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The Relationship Between Static and Dynamic Measures of Phonological Awareness and Measures of Reading in Children with Speech-Language Disorders in Early Grades

by

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The undersigned certify that they have read, and recommended to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled *The Relationship Between Static and Dynamic Measures of Phonological Awareness and Measures of Reading in Children with Speech-Language Disorders in Early Grades* submitted by Catherine R. O'Connell in partial fulfillment of the requirements for the degree of Master of Science in Speech-Language Pathology.

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Abstract

Relationships between static and dynamic measures of phonological awareness and measures of reading were investigated in 20 Grade 1 and Grade 2 children with speech-language disorders. Static (conventional, nonprompted) and dynamic (prompted) forms of rhyme production, phoneme segmentation and phoneme deletion, as well as 2 measures of word recognition were administered. Correlations between phonological awareness measures and measures of reading and differences between dependent correlations (static & reading; dynamic & reading) were examined. Results indicated that one dynamic measure, dynamic segmentation, demonstrated a stronger relationship with a reading measure than its static counterpart. It is concluded that a dynamic assessment task can strengthen the relationship between phonological awareness and early reading. The suggested predictive utility of dynamic assessment requires further study.

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CHAPTER I

Introduction

Research in the past fifteen years has focused on phonological processing skills as possible sources for explaining deficits in reading acquisition in young children. Phonological processing refers to use of the sounds of language to process verbal information in oral or written form in short and long-term memory (Wagner & Torgesen, 1987). Phonological processes are considered good candidates as specific causes of reading disability because of their established strong correlation with reading and relative independence from general intelligence (Stanovich, 1988).

One area of phonological processing that has received much attention is phonological awareness. A decade of research on reading has highlighted a consistent relationship between phonological awareness and reading acquisition (see reviews by Adams, 1990; Wagner & Torgesen, 1987). Research has typically been carried out with normally developing children though a growing number of studies involving children with speech-language impairments also demonstrates this relationship (Magnusson & Naucler, 1990). Children with speech-language impairments are at risk for reading difficulties (Bishop & Adams, 1990, Catts, 1991) and often exhibit deficits in phonological awareness (Catts, 1993), considered to be causally linked with reading (Wagner & Torgesen). Children with speech-language impairments may perform poorly on phonological awareness tasks due to phonological processing deficits or due to difficulties in comprehending task demands. A limitation of conventional phonological awareness tasks lies in the high number of false negatives that result (Spector, 1992). This may be the case when the child fails the task but may possess or easily acquire the ability that the task was designed to measure. Dynamic assessment is a procedure which emphasizes the process as well as the product of assessment and it has been put forward as a means of dealing with this shortcoming in conventional tests. Dynamic assessment has been recommended as a useful addition to the assessment battery in the area of phonological awareness (Spector).

This study addressed the relationship between three phonological awareness tasks and reading ability in children with speech-language impairments utilizing both conventional (static) and dynamic measures of phonological awareness. The present study expanded on work conducted by Spector (1992) who used typically developing children and one dynamic assessment measure of phonological awareness.

CHAPTER II

Literature Review

Phonological Awareness

Phonological awareness is the awareness of, and ability to manipulate the phonological segments in words, specifically the phonemes represented in an alphabetic orthography (Blachman, 1991). This skill is part of the broader area of language knowledge termed metalinguistic awareness, that is, the ability of the listener to reflect upon the features of spoken language and manipulate them (Dohan, 1996). Phonological awareness is developmental in nature and appears to be related to maturation of cognitive-linguistic abilities (Catts, 1991). A large body of research indicates that phonological awareness is an underlying and critical dimension to early reading ability (Ball & Blachman, 1988; Swank & Catts, 1994). Awareness of phonological segments has been found to influence decoding ability (Catts, 1993) and to influence reading comprehension indirectly (Stanovich, Cunningham & Cramer, 1984). Poor readers and normal readers differ significantly in phonological awareness skills, with children demonstrating poor phonological awareness appearing to have more difficulty learning to read than children with well-developed speech-sound awareness (Wagner & Torgesen, 1987). Findings from a large body of research converge to suggest that students who enter grade one with little phonological awareness experience less success in reading than peers who enter school with conscious awareness of the sound structure of words and the ability to manipulate sounds in words (Adams, 1990). From a theoretical perspective, these findings are consistent with models of reading acquisition that emphasize the critical role of insight into the alphabetic principle during the initial stages of learning how to read (Perfetti, 1985).

Awareness of phonological segments appears to be significantly influenced by reading experience or instruction. Children who successfully learn an alphabetic writing system become explicitly aware of phoneme-sized units and can perform a wide variety of tasks that require the segmentation and\or manipulation of these units (Perfetti, Beck, Bell, & Hughes, 1987). Spontaneous development of these skills does not occur without exposure to the alphabetic system (Lundberg, Frost, & Peterson, 1988; Morais, Cary, Alegria, & Bertelson, 1979). However, growth in phonological awareness is not simply a reflection of knowledge and skill acquired as a result of learning to read. Research by Torgesen, Wagner, and Rashotte (1994) indicates that phonological awareness skills are remarkably stable over the early school years, beginning prior to reading instruction, suggesting that phonological awareness and other phonological processing skills are an enduring aspect of children's cognitive endowment.

While a sizable body of research indicates causal and reciprocal relations between phonological awareness and reading acquisition, questions remain concerning the extent to which it is necessary or sufficient for adequacy in literacy development (Bird, Bishop, & Freeman, 1995). Research findings appear to be converging on the fact that while phonological awareness is necessary, it is not sufficient for successful reading acquisition. Knowledge of letter-sound correspondence and knowledge of the utility of the alphabetic principle in the context of reading are crucial. Recent research suggests that ability to efficiently represent phonological information in working memory and access phonological information in long-term memory may significantly affect ease of reading acquisition (Torgesen, Wagner, & Rashotte, 1994).

While a reciprocal relationship between reading and phonological awareness exists, Stanovich (1992) states that the relationship is developmentally limited. There is a stage where direct visual access in reading predominates, when the influence of phonological awareness can no longer be seen as a primary cause of differences in reading ability.

There is moderate support for phonological awareness being a general ability with multiple dimensions of varying complexity as distinct from a collection of independent but related abilities. Support for a general ability theory arises from the high degree of interrelatedness among dimensions of phonological awareness in a variety of research. This degree of interrelatedness suggests that the dimensions tap a similar construct (Yopp, 1988). However, some phonological tasks (e.g., rhyme) do not fit well into the general ability model. Yopp (1988) conducted a factor analysis on ten phonological tasks and found that rhyme was only minimally involved in the factors that emerged, suggesting that rhyme tasks may tap a different underlying ability than other tests of phonological awareness.

Phonological awareness has been measured by performance on a wide range of tasks, including rhyming (Bird, Bishop & Freeman, 1995; Blachman, 1984; Calfee, Chapman, & Venezky, 1972), segmenting words into syllables (Sawyer, 1987), segmenting words into phonemes (Kamhi & Catts, 1986), syllable and phoneme blending (Catts, 1993), syllable and phoneme deletion (Catts, 1993) and phoneme reversal (Alegria, Pignot, & Morais, 1982). A hierarchy of difficulty of phonological awareness tasks has been identified in the literature ranging from easiest (rhyme, auditory discrimination, blending) to hardest (phoneme segmentation, phoneme deletion) (Adams, 1990; Yopp, 1988). Stanovich (1992) suggests a continuum of phonological awareness tasks ranging from "deep" sensitivity to "shallow" sensitivity with tasks involving deeper levels of sensitivity requiring more explicit reports of smaller sized units, that is, phonemes versus syllables. Examples of deeper tasks would be sound isolation tasks and phoneme segmentation tasks while tasks tapping the shallow forms of phonological awareness would be rhyming. It appears that at least some ability to distinguish phonological elements smaller than syllables ("deep" sensitivity) is necessary to make use of the alphabetic orthography (Gough, Juel, & Griffith, 1992). Meanwhile, the "shallow" forms serve as powerful prerequisites in acquiring literacy (Stanovich, 1992). Bird, Bishop, and Freeman concur and suggest that rhyming activities in the form of rime and onset matching tasks tap a primary skill in analyzing speech input in terms of subsyllabic units, and deficits in this skill lead to problems in acquisition of an alphabetic reading strategy. Research by Bryant, Bradley, MacLean, and Crossland (1989) and Bryant, MacLean, Bradley, and Crossland (1990) also points to the contribution that rhyme makes to reading, indirectly by leading to awareness of phonemes which in turn affects reading and directly, by focussing on intrasyllabic units which represent whole spelling sequences (e.g. -ight). These sequences play a crucial role in learning to read.

Previous research has identified tasks that appear to be reliable and valid predictors of reading progress. Yopp (1988), for example, identified two tasks from a battery of ten phonological awareness tests (a phoneme segmentation task and an phoneme deletion task) that together accounted for 58% of the variance in scores on a learning test designed to simulate the learning-to-read process.

