these metaphonological ability, literacy experience and instruction. Gentry (1978) has suggested that second grade is a pivotal year for beginning writers and readers. By grade 2, most children have received some kind of literacy instruction, whether formal or informal. They have gained experience in written language knowledge through their own readings and writings. Most have developed a high degree of metalinguistic awareness, and possess the general cognitive capacity to perform metaphonological operations upon the alphabetic code. For most children, the transitional stage (IV) of spelling development occurs during grade 2. Prior to this point, children’s misspellings evidence a strong reliance on "invented" acoustic-articulatory spelling strategies, but from this point onward, children rely increasingly on visual-orthographic spelling strategies. As discussed above, early "invented" spellings may be dependent upon metaphonological abilities, whereas visual-orthographic misspellings appear to be more dependent upon literacy experience and instructional factors.

Some support for this position is given by Griffith (1989), who compared the performance of children in grade one and two on measures of phonological awareness, "word-specific information" (recognition of idiosyncratic spellings of specific words) and spelling ability. Her findings indicated that phonological awareness is more strongly correlated to spelling ability in grade one, and that "word-specific information" is more strongly correlated
to spelling ability in grade two. She also reported that high levels of word-specific awareness
did not occur in the absence of high levels of phonological awareness, indicating that the
former was to some degree dependent upon the latter.

The indication that specific aspects of phonological awareness play a critical role in
the acquisition of spelling knowledge suggests that teachers may facilitate spelling ability by
focusing on activities which develop metaphonological ability prior to formal spelling
instruction. By implication, phonological awareness training may benefit those children who
have difficulty acquiring literacy skills.

Research in "invented" spelling has presented educators with a new way of thinking
about spelling development. As in all areas of research on child development, one must look
toward the driving force of theory to practice. Developmental spelling theory carries
implications for both the construction of spelling curricula and the teacher's role in spelling
instruction.

This area of research is admittedly a young one. However, the large body of
developmental spelling research cannot be summarily discounted for this reason. True, it
would be premature to discard traditional instructional methods that have proven effective in
the past, but it would also be foolish to disregard the implications of developmental spelling
research. New insights offered by research into developmental spelling can "augment, not
supplant, that which has made sense in traditional practice" (Morris, 1989).
FUTURE RESEARCH

Future directions for research that arise out of the present study seem to involve the following areas:

1. Training studies to establish the magnitude of the effect of preschool training in specific metaphonological abilities on later spelling ability

2. The investigation of the relationship between certain aspects of metaphonological awareness and specific parameters of spelling knowledge, such as letter-sound correspondences

3. The examination of the variable roles of grade and age in metaphonological ability.

SUMMARY AND CONCLUSION

The purpose of the present study was to investigate the relationship between aspects of metaphonological awareness and spelling ability in children from Kindergarten to Grade Two. The major finding from this endeavor is that a reliable and moderately strong relationship exists between certain measures of metaphonological ability and early spelling ability. This finding is compatible with a view of spelling knowledge as a multidetermined and multifaceted ability. Spelling ability may be influenced by a number of determining factors, including metaphonological awareness, general cognitive ability, literacy experience and formal instruction. Further, spelling ability comprises various parameters of spelling knowledge. With this understanding, it is not surprising to find that the single contributing variable of metaphonological awareness is only moderately related to spelling ability. This
finding is compatible with earlier studies on the relationship between metaphonological awareness and spelling ability. The current study makes a unique contribution to the literature by using informal spelling assessment measures that emphasize the child's evolving literacy skills rather than orally dictated word lists. Taken together with the considerable body of literature on developmental spelling, findings from this study suggest that children's early spelling abilities can be characterized by arbitrary stage levels, and that different parameters of spelling knowledge comprise this developmental continuum. The primary instructional implication of this area of research is that teacher's be sensitive to children's individual understanding of English orthography as they acquire knowledge of conventional spelling.
NOTES

NOTE 1: This generalization is based on group studies of children who individually demonstrate this trend to greater or lesser.

NOTE 2: As implemented by the statistical program BMDP, the criteria for the Kendall Coefficient of Concordance statistic dictated that, for any one subject, the same stage level may not be assigned for all parameters. This criterion was met by arbitrarily assigning a one-level lower stage for one parameter only, for those subjects (N=3) who obtained perfectly consistent stage assignments. Thus, the "best" possible range of stage assignments across parameters was two, and the resultant coefficient actually underestimates consistency of stage assignments within subjects. One subject, who could be assigned to a stage on only one parameter, was omitted from the data in order to run this particular analysis.

NOTE 3: The parameter Vowel Representation (2) was analysed independently of Sound-Symbol Correspondence (parameter 1) for the reason that the emergence of one-to-one sound-symbol correspondence for vowels in children's early spellings occurs at a later stage than the representation of consonant sounds. For example, at Stage II rudimentary sound-symbol correspondences are observed primarily for consonant
sounds, whereas vowels are typically omitted. By stage III, children represent most vowels and consonants, though not necessarily by correct spelling.
REFERENCES