While studies have identified phonological awareness tasks which predict reading progress (Bradley & Bryant, 1985; Share, Jorm, Maclean, & Matthews, 1984), these prediction studies have, at times, resulted in seemingly contradictory findings. Stanovich et al. (1984), working with kindergarten children, found that while all nonrhyming phonological awareness tasks correlated significantly with reading (correlations ranging from .39 to .60), none of the rhyming activities administered correlated significantly with reading tasks a year later. Blachman (1984), found that rhyme production was a significant predictor of reading achievement although only in kindergarten. The apparent contradiction in results can be explained by a timing factor - Blachman's study was administered at the beginning of the kindergarten year while Stanovich et al. administered the rhyming tasks at the end of the kindergarten year when greater proficiency in rhyme might be expected. Indeed, Stanovich et al. reported that a ceiling effect was evident, accounting for the insignificant relationships between rhyme and reading. Similarly, Bird, Bishop, and Freeman (1995) found that measures of phonological awareness (rime matching, onset matching and onset segmentation and matching) did not predict which children would have good reading and spelling outcomes when reassessed almost two years later. However, Bird, Bishop, and Freeman note that the children all had phonological impairments and that many scored at chance on the phonological awareness tasks, resulting in a restricted range of scores. They suggest that data on a mixed sample that included the matched control children might have resulted in a different outcome.

Many studies have found strong correlations between phonological awareness and measures of reading (Lundberg, Oloffson, & Wall, 1980, Stanovich et al., 1984). However, a study by Felton and Brown (1990) found no relationship between phonological awareness and later reading abilities, when IQ was controlled, despite research evidence to suggest that phonological awareness skills are largely, though not completely independent of general cognitive ability (Torgesen, Wagner & Roshotte, 1994). Felton and Brown explained this discrepancy in part by reporting that their at-risk sample presented a more restricted range of phonological abilities and reading outcomes than samples containing a wider range of abilities, thus resulting in smaller correlations. Furthermore, they used a broad-based measure of general ability to control for IQ which resulted in a smaller estimate of variance attributable to phonological abilities. In addition, they reported that a subset of the subjects had received intensive reading instruction. Consequently, the presumed interaction between instruction and any deficit in phonological awareness would decrease the relationship between awareness and reading outcome. This instruction component considerably limits the extent to which these findings can be generalized.

The studies above highlight difficulties in evaluating and comparing results of studies in phonological awareness. Some researchers in the area, for example, Stanovich et al. (1984) and Yopp (1988) draw attention to a number of experimental paradigms using a variety of tasks found in studies of phonological awareness. These tasks involve many cognitive processes (e.g. stimulus comparison, processing of task instructions) in addition to the phonological awareness ability that is the focus of interest. Furthermore, subject groups vary. They include typically developing, academically "at risk" and language-impaired children. These and other confounding factors, such as instructional effects make interpretation and comparison of studies and consolidation of knowledge somewhat difficult.

Relationship between Oral Language and Reading in Children with Speech-Language Disorders

Language-based theories of reading have come to the fore in the past two decades (Liberman, 1983; Mattingly, 1972; Stanovich, 1986). Some researchers, for example Catts (1991), view problems with reading as a developmental language disorder and suggest that deficits in oral language may be an early manifestation of a reading disability. Researchers have examined the oral language-reading relationship from a number of perspectives. One area of research has looked at the language difficulties exhibited by children with identified reading problems. This work has shown that many children with reading disabilities also have difficulties in the use and/or comprehension of morphology and syntax (Kamhi & Catts, 1991) narrative production (Feagans & Short, 1984), naming (Kamhi, Catts, Mauer, Apel, & Gentry, 1988), verbal short memory, (Shankweiler, Liberman, Mark, Fowler, & Fischer, 1979) as well as in phonological awareness (Kamhi & Catts, 1986).

Another area of research that has been particularly useful has been the longitudinal investigation of preschool children with speech-language impairments. Studies have shown that many of these children have reading disabilities in the primary grades (Bishop & Adams, 1990; Menyuk et al., 1991). The percentages of language impaired children with subsequent reading deficits varies from lows of 25% (Bishop & Adams, 1990) to highs of over 50% (Stark et al., 1984) depending on sampling factors and how reading deficits have been defined. Studies have indicated that deficits in the semantic-syntactic aspects of language are associated more often with reading disabilities than difficulties that are restricted to phonology (Bishop & Adams, 1990). However this subgroup of children with phonological impairments has not been studied extensively and a few recent studies suggest some children within this subgroup may, in fact, be at greater risk for reading difficulties. Bird, Bishop, and Freeman (1995) found that while children with isolated phonological problems performed better on literacy tasks than children with phonological deficits and additional language problems, their performance was depressed compared to their nonverbal abilities. In spite of this, these children with isolated phonological impairments with high nonverbal abilities had developed literacy skills adequate to master reading and spelling at an age-appropriate level. Bird, Bishop, and Freeman suggested that age and severity of impairment may be critical to good literacy outcome. There was a tendency for those with good outcomes to be children who were aged under 5:6 when first seen and who had moderate rather than severe phonological impairments. Shriberg and Kwiatkowski (1988) found that intelligibility (as distinct from severity), error type (word final errors, cluster errors, deletion of unstressed syllables in words of three or more syllables), as well as cognitive and linguistic status were predictive factors in educational outcome. Magnusson and Naucler (1990) also suggest that type of phonological disability may be critical. Children showing sequential errors (assimilations, metathesis) are at a greater risk for reading problems than those with primarily segmental errors (substitutions, deletions). Similarly, Catts (1993) suggests that children exhibiting specific types of phonological errors in multisyllabic words and in phonetically complex phrases may be at increased risk for reading difficulties. Catts has attributed these difficulties to problems in phonological encoding, as well as speech sound planning and articulation. Bird and Bishop (1992) have linked expressive phonology problems with an inability to analyze words at the level of phonemic segments. Children who do not perceive that different words are composed of a small number of phonemic units are likely to be inefficient in learning how to pronounce new words. Such analysis problems have long been linked with difficulties in early reading acquisition.

Although the relationship between oral speech-language deficits and reading appears to be a strong one, Kamhi and Catts (1991) argue that the relationship is not straightforward. It is not the oral speech-language problem that causes the reading difficulty but an underlying processing limitation that affects both spoken and written language development. Processing limitations suggested in the literature include encoding, retrieving and using phonological memory codes (Catts, 1991).

Phonological Awareness in Children with Speech-Language Impairments

Research suggests that children with speech-language impairments frequently exhibit deficits in phonological processing, including phonological awareness, which are most often associated with reading disabilities (Catts, 1989). A limited number of studies have been carried out on the phonological awareness abilities of children with speech-language impairments and these studies have consistently shown that these children perform less well on phonological awareness tasks than their normally developing peers (Catts, Swank, McIntosh, & Stewart, 1989; Kamhi, et al. 1988; Kamhi & Koenig, 1985; Warrick & Rubin, 1992; Webster & Plante, 1992). Paul, Laszlo, and McFarland (1992) suggested that performance by children with histories of speech and language impairment on phonological awareness tasks may vary depending on the type of phonological awareness task administered. In their study, kindergarten children with a history of slow expressive language development and phonological impairment performed within normal limits on suprasegmental phonological awareness tasks such as rhyming but performed poorly compared to controls on tasks of a segmental/phonemic nature, such as identifying the first and last sounds in words and blending sounds to form words. Paul et al. suggested that phonological awareness depends, at least in part, on primary linguistic ability. Children with histories of slow development in a variety of primary linguistic abilities may retain some difficulties with higher level phonological skills that are related to reading ability, even when those primary linguistic disabilities appear to be on the wane.

Research also indicates that the deficits in phonological awareness that children with speech-language impairments exhibit are directly related to their early reading difficulties (Bird, Bishop, & Freeman, 1995; Magnusson & Naucler, 1990). Bird, Bishop and Freeman suggested that their subjects with expressive phonological and language deficits experienced difficulty identifying the smaller segments of which syllables are composed, resulting in problems in both speech production and acquisition of an alphabetic reading strategy. They suggest that negative educational implications would depend on the child's other compensatory resources, such as intelligence and general language ability.

Phonological awareness has been assessed using a plethora of tasks, all of which differ in terms of extraneous cognitive and linguistic demands. Spector (1992) reported that conventional phonological awareness tests, because of their unfamiliarity and complexity, may yield a high proportion of false negatives. Spector suggested the use of dynamic assessment to eliminate the problem of false negatives in these tasks. Furthermore, dynamic forms of conventional phonological awareness tasks may serve as more sensitive measures of the child's knowledge of and potential for change in phonological awareness.

Dynamic Assessment

Dynamic or interactive assessment is a term used to represent a number of specific models and evaluation approaches, all of which share several characteristics (Lidz, 1992). These include an active role for the examiner, a deliberate effort to change what is being assessed and a collaborative interaction between examiner and subject where some sort of teaching/helping is part of the testing (Haywood, Tzuriel, & Vaught, 1992). There is an emphasis on learning processes, usually metacognitive processes as opposed to the products of these processes. Dynamic assessment provides information about the responsiveness of the learner (Lidz, 1995). This information derives from comparing pre- and post-test performance where a test-train-retest format is used, as well as from observations of changes in the learner's approaches to problem-solving during the assessment. Attempts are made to specify obstacles to effective learning and to specify conditions that will permit or encourage better performance. This approach to assessment is concerned with estimating potential rather than only current performance (Haywood, 1992). Dynamic assessment has as its broad goal the assessment of learner modifiability

(Lidz, 1991), measured by the amount of assistance needed to complete a task and the degree of transfer there is to other tasks.

Dynamic assessment has developed in response to growing dissatisfaction with standardized psychoeducational instruments over the past two decades. Feuerstein, Rand, and Hoffman (1979) reported that traditional tests were overly concerned with measuring the end results of prior learning rather than focusing on actual behaviours in a learning situation for inferences about future learning. Concerns have arisen over the limitation of standardized tests to provide educationally relevant information (Missiuna & Samuels, 1988). Standardized assessments have also been criticized for underestimating the performance and potential of certain groups of children, such as children with specific learning difficulties (Missiuna & Samuels, 1989) and children from culturally different backgrounds (Brown & Campione, 1986). Furthermore, standard testing has failed to take into consideration motivational, personality and social adequacy factors for effective functioning (Tzuriel & Haywood, 1992).

Despite its recent emergence, there exists some empirical support for dynamic assessment (Missiuna & Samuels, 1988). Three theoretical constructs have been developed and widely accepted. These are Feuerstein's (1979) theory of structural cognitive modifiability (SCM) and mediated learning experiences (MLE), Budoff's (1987) training tests and finally, Campione and Brown's (1987) graduated prompt procedure. Campione and Brown's approach, in particular, has been greatly influenced by Vygotsky's (1978) social-interactional theory of cognitive and linguistic development. Vygotsky was one of the first to suggest that learning and interaction might provide more valid bases for determination of the child's cognitive functioning than standardized tests (Lidz, 1995). Vygotsky viewed social interaction as essential for the development of independent cognitive and linguistic functioning. Psychological functions are carried out initially in a social context between the child and an adult. The child gradually begins to share in the activity, gradually internalizing the process and eventually carrying out the function independently. The conceptual structure that Vygotsky used to guide his work was the "zone of proximal development" (zpd). Vygotsky (1978) defined the zpd as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under either adult guidance or in collaboration with more capable peers." (p. 86). The difference between independent performance and potential is interpreted as zpd. It is where the teaching-learning interaction is developed and the potential for change is determined through dynamic assessment (Olswang, Bain, & Johnson, 1992). In keeping with this framework, dynamic assessment typically follows a test-train-retest format. In the test phase, independent performance is assessed usually with a standardized test. During the training phase, adult assistance is given, using either a hierarchy of predetermined cues (e.g., Spector 1992) or individualized contingent instruction (e.g., Missiuna & Samuels, 1989). In the retest phase, response to intervention is assessed using the same or similar static assessment.

The graduated prompt approach of Campione and Brown (1987) is concerned with the dynamic assessment of learning and transfer processes and linking this to achievement content. The approach involves a number of hints or prompts of increasing explicitness presented in a graduated sequence. The prompts are designed to teach the rules needed for task completion (Burns, 1985). The number of prompts yields information on the child's efficiency in learning and degree of success in transfer tasks. This approach differs from others in dynamic assessment. The focus is not on how much improvement can be brought about by aid but how much aid is needed to bring about a specified amount of improvement. A limitation with this approach is that assistance is predetermined and so not individually modified to meet a child's unique learning needs. As such the approach does not provide much insight into effective intervention practices for any specific child. However, the graduated prompt approach has been shown to generate useful information regarding children's ability to benefit from instruction and to transfer that learning within the task domain in which the learning occurred (Missiuna & Samuels, 1988).

Advocates of dynamic assessment outline several advantages of this approach. Static and dynamic measures together provide more information about a child's abilities than either one alone (Bolig & Day, 1993). Some children successfully complete dynamic tasks that static measures suggest they are incapable of completing (Vye, Burns, Delclos, & Bransford, 1987). Groups of children who receive dynamic assessment exhibit learning potential not detected in static assessment (Burns, 1985). Dynamic assessment allows for the fact that children with identical competencies on static tests may vary in their dynamic performance as a function of their zones of proximal development and hence may profit differentially from instruction (Day & Hall, 1987). Dynamic assessment, by focussing on the processes involved, can provide information on possible intervention, on what environmental conditions must exist, and how strategies must be changed in order to produce an acceptable level of learning and performance (Haywood, Tzuriel, & Vaught, 1992). Dynamic assessment incorporating mediated learning experiences appears to show promise in assessing the cognitive modifiability of different groups with learning difficulties such as deaf children, children and adults with learning disabilities as well as groups such as minorities and the economically deprived. Furthermore, teachers rate their expectations of children's learning ability higher when they observe dynamic assessment than when they observe static assessment, suggesting that dynamic assessment may be an important tool for changing teachers' attitudes about low-functioning children (Burns, 1985).

The study of dynamic assessment is acknowledged to be at an early stage, and several shortcomings of this approach have been identified particularly with regard to its psychometric properties. By its nature dynamic assessment induces change. Such change reduces reliability as conceptualized by classical test theory (Spector, 1992). Individualization of the procedure makes standardization of the assessment difficult (Guthke, 1992). Use of standardized prompts can, in part, address this problem by producing quantitative data with good psychometric properties. However, important information regarding individual learning styles and individual-specific obstacles and facilitators to learning may not be exposed.

Much of the research in dynamic assessment has focused on examining alternatives to static measures of IQ. More recently, however, the dynamic approach has been proposed in assessment of language (Gutierrez-Clellen & Quinn, 1993; Olswang, Bain, & Johnson, 1992; Pena, Quinn,& Iglesias, 1992) and in language intervention (Schneider & Watkins, 1996). Gutierrez-Clellen and Quinn put forward a dynamic assessment approach with narratives to take into account differences in narrative experience in culturally and linguistically diverse populations. They suggest that a dynamic approach provides an opportunity for these children to demonstrate higher performance when the unfamiliar demands and rules of the narrative context are discovered interactively. Furthermore, dynamic assessment can provide a framework for evaluating the amount and type of intervention needed to teach a repertoire of contextualization rules valued by the majority culture. Gutierrez-Clellen and Quinn also suggest that dynamic assessment, by taking into account the contextual and cultural factors in narrative production, can help distinguish between narrative differences and impaired narrative skills.

Pena, Quinn and Iglesias (1992) also addressed the issues of language difference versus impairment and the cultural-linguistic biases in conventional testing by using a test-train-retest dynamic approach to language assessment involving lexical items with a group of low socioeconomic status bilingual Puerto Rican and African-American children. Their findings suggested that while pretest scores on the expressive vocabulary test (static measure) did not differentiate possibly language disordered (PLD) children from a nondisabled group with different cultural/linguistic experience, the posttest scores did. The PLD children showed smaller gains from pre-to posttest and were less responsive to mediation, requiring a more intense effort on the part of the examiner to induce change. Therefore dynamic assessment was successful in distinguishing between subgroups of children with possible language impairments as distinct from children with a history of different interactional experiences.

Olswang, Bain, and Johnson (1992) suggested that zpd was a useful construct for assessing children with language disorders in that it could determine the child's range of performance and provide critical information for planning immediate intervention. They used a dynamic assessment language protocol consisting of a hierarchy of cues to predict children's immediate potential for production of two word utterances. Cues ranged from least supportive (a general statement calling attention to the linguistic target) to most supportive (a direct model with an elicitation statement). Data presented from two children indicated that, although they appeared similar on their static assessment results, they differed markedly in performance on dynamic assessment and, by inference, in the degree to which they were ready to move ahead in their language learning. A follow-up treatment phase supported this hypothesis. Differential progress was made by the two subjects in their language learning as predicted by the dynamic assessment.

Bain (1994) expanded on the traditional concept of stimulability to propose a framework for dynamic assessment for children with phonological disorders, based on Vygotsky's principles and theory. A shortcoming with using stimulability to estimate readiness for and responsiveness to intervention lies in the limited use of prompts or cues, which typically consist of one (auditory) or two (listen and watch) cues only. Bain suggested that stimulability skill may not be adequately explored and she recommended an expanded dynamic framework as an alternative. Bain identified three levels of events that could be manipulated: antecedent events, response events and consequent events, presented in a hierarchical order. Such a framework, she suggested, has clinical utility in addressing questions such as who, when, what and how to treat and what prognosis can be expected from treatment for children with phonological disorders.

Schneider and Watkins (1996) provided an account of how a dynamic approach based on a Vygotskian view of development could be applied to language intervention. By its nature the distinctions between testing and intervention become unclear during dynamic assessment as both are linked to determine how a particular intervention can enhance a child's performance (Missiuna & Samuels, 1988). Schneider and Watkins provide a case study to illustrate a qualitative approach to dynamic assessment of narrative skills (i.e., focussing on what went on in the dynamic interaction, how the child responded and how the adult adjusted the assistance to mediate for the child at any given moment). The Vygotskian notion of zpd provides a framework for determining the skills with which the child is ready to be helped (in this case, oral narrative abilities) and explains how, through mediation, the child develops these skills, finally internalizing the process carried out in collaboration with an adult. Through this type of intervention, Schneider and Watkins suggested that the child gradually takes on more responsibility for storytelling and retelling. Eventually, by internalizing the process of using story units he/she can create more acceptable stories independently.

Only one study to date (Spector, 1992) has used a dynamic assessment approach in investigating phonological awareness skills in children. Spector hypothesized that phonological awareness tasks may pose difficulty for some children, by virtue of their unfamiliarity. While low performance might be due to poor phonological awareness, it might also reflect the child's lack of understanding of unfamiliar task demands or difficulty meeting ancillary task demands (e.g., counting syllables or holding phonemes in short-term memory). Spector proposed that dynamic assessment was a more sensitive indicator of phonological awareness and as such would be a better predictor of growth in phonological awareness over time and of early reading scores, which are dependent on phonemic awareness ability. While most dynamic assessment approaches follow a test-teach-test paradigm, Spector's dynamic assessment procedure focussed instead on measures of performance during the dynamic assessment, to establish the degree of independence the subject achieved during the procedure. Spector used a fixed set of prompts administered to all subjects in the same order. Success on early prompts reflected a need for minimal adult intervention, whereas success on later prompts indicated a need for more extensive adult help in performing the task. This approach is in keeping with Campione and Brown's graduated prompt procedure with a focus on quantifying the dynamic assessment and analyzing the task. Spector found that a dynamic measure of phoneme segmentation, administered in kindergarten, was a better predictor of growth in phonological awareness and of end-of-year reading scores than static measures of phonological awareness and other predictor variables, such as vocabulary score.

Statement of Problem

Limited research has been carried out on dynamic assessment as it pertains to language and specifically to the area of phonological awareness. Spector (1992) found that a dynamic measure of phonological awareness was a better predictor of reading scores than static measures. However, this study was restricted to only one dynamic measure of phonological awareness, and it is not known if other dynamic measures might have similar or more powerful relationships with reading scores. The present study will address this issue, using three static and three dynamic measures of phonological awareness.

Because children with speech-language impairments have been identified as an at-risk group for reading disabilities (Catts, 1993) and because limited research has been conducted on the phonological awareness of these children specifically, this investigation will focus on children with speech-language impairments.

There is considerable evidence in the literature of a relationship between phonological awareness and reading. A wider spread of performance scores is expected in dynamic versions of phonological awareness tasks due to differential performance on the dynamic tasks. This wider spread reflects the variation in potential for success at the tasks. Consequently, dynamic tasks should correlate more highly with measures of reading than static tasks.

Research Question

Do dynamic measures of phonological awareness correlate more highly with measures of reading than static phonological awareness measures in children with speech-language disorders?

CHAPTER III

Methodology

Subjects

Subjects were recruited from school district # 57, Prince George, British Columbia. Following permission from the School Board, individual speech-language pathologists working in the school system were given written and verbal information regarding the study. Parents were informed of the study by the speech-language pathologist working with their child and further information was provided by the investigator, if the parent requested it. Written consent was obtained (see parent information sheet and consent form in Appendix A).

The subjects were 20 children in grades one and two with speech and language impairments, ranging in age from 6.2 to 7.6 years with a mean age of 6.8 years. There were 12 boys and 8 girls. All but three subjects were in grade 2. No control subjects were used in the study because the focus was specifically on children with speech-language impairments in the context of dynamic/static assessment relationships with early reading. To be included in the study subjects had to meet the following criteria:

(i) A score of 1.0 standard deviations below the mean on the Spoken Language Quotient of the Test of Language Development-Primary:2 (TOLD-P:2) (Newcomer & Hammill, 1988).

(ii) A Percentage Consonant Correct (PCC) score of no lower than 65% (mild-moderate phonological delay) (Shriberg & Kwiatkowski, 1982) on the Goldman Fristoe Test of Articulation (1986).

(iii) No reported or observed apraxia of speech.

(iv) A standard score of 90 or greater on the Test of Nonverbal Intelligence

(TONI-2) (Brown, Sherbenou, & Johnsen, 1990).

(v) Monolingual English speaking.

(vi) Absence of uncorrected visual defects.

Subjects were referred by their speech-language pathologists based on a confirmed or suspected receptive/expressive or expressive language impairment. Confirmed delays were based on language scores greater than or equal to 1.5 standard deviations below the mean on at least one norm-referenced language instrument. 1.5 standard deviations below the mean was chosen because some norm-referenced tests have more restrictive normative samples than the TOLD-P:2. No standardized assessments were available on suspect children. The TOLD-P:2 was administered to 16 subjects to confirm language impairment. The TOLD-P:2 had been administered to the four other subjects within the previous six months and these results were used for confirmation. All subjects scored at or below 1.0 standard deviation below the mean on the Spoken Language Quotient of the TOLD-P:2. Standard scores ranged from 65 to 85 with a mean standard score of 77.3.

Some children had reported phonological delays. The Goldman Fristoe Test of Articulation was administered to all children. There were 14 above 85% and 6 between 65% and 85%. This extent of delay might be expected in this population but was considered adequate to perform the experimental tasks.

Subjects' standard scores on the TONI-2 ranged from 92 to 122 indicating normal cognitive functioning. No child was observed to exhibit oral-motor problems reflecting developmental apraxia of speech. All subjects were reported to be monolingual English speakers by their speech-language pathologist and to be free of uncorrected visual defects.

Data on socio-economic status was also collected. Parents were asked to list their occupations on the parental consent form so that socioeconomic status (SES) could be ascertained using the Blishen, Carroll, and Moore (1987) SES index for Canada. One occupation, that with the higher score on the income index, was selected for each subject's family. As no score could be assigned where parents were unemployed or doing unpaid work in the home, the mean for the group was given to that subject. SES scores ranged from a low of 20.38 (unskilled laborer) to a high of 68.37 (teacher). Four subjects came from families where parents were unemployed. The mean SES was 35.32. The median value was 35.73.

All subjects passed a pure tone screening test of hearing at the time of testing as per ASHA (1985) guidelines (audiometric screening at 20 dB HL at frequencies 1000, 2000, and 4000 Hz.). Screening at 20 dB HL at 500 Hz was included if ambient noise level permitted (ambient noise levels not exceeding 41.5 dB SPL).

Assessment Protocol

Measures of Reading Ability. Reading consists of two primary components: decoding/word recognition and comprehension (Swank & Catts, 1994). In the early school grades word recognition/decoding are the primary focus. In this study, word recognition/decoding were assessed using the Word Identification and Word Attack subtests of the Woodcock Reading Mastery Tests - Revised (Woodcock, 1987). The Word Identification subtest required that the subject identify isolated words (e.g., "is", "and"). The Word Attack subtest measured the subject's ability to apply phonic and structural analysis skills to pronouncing words that were not recognizable by sight (e.g., "dee", "bim"). The test items consisted of nonsense words and words used very infrequently in English. These subtests have been used as measures of written word recognition or decoding ability (Catts, 1993; Swank & Catts, 1994). Standard scores and percentile rank scores were obtained. This assessment is a valid and reliable standardized test instrument. Split-half reliability coefficients for Word Attack and Word Identification were reported (Word Attack: r = .94; Word Identification: r = .98). Concurrent validity correlations among Woodcock Reading Mastery Tests-Revised and Woodcock-Johnson Reading Tests were also reported for Word Attack (r = .64). Each subtest took a maximum of seven minutes to administer.

Static Measures of Phonological Awareness. Included were a rhyme production task, a phoneme segmentation task and a phoneme deletion task. To eliminate a possible word order effect all stimulus items for each subject were randomized. Fifteen items (for static rhyme and static deletion) and 16 items (for static segmentation) were randomly selected. These were assigned to the static conditions. The remaining 10 items were assigned to the dynamic conditions.

A test of rhyming was included because this is a skill that is usually in place early in normally developing children though it has been shown to present difficulties for children with language impairments (Magnusson & Naucler, 1990; Warrick & Rubin, 1992). Warrick and Rubin found a rhyming task was one of four phonological awareness tasks that showed the biggest differences between normally developing children and children with language impairments. Studies of typically developing children (Bryant et al., 1989) and children with language impairments (Magnusson & Naucler, 1990) indicate that performance on rhyming tasks between ages 3 and 6 strongly predict success in reading and spelling achievement, one year and up to 3 years later. Lewkowicz (1980) stated that rhyming may be useful in both segmentation and blending, the skills she calls "basic" to decoding.

Stimulus items for the rhyming task are provided in Appendix B. Subjects' production of stimulus words was examined prior to testing by having subjects imitate the name of each picture. If the subjects' production of the stimulus word contained a phonological error this item was included in the test but the error production was noted for scoring purposes. For example, if the subject produced [weik] for [reik], this stimulus item was included but a response consisting of a rhyming word other than [weik] was required to be scored correct.

Standard procedures as outlined by Blachman (1984) and Calfee et al. (1972) were followed. The investigator demonstrated what was required by producing two words that rhymed with the demonstration item. Two rhyme production practice items followed with the subject giving a rhyme for each of two words produced by the investigator as the name of a picture. Corrective feedback was given.

Fifteen words were presented pictorially. Pictures were simple line drawings, approximately one to two inches in width, drawn on 3 x 5 inch index cards.

Procedures for correct scoring as outlined by Warrick & Rubin (1992) were followed. Rhymes were scored correct if the initial phoneme was changed or deleted or if a consonant was added to make a consonant cluster. The score was calculated out of a total of 15. Using Warrick and Rubin's scoring procedures, subjects who misarticulated the stimulus item were given credit only if they made a change from their own production (e.g., if the stimulus word was "pen", and subject's production was "ben", credit was given only if the rhyming response was a word that rhymed with "ben"). If the first eight items were scored correct, the subject was credited with all 15 items; if the subject failed to score on any of the first eight items the task was discontinued and a score of zero was awarded. This task took approximately five minutes to administer.

Inclusion of the phoneme segmentation task was based on Yopp (1988). Yopp studied the reliability and validity of ten phonological awareness measures. Her findings indicated that phonological awareness comprises simple phonological awareness and compound phonological awareness. In her study, a phoneme segmentation task provided the most reliable measure of simple phonological awareness and together with the Bruce Phoneme Deletion Test described below, accounted for 58 percent of the variance in the rate at which subjects learned to decode new words. Lewkowicz (1980) described phoneme segmentation as one of two phonological awareness tasks basic to decoding and reported that phoneme segmentation was among the best predictors of success in reading.

The purpose of the phoneme segmentation task was to measure the subject's ability to produce the sounds in pseudowords separately, in order (see Appendix C for list of pseudowords for the phoneme segmentation task). Pronounceable pseudowords were used in order to eliminate a possible difficulty with the use of real words as segmentation stimuli. As subjects in this study had been exposed to letters in school, there was a possibility that they might confound the segmentation of phonemes with the segmentation of graphemes (Tunmer & Nesdale, 1982). Pseudowords were taken from Kamhi and Catts' (1986) experimental protocol with some modifications. In four of Kamhi and Catts' two phoneme words, a short vowel was replaced by a long vowel to facilitate oral segmentation (um/ιm; ib/ιb; fu/£;kae:/ka) A total of sixteen randomized pseudowords were presented.

Procedures for administration as outlined by Yopp (1988) were followed with modifications given the use of pseudowords, as in Kamhi and Catts' (1986) experimental protocol. Four practice items were presented. Corrective feedback was given to ensure success on these items. No feedback was given on the test items. Yopp had provided corrective feedback during administration of her segmentation task, however in this study feedback was withheld to distinguish more clearly between the static phoneme segmentation task and the dynamic version of the same task as suggested by Spector (1992).

Prior to the pseudoword segmentation task, the subject was required to repeat each pseudoword after the examiner. Any articulation errors were noted; credit was given in the segmentation task only if the error sound remained unchanged.

In order to alleviate a possible floor effect, the following scoring procedures were followed. Two points were awarded for each pseudoword correctly segmented. A score of one was awarded if some segmentation skill was demonstrated, i.e., if the subject segmented one or more phonemes in a two or three phoneme word or segmented two or more phonemes in a four phoneme word, but failed to fully segment the pseudoword. If the subject duplicated a correctly segmented phoneme in an attempt to segment (e.g. p-p-olt) he/she was credited for the segmented phoneme according to the scoring criteria above. If the subject duplicated a phoneme but did not segment it from the pseudoword (e.g. p-p-polt) a score of zero was awarded. If the subject reversed or otherwise altered the order of phonemes when segmenting, partial scores were given. A score of one was awarded if he/she segmented all phonemes but in incorrect order. A score of 1/2 was awarded if he/she segmented one or more phonemes in a two/three phoneme word or two or more phonemes in a four phoneme word but in incorrect order. If the subject added extra sounds, a score of 1/2 was deducted from the segmentation score for that item, assuming the subject had a score of at least 1/2, otherwise a score of 0 was awarded. No points were deducted if the subject segmented pseudowords into consonant plus schwa or /ʌ/ if a vowel was also segmented in the vowel position. No points were deducted if the subject substituted a vowel with similar auditory qualities in the segmentation process, for example if the subject substituted a low front vowel with a different low vowel. Voice-voiceless substitutions occurring in the segmentation process were not penalized. If a subject segmented words into letter names rather than sounds, the investigator reviewed practice items and further examples as necessary to illustrate that the task required sound segmentation. If the subject persisted in letter segmentation, the following scoring procedure was used. A score of one was awarded for any word correctly segmented into individual letters or combination of correct letters and sounds. A score of 1/2 was awarded if the subject correctly segmented one or more letters/sounds of a two or three phoneme word or two or more letters/sounds of a four phoneme word. Scoring was out of a maximum of 32. If the subject scored the first eight items correct, credit was given for all items. If the subject received a score of 0 on the first eight items, the task was discontinued. The task took between five and ten minutes to administer.

The phoneme deletion task (Bruce, 1964) was chosen on the basis of Yopp's (1988) finding that Bruce's phoneme deletion task provided the most reliable measure of compound phonemic awareness. Phoneme deletion is a more difficult task than rhyming (Yopp 1988) or segmentation (Griffith & Olson, 1992) and it is thought to be important in consolidating "basic" phonological awareness tasks (segmentation & blending) both essential to decoding (Lewkowicz, 1980).

This particular task sampled initial, medial and final positions in keeping with Bruce's (1964) phoneme deletion task (see Appendix D for list of words for the phoneme deletion task). The investigator presented a word and the subject was asked what word would remain if a certain sound were removed from a stimulus word. The target sound and position varied, depending on the stimulus item. A number of examples were provided and corrective feedback given, until the subject was familiar with the concept.

Fifteen randomized words were presented. All items yielded recognizable words when the appropriate sound was deleted. Each of the three phoneme positions was sampled five times. The positions were randomly ordered in the test list, although the initial item always required final sound deletion, as deletion in this position is an easier task than in other positions (Rosner & Simon, 1971) thus encouraging early success and motivation to continue.

Procedures regarding task administration adapted from Bruce (1964), Yopp (1988) and Perfetti et al. (1987) were followed. A further modification was made given the difficulty of this task. Three compound words with accompanying pictures were introduced first to orient the subject to the nature of the task. The subject said what was left when part of the word (the syllable in this case) was taken away. The compound words were "cupcake" - delete the "cake", delete the "cup"; "cowboy" -delete the "boy", delete the "cow" and "tidying" - delete the [di]. These were followed by practice items requiring deletion of initial, medial and final phonemes. Corrective feedback was given on practice items until the subject was successful. Prior to each deletion task item the subject was required to repeat the word after the investigator. Any articulation errors were noted. Credit was given in the deletion task if the error sound remained unchanged. For example, if the subject produced [nai] for [nais], and deleted the /n/ to produce [ai], credit was given. If, however, the subject omitted a sound in his speech that was targeted in the deletion task, that item was eliminated. If the subject reduced consonant clusters that were targeted in the deletion task, these items were eliminated from the task.

A score of 2 was awarded for a correct response; a partial credit of 1 was given if the subject deleted the designated phoneme but also deleted another phoneme along with it, for example, "fair-y" - [fei]. A score of 1 was also given if the subject deleted the appropriate sound, but failed to blend the remaining sounds. Subjects were not penalized for voice-voiceless substitutions. Maximum score was 30. Administration of the task was discontinued if the subject received a score of 0 after 8 items; if he/she scored all of the first eight items correct, credit was awarded for all 15 items. The task took a maximum of ten minutes to administer.

Dynamic Measures of Phonological Awareness. Dynamic versions of rhyming, phoneme segmentation and phoneme deletion were administered after the three static tasks. Each task consisted of ten items. Measures of dynamic assessment used in this study were measures of performance during the dynamic assessment itself. If a subject did not respond to the stimulus correctly, performance was aided by the use of up to six prompts of increasing explicitness, standardized for each dynamic task (see Appendices E, F and G for instructions and hierarchies of prompts for dynamic rhyme, segmentation and deletion tasks). Success on initial prompts reflected need for minimal investigator intervention, whereas success on later prompts indicated need for more extensive help.

Instructions and prompt hierarchy for dynamic rhyme production are illustrated in Appendix E. Two demonstration picture items were introduced, followed by two practice items when the subject was asked to give a rhyme for each named picture. Corrective feedback was given. Ten monosyllabic words were presented as test items. Names of each picture were imitated by the subject to ensure recognition and to note any misarticulations of stimulus words. This task took between five and ten minutes to administer.

Instructions and prompt hierarchy for the dynamic segmentation task are shown in Appendix F. Two practice items were introduced and corrective feedback given. Ten randomized pseudowords were then presented. This task took approximately 10 minutes to complete. The dynamic phoneme deletion task instructions and prompt hierarchy are illustrated in Appendix G. Three practice items were introduced initially followed by ten stimulus words. This task took approximately 10 minutes to administer.

Scoring for Dynamic Measures of Phonological Awareness

Each of the dynamic phonological awareness tasks consisted of ten items, however, if the subject produced a correct response on the first five items of a task, without use of prompts, he\she was credited for all ten items. The tasks were terminated if the subject obtained a score of zero, after prompting, on the first five items. Items were eliminated and the maximum score adjusted accordingly, when articulation errors warranted exclusion.

The scoring procedure indicated the degree of independence that the subject achieved in performing the task. All dynamic tasks had six prompts and each item was scored as follows: 6 = correct response with no prompts required, 5 = correct response after Prompt 1, 4 = correct response after Prompt 2, 3 = correct response after Prompt 3, 2 = correct response after Prompt 4, 1 = correct response after Prompt 5, and 0 = correct response after Prompt 6 or if the subject failed to respond to any prompts. This scoring system was similar to that adopted by Spector (1992), where no score was awarded for final prompts which are purely imitative and therefore made little demands on the subject's ability to determine the correct response. The maximum score for each dynamic task was 60 (6x10).

Procedures

The subjects were assessed in the spring of their grade one or grade two year. Each subject was seen individually in a quiet room in the child's school. The screening test of hearing, Test of Nonverbal Intelligence and the speech and language assessments were administered in the first session. In the second session the measures of reading were administered first to eliminate any facilitative effects that might result from the phonological awareness tasks. Next, the static measures of phonological awareness (rhyme, followed by segmentation and deletion) were administered, followed by the dynamic measures.

The procedures took approximately 160 minutes. Each session was audiotaped for the purpose of later scoring.

Reliability

The static rhyme task in this study was based on Blachman's (1984) static rhyme production task. A high level of internal consistency has been reported for this task. Blachman (1984) completed odd-even reliability for the rhyming task using Pearson product moment correlation co-efficients with the Spearman-Brown correction. The correlation in her kindergarten sample for the rhyme production task was .98 ($p<.001$). This study used 29 of 30 of Bruce's (1964) phoneme deletion stimulus items. High internal consistency was reported by Yopp (1988) for this task (.92) determined using Cronbach's alpha. No reliability data pertaining to internal consistency were provided by Kamhi and Catts (1986) for the phoneme segmentation task.

Subjects' performance on static and dynamic tasks was scored on-line and audiotaped. The audiotape was considered the primary source if a discrepancy arose between on-line and audiotaped scoring.

Intra and interjudge reliability scores were determined. A certified speech-language pathologist was trained in scoring the static and dynamic measures of phonological awareness. Training reliability of 85% was established prior to formal scoring. When reliability fell below this level, retraining was introduced. For formal scoring procedures, intrajudge reliability was calculated by randomly selecting, transcribing and scoring 20% of each of the taped static and dynamic phonological awareness tasks. Point-to-point comparison was expected to produce exact intrajudge reliability of 90% or above. Intrajudge reliability ranged between 90% and 100%. Interjudge reliability was calculated by randomly selecting, transcribing and scoring 20% of the static and dynamic phonological awareness tasks. Point-to-point comparison was expected to produce exact interjudge reliability of 80% or above. Interjudge reliability ranged between 88.75% and 100%. In the case of a discrepancy, both judges listened to the item again, scoring and transcriptions were reanalysed and a consensus reached.

CHAPTER IV

Results

This study looked at relationships between static and dynamic measures of phonological awareness and measures of reading. A correlational design was used. The independent variables were static and dynamic measures of phonological awareness. The criterion variables were scores on two reading tasks. Correlational analysis using Pearson Product-Moment Correlation was carried out using SPSS statistical package. Alpha was set at .05. A Test for Difference Between Dependent Correlations (Bruning & Kintz, 1977) was used to determine the significance of differences between experimentally dependent correlations (i.e., correlations based on data taken from the same group of subjects). In this study the significance of the difference between the correlations of dynamic and static phonological awareness scores with reading scores was of primary concern. Descriptive statistics for phonological awareness and reading tasks are displayed in Table 1. Given the skewed nature of some of the data, medians and ranges are also reported.

Table 1

Descriptive Statistics for Phonological Awareness Tasks

Phonological Awareness Task	Mean %	SD	Median	Range
Static Rhyme	53	44.67	76.66	0-100
Static Segmentation	42.94	30.65	48.43	0-90.63
Static Deletion	28.16	25.33	26.66	0-80
Dynamic Rhyme	72.58	33.21	92.5	8-100
Dynamic Segmentation	54.93	32.93	60	0-100
Dynamic Deletion	53	32.15	55.83	0-100

Mean and median scores for static and dynamic conditions indicated a hierarchy of difficulty. In keeping with similar findings in the literature, rhyming was the easiest task while deletion posed most difficulty. There was a strong tendency for rhyming scores, in particular, to cluster around very high or very low values, resulting in considerable skewness. Rhyming appeared to be an "all-or-none" skill in the static condition. There was a high level of variability for all phonological awareness tasks, as indicated by high standard deviations and scores which ranged from 0% to 100% on 5/6 phonological awareness tasks.

Performance on Word Identification and Word Attack subtests of Woodcock Reading Mastery Tests - Revised is displayed on Table 2. Average scores on both reading tasks were very similar and scores on both reading tasks were normally distributed.

Table 2

Descriptive Statistics for Reading Subtests

Reading Task	Mean SS	SD	Median	Range
Word Attack	91.6	10.9	92.5	64-105
Word Identification	92.2	11.59	92.5	72-112

Table 3 presents the matrix of simple Pearson intercorrelations among the independent variables. The intercorrelations ranged from insignificant (rhyme and static deletion tasks) to strong (static deletion and dynamic segmentation). Rhyme tended to be weakly or insignificantly correlated with segmentation and deletion tasks, while the latter two tasks were moderately or strongly related.

Table 3

Intercorrelations Among Phonological Awareness Tasks

	1	2	3	4	5	6
STATIC						
1. Rhyme		.52*	.24	.91***	.46*	.49*
2. Segmentation	.52*		.63**	.53*	.78***	.71***
3. Deletion	.24	.63**		.28	.72***	.84***
DYNAMIC						
4. Rhyme	.90***	.53*	.28		.47*	.47*
5. Segmentation	.46*	.78***	.72**	.47*		.73***
6. Deletion	.49*	.71***	.84***	.47*	.73***	

* $p < .05$; ** $p < .01$; *** $p < .001$.

A correlational analysis was carried out to investigate if significant relationships existed between the measures of phonological awareness and the measures of reading (see Table 4). All phonological awareness tasks, except rhyming, correlated positively and significantly with both measures of reading. Strong correlations were found between dynamic segmentation and Word Attack ($r = .83$, $p < .001$) and between static deletion and Word Attack ($r = .77$, $p < .001$). Word Attack correlated more highly with segmentation and deletion tasks than did Word Identification.

Table 4

Correlations Among Phonological Awareness Tasks and Reading Subtests

	STATIC			DYNAMIC		
	Rhyme	Segmentation	Deletion	Rhyme	Segmentation	Deletion
Word Attack	.36	.63**	.77***	.38	.83***	.67**
Word Identification	.19	.49*	.64**	.29	.60**	.53*

* $p < .05$; ** $p < .01$; *** $p < .001$.

Correlations between static measures and reading were compared with correlations between dynamic measures and reading to establish if the latter were stronger. Correlations between dynamic segmentation and both reading measures were indeed stronger than correlations between static segmentation and reading tasks. However, in the case of the deletion tasks, it was static deletion task that demonstrated a stronger relationship with reading. Tests for Difference between Dependent Correlations (Bruning & Kintz, 1977) were carried out to examine if the differences in correlations were significant. The difference between dynamic segmentation and Word Attack and static segmentation and Word Attack was found to be significant, $t(17) = 2.18$; $p < .05$. All other differences between dependent correlations failed to reach significance.

The age range of the sample was quite large (6.2 - 7.6 years) and SES was also variable. Consequently multiple correlations were carried out to investigate the effects of age and SES on independent and criterion variables. Multiple correlations revealed no significant relationship of either variable with phonological awareness or reading scores (see Appendix H).

CHAPTER V

Discussion

The intent of this study was to examine relationships between static and dynamic measures of phonological awareness and measures of reading in a sample of children with speech-language impairments. The results indicated that dynamic assessment principles can be applied to measurement of phonological awareness in children with speech-language impairments for the purpose of identifying responsiveness to instruction and linking this to reading performance. This study revealed that a measure of dynamic segmentation demonstrated a stronger relationship with reading than a measure of static segmentation. This lends support to the hypothesis that dynamic assessment better reveals performance potential for processing sound-based information which is basic to early reading. In keeping with Vygotskian theory, individual differences in responsiveness to segmentation instruction were revealed using the dynamic measure. This finding is in keeping with the results of Spector's (1992) study and extends it to children with speech-language impairments.

Contrary of expectation, no significant relationships were found between static or dynamic rhyming and reading measures. The decision to include such an early developing task as rhyming was based on the difficulty some children with speech-language impairments exhibit with this task (Warrick & Rubin, 1992). It was assumed that this subgroup of children would not have reached ceiling level. In this study many subjects did indeed experience difficulty with rhyming - 40% scored zero in the static condition. However 35% of subjects had in fact reached ceiling levels in the static condition and 55% reached or approached ceiling in the dynamic condition. Clustering of zero scores in the static condition further weakened the possibility of finding a significant relationship with reading measures. Previous research has indicated the lack of predictiveness of rhyme tasks beyond the kindergarten level with typically developing children (Stanovich et al., 1984). The results of the present study suggest that by grade 1 rhyme was not useful as a predictor variable even for children with speech-language deficits. However including this task as a variable did illustrate that some children with speech-language impairments were strikingly insensitive to rhyme, supporting similar findings with this population by Warrick and Rubin (1992).

Both static and dynamic measures of deletion correlated moderately strongly or strongly with both reading measures, with correlations ranging from .52 to .76. This is in keeping with previous studies indicating a strong link between deletion and reading (Lenchner, Gerber, & Routh, 1990; Yopp, 1988). There is general agreement that reading, particularly decoding, requires both the ability to segment and to blend, plus a certain level of ability to manipulate phonemes. The deletion task drew on all of these abilities. It is perhaps for this reason that deletion was so highly correlated with Word Attack.

Deletion appeared to be a good choice of task despite suggestions in the literature that it might be too difficult for children until the end of grade one (Adams, 1990; Bruce, 1964). In this study subjects exhibited a wide range of scores, with only a few, usually younger subjects, failing to perform at all on the task, and only one subject reaching ceiling.

Static deletion was highly related to reading, yet this relationship was less strong in the dynamic condition, contrary to expectation. It appeared that cueing was facilitative to varying extents for the vast majority of subjects, regardless of their reading ability. The dynamic task certainly uncovered ability that was not indicated in the static condition. However, the prompts did not appear to be equally scaled in terms of difficulty and so this task may not have been an accurate indicator of increasing ability in phoneme deletion. At prompt 3, for example, a high level of explicitness was evident and many children were credited at that stage. Therefore a number of children performed similarly on the dynamic deletion task, despite possibly varying potential for performance. What was effectively a reduced scaling system failed to explore the range of potential. A more detailed task analysis, using explicitness ratings from a number of judges might have produced a hierarchy of prompts that was more sensitive in terms of incremental increases in explicitness.

The prompts used in this study were predetermined in order to standardize the testing procedures. This approach, however, meant that the exact nature of the prompts was not contingent on subjects' performance. Factors such as attention and motivation could not be addressed although these factors certainly impacted on how subjects approached and performed the tasks. It was observed that subjects who were well motivated, with mature attention responded better to the dynamic tasks overall than subjects with poor attention and motivation, who demonstrated overall lower or inconsistent levels of performance. In the case of dynamic deletion, it was the last of six phonological awareness activities administered and was also a difficult task (Yopp, 1988). It is possible that performance on this task, which placed heavy demands on attention, might be a reflection of behavioural factors rather than innate knowledge of sound manipulation. Addressing individual differences in attention and motivation/endurance prior to testing might provide a more accurate estimate of responsiveness and modifiablity to phonological awareness instruction.

All phonological awareness tasks, except rhyming, correlated significantly with both measures of reading. Word Attack correlated strongly while Word Identification correlated moderately with phonological awareness measures. The strong correlations are in keeping with similar findings in the past. Swank & Catts (1994) found that measures of phoneme segmentation and phoneme deletion correlated moderately strongly with both Word Attack and Word Identification. In this study, however, the correlations tended to be higher. This can be partly explained by the temporal factor. Two measures given at the same time can be expected to correlate more highly with each other than measures given at different times. In addition, a dependent reading measure was chosen (Word Attack) that was highly dependent on phonemic awareness specifically, measured by tasks such as segmentation and deletion. Hence the higher relationships with Word Attack than with Word Identification. These results support Wagner and Torgeson's (1987) contention that phonemic awareness tasks should be better predictors of Word Attack than Word Identification. However, Word Identification also depends indirectly on phonemic awareness. Poor awareness affects the ease with which phoneme-grapheme rules and hence decoding, are acquired. This slows down the process of acquiring a sight word vocabulary tapped by a Word Identification task. In this way, phonological awareness ability affects performance on word recognition and this accounts, at least in part, for the significant relationships between segmentation and deletion tasks and Word Identification.

This study demonstrated that a dynamic segmentation measure could be adapted to estimate responsiveness to standardized instruction in phonological awareness. The higher correlation between dynamic segmentation and Word Attack points to the potential predictive utility of dynamic segmentation with children having speech-language disorders. A longitudinal research design is suggested to establish the predictive strength of the dynamic task. Such a design would control for bidirectional causality between phonological awareness and reading development, a factor which could not be controlled in the present study. The predictive utility of the dynamic deletion task warrants further investigation. A carefully designed prompt scaling procedure is suggested to produce graded increments of assistance for successful performance. Finally, there is some evidence that a dynamic approach to assessment may be particularly suited for differential assessment of children with learning differences (Missiuna & Samuels, 1989). Further research into this approach with children with speech-language impairments may be timely, in a range of areas for possible diagnostic and predictive information and for intervention strategies.

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Appendix A

Parent Information for Research Study Entitled: The Relationship Between Static and Dynamic Measures of Phonological Awareness and Measures of Reading in Children with Speech-Language Disorders in Early Grades

Name of Investigator:	Kathleen O'Connell B.Sc. Department of Speech Pathology and Audiology University of Alberta
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Name of Supervisor:	Gary Holdgrafer, Ph.D. Department of Speech Pathology and Audiology University of Alberta
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General Information

Purpose

This study will examine the relationship between phonological awareness (that is, awareness that words can be broken down into sounds) and early reading. Phonological awareness is an important skill for early reading. Children with speech-language disorders sometimes have difficulty with phonological awareness.

Procedures

The child's speech-language pathologist will provide information to me about each child's speech and language skills. I will read each child's clinical case-file and school file.

Each child will have a screening test of hearing. If a child fails a screening, he/she will have a rescreening. If the child fails the rescreening, I will inform the child's parents, speech-language pathologist and teacher. I will give each child an assessment of speech and language abilities called the Test of Language Development. I will also give each child The Test of Nonverbal Intelligence. This test assesses the child's ability to solve problems with shapes and patterns. All of this information will help me decide if a child can be included in the study.

In the second session the child will complete two reading tasks. In these tasks the child will read real and nonsense words. Then he/she will complete three phonological awareness tasks. These are rhyming, sound segmentation and sound deletion. Each task will be done twice. The first time I will not help the child in any way. The second time I will give clues to assist him/her in performing the task.

If the parents wish, I will discuss results of the assessments with them. I will also discuss results with the child's speech-language pathologist and teacher if parents request this.

Parents' occupations are requested on the consent form so that I know the range of backgrounds of the children in the study.

Time Requirements

Each child will spend two sessions with me. The total time commitment will not be more than 140 minutes. Sessions will take place in the child's school.

Risks and Benefits

There are no known risks for participating in this study. There are benefits to participation. Information will be obtained about the child's phonological awareness skills, early reading ability and ability to use clues in performing tasks. This information can be shared with parents, the child's speech-language pathologist, and teacher with parents' consent. There are potential indirect benefits to all children who have speech-language and/or reading problems: each child's participation will help speech-language pathologists better understand the relationship between reading and phonological awareness.

Subject Confidentiality

All information gathered in this study will be kept completely confidential. The child will be identified by number, not by name on all records and documents. Each child will be audiotaped. Audiotapes will be stored in a secure location. Any identifying information on audiotapes will be erased when the study is complete.

My supervisor or I will answer any questions about the study at any time, either before, during or after parents give consent.

To the parent:
Your child's participation in this study is completely voluntary. If you agree to allow your child to take part, I will read the procedures to him/her so he/ she understands what to do. I will ask your child if he/she wants to take part. You or your child may decide to withdraw from the study at any time. There will be no negative consequences for withdrawing.

If you consent to your child's participation, please return the attached consent form with your signature.

Kathleen O'Connell

Parental Consent Form

I consent for my child ____________________ to participate in the research study entitled: **The Relationship Between Static and Dynamic Measures of Phonological Awareness and Measures of Reading in Children with Speech-Language Disorders in Early Grades.**

I understand that my child's hearing will be screened. I understand that the investigator will give my child a test of speech-language ability. She will also give my child a test of nonverbal intelligence. I understand that my child will do two short reading tasks. Then my child will perform two forms of phonological awareness activities. I understand that the total time commitment will not be more than 140 minutes.

I understand that there are no risks involved in this study. My child can withdraw from the study at any time without negative consequences. I understand that all information will be kept completely confidential before, during and after the study is complete. I understand that the investigator will discuss the assessment results with me. She will also discuss them with my child's speech-language pathologist and teacher, if I request this.

I have read the parent information sheet and this parental consent form.

__________________________ ____________________ ________

Signature of parent/guardian Relationship to child Date

____

Signature of child

_______________________ ______________

Signature of Investigator Date

Mother's Occupation ___________ Father's Occupation ___________

Do you request that assessment results be discussed with you? ____

Do you request that assessment results be discussed with your child's speech-language pathologist and teacher? ____

Appendix B

Stimulus Items For Rhyme Production Task

key	sun	nose
rake	feet	pig
man	shoe	chair
boat	mop	sock
tail	light	bed
sea	four	chick
nail	sheep	pen
boot	cup	tack
mitt		

Appendix C

Stimulus Items For Phoneme Segmentation Task

kɛst	kos	wap
gɛlt	wʌg	ib
tʊb	fu	kɛl
mʊk	zan	blʊm
ap	nʊz	af
pʊv	ɔg	spʌt
kae:	smʊk	im
polt	fʌd	um
kɛb	masp	

Appendix D

Stimulus Items For Phoneme Deletion Task

wind-ow	lo-s-t	mon-k-ey
for-k	p-late	ha-n-d
pain-t	c-old	ever-y
thin-k	n-ice	f-r-og
f-an	ne-s-t	part-y
b-ring	p-in	j-am
s-t-and	fair-y	car-t
s-n-ail	we-n-t	s-top
t-able		

Appendix E

Instructions and Hierarchy of Prompts for Dynamic Rhyme Production Task

INTRODUCTION: "We're going to play another rhyming game, but this time, I'll help you if you need help. Let's practice a few right now." Practice items are introduced and corrective feedback given.

Test items follow. The subject is shown the picture, imitates the picture name and produces a word that rhymes with it, for example, "this is "pen". You say it. Now tell me a word that rhymes with "pen".

PROMPT 1: Tell me a word that rhymes with ____ or that sounds like ____.

PROMPT 2: (Point to hair). What is this? I'll tell you a word that rhymes with "hair". "Bear" sounds like "hair". "Bear" rhymes with "hair"; "hair"-"bear". You say that. Now let's try ____. Tell me a word that rhymes with ____.

PROMPT 3: (Pictures: 4 foils and 1 correct). I'm going to help you some more. Here are some pictures to help you. One of the pictures rhymes with ____.
(Lay out and label). Here's ____. You say that. Here's ____. You say that...... etc.
Which one rhymes with ____.

PROMPT 4: Listen: "pen"-"pet" (for example). Does "pet" rhyme with "pen"? No - I don't think so; let's try again. (Take away incorrect picture; name the remaining pictures again and have the subject imitate). Which one rhymes with ____?

PROMPT 5: (Isolate stimulus picture and incorrect one). Listen carefully to these words: "pen"-"feet". Does "feet" rhyme with "pen"? No, I don't think so but that was a good try.

Which one here rhymes with ____.

PROMPT 6: (Show stimulus picture and correct picture).

"Pen"-"men": "men" rhymes with "pen". "Pen" and "men" rhyme. Now you tell me the word that rhymes with "pen". If correct say: good job: "men" rhymes with "pen". If incorrect say: no, "men" rhymes with "pen". Now you tell me the word that rhymes with "pen".

Appendix F

Instructions and Hierarchy of Prompts for Dynamic Phoneme Segmentation Task

The dynamic phoneme segmentation procedure is that used by Spector (1992) with some modifications.

INTRODUCTION: Do you remember the game we played earlier with sounds? I said a word and asked you to break the word apart. You had to tell me each sound that you heard in the word. When I said "top", you had to say "t-o-p". We're going to try a few more but this time I will help you if you need help. Let's practice a few right now. These are play words, funny words, O.K.?

Two practice items are introduced: [ob] and [tis]. The subject is instructed to say the word, then to break the word apart: "say `ob'; now I want you to break `ob' apart." Corrective feedback is given on these items. If incorrect, the examiner says "when I break `ob' apart, it sounds like `o-b'." The subject imitates the examiner's segmentation model, if the response is incorrect.

The test items are then introduced; the examiner says "Here are some more play words that I will help you with, if you need help."

"Say (pseudoword); now I want you to break (pseudoword) apart."

PROMPT 1: Pronounce the target word slowly. "Listen while I say the word slowly": Now you say (pseudoword). (Produce slowly). Now can you make each sound in (pseudoword)." Standard feedback is given depending on the subject's response: e.g. if the subject is unable to respond, move to prompt 2. If the subject responds with incorrect sounds say "I don't think so" and move to prompt 2. If the subject responds with one or more sounds correct, say "good try, you said one/two of the sounds in (pseudoword)". Move to prompt 2(a).

PROMPT 2: Ask the subject to identify a sound of the pseudoword.
"Try to tell me just one of the sounds you hear, when I say (pseudoword)". If the subject responds correctly, say "yes, / / is a sound in (pseudoword). Now can you make each of the sounds in (pseudoword)"?

(2a) If the subject says more than one sound, say "yes, / / is a sound in (pseudoword) and / / is another sound in (pseudoword), but there are 1/2 other sounds in (pseudoword). So, now can you make each of the sounds in (pseudoword)"?

PROMPT 3: Cue the subject with the first sound of the word.
"/ / is the first sound in (pseudoword). What sound comes next? (and what sound comes after / /; and after / /? if the pseudoword has 3 or 4 phonemes). "Now can you make each sound in (pseudoword)"? Corrective feedback is given, for example,"yes, / / comes next" or "no, that is not the next sound."

PROMPT 4: Cue the subject with the number of sounds in the word using raised fingers.
"There are 2 (or 3 or 4) sounds in (pseudoword). / / is the first sound. What is/are the other sound/s? Now make each of the sounds in (pseudoword)." Corrective feedback is given, for example, if the subject responds with an incorrect sound, the examiner says "no, that's not a sound in (pseudoword); if the subject responds with a sound that is in the word, but not in the right order, the examiner say s"/ / IS a sound in (pseudoword), but it is not the next sound. What sound comes after / /"?

PROMPT 5: Model segmentation using tokens placed in squares to represent the number of sounds in the word.

"Watch me." Model segmentation placing a token in a square as each sound is spoken, then repeat the word as a whole. After the demonstration, say "now you do it, make each sound".

The subject manipulates the tokens as he/she says each sound. Repeat the demonstration if the subject is failing to make one-to-one sound-token correspondence."Now make each of the sounds in (pseudoword)."

If the subject continues to have difficulty with one-to one correspondence, model segmentation as above, but working hand over hand with the subject who manipulates the tokens and makes the sounds with the examiner."Let's try together. Now try to do it yourself. O.K., so now tell me each sound you made when you broke (pseudoword) apart."

PROMPT 6: Have the subject imitate directly.

"Say (pseudoword). Now say (first sound). (First sound) is one sound. Say (second sound). (Second sound) is the other sound. (First sound) and (second sound) are the two sounds we make when we break (pseudoword) apart." "What sounds do we make when we break (pseudoword) apart"? Instructions for three and four phoneme pseudowords follow the same format.

Appendix G

Instructions and Hierarchy of Prompts for Dynamic Phoneme Deletion Task

INTRODUCTION: We're going to play one more word game; remember I asked you to say a word and then to say the word without one of its sounds? We're going to try some more but this time I will help you if you need help. Let's practice a few right now.

Each of three practice items is introduced: "say `sit'; now say `sit' without the /s/ at the beginning; say `form'; now say `form' without the /m/ at the end; say `spoon', now say `spoon' without the /p/ in the middle." Corrective feedback is given, drawing attention to the new word formed: "`sit' without the /s/ at the beginning sounds like `it'. `It' is the word that's left; we made a new word: `it'. You say `it'. Good, `sit' without the /s/ at the beginning sounds like `it'." "Here are some more that I will help you with, if you need help."

INSTRUCTION: "Say (word). Now say (word) without the (initial/medial/final sound) at the beginning/middle/end"; for example, "say `fan'; now say `fan' without the /f/ at the beginning."

PROMPT 1: Pronounce the target word slowly when repeating the instruction. "Listen while I say the word slowly - (word). Now you say (word) (produced slowly). Now say (word) without the / / at the beginning/middle/end."

PROMPT 2: Tell the subject the sounds in the word; then ask the subject to say the word without the target phoneme.

"The sounds in (word) are / /, / / and / /. Now say (word) without the (initial/medial/final sound) at the beginning/middle/end."

PROMPT 3: The word is broken up into the target and remaining syllables in a way that highlights the sound to be deleted e.g. `fan' is broken into /f/ and `an'; `cart' into `car' and /t/, `snail' into /s/, /n/ and `ail'.

The subject is asked to say the word without the target phoneme.

"I can break (word) apart like this:(for example `f-an'). Now say (word) without the (initial/medial/final sound) at the beginning/middle/end."

PROMPT 4: Visual cues are provided in the form of a token placed in each square, each square representing a sound. The examiner says the stimulus word, touching each token corresponding with the target sound and remaining syllable. The subject imitates. Further demonstrations and hand over hand attempts ensue if the subject cannot maintain sound-token correspondence. The subject is again asked to say the word without the target phoneme using visual cues.

"This is (word) (touching tokens). Now you do that." The subject touches the tokens while making the sounds, with examiner assistance, if necessary. Repeat as many times as needed for the subject to make one-to-one sound-token correspondence. "Good. Now say (word) without the / / at the beginning/middle/end". Examiner points to tokens representing the word and the targeted sound.

PROMPT 5: The examiner says that the target token will be removed and takes that token from its square. The examiner asks the subject what is left, using visual cues. "I'm going to take the / / away from (word). What is left"?

PROMPT 6: The subject is told what is left and is asked to tell the examiner the word without the target phoneme.

"(remains of word) is left; when I say (word) without the / / at the beginning/middle/end, it sounds like (remains of word). Now you say (word) without the / / at the beginning/middle/end."

Appendix H

Multiple Correlations of Phonological Awareness, Reading, SES and Age

	1	2	3	4	5	6	7	8	9	10
1.St R		.52*	.24	.91***	.46*	.49*	.36	.19	.06	.29
2.St S	.52*		.63**	.53*	.78***	.71***	.63 **	.49*	.08	.32
3.St D	.24	.63**		.28	.72***	.84***	.77 ***	64**	-.09	.43
4.Dy R	.91***	.53*	.28		.47*	.47*	.38	.29	.05	.34
5.Dy S	.46*	.78***	.72***	.47*		.73***	.83***	.60**	-.19	.40
6.Dy D	.49*	.71***	.84***	.47*	.73 ***		.67**	.53*	-.14	.44
7.W A	.36	.63**	.77***	.38	.83***	.67**		.78***	-.12	.31
8.W Id	.19	.49*	.64**	.29	.60**	.53*	.78***		-.18	-.03
9.SES	.06	.08	-.09	.05	-.19	-.14	-.12	-.18		.18
10.Age	.29	.32	.43	.34	.40	.44	.31	-.03	.18	

Note: St R is Static Rhyme; St S is Static Segmentation; St D is Static Deletion; Dy R is Dynamic Rhyme; Dy S is Dynamic Segmentation; Dy D is Dynamic Deletion; W A is Word Attack; W Id is Word Identification; SES is Socioeconomic Status.

* $p < .05$; ** $p < .01$; *** $p < .001$.