THE UNIVERSITY OF CALGARY

Children with Phonological Impairments versus Children with Normal Phonological Development: Do They Differ on Rhyming Ability?

by

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A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE

DEGREE OF MASTER OF SCIENCE

DEPARTMENT OF EDUCATIONAL PSYCHOLOGY

CALGARY, ALBERTA

APRIL, 1998

ABSTRACT

The purpose of this research was to determine if there was a significant difference between pre-school children with phonological impairments and pre-school children with normal phonological development on rhyming ability. Pre-school children with phonological impairments scored significantly lower than normally developing peers on tasks of rhyme formulation and rhyme detection. Performance on the rhyme detection task decreased as the severity of the phonological impairment increased. Further, performance on the rhyme detection task increased with age for the children with normal phonological development. Based on the type answers provided by each child, the examiner was able to speculate about his/her understanding of the rhyming concept when administering the rhyme formulation task. Children with phonological impairments did not benefit from phonemic cueing and often provided semantically related answers rather than rhyming words.

ACKNOWLEDGEMENTS

I wish to acknowledge and thank the parents of all of the children involved in this study. Their commitment to this research as demonstrated by bringing the child to the Alberta Children's Hospital for the assessment session, or by opening their homes to me and allowing me to complete the assessment there, was of great help.

The Speech and Language Pathology Department of the Alberta Children's Hospital is to be acknowledged as well. Their willingness to lend me office space during my assessments, and the interest demonstrated by many of the staff members will not be forgotten. Finally, each of the Speech Language Pathologists on staff was made aware of my research and referred appropriate children to me . It is these referrals that made this research possible.

DEDICATION

This thesis is dedicated to my family.

A very special thank you to my husband, Jerome, whose constant support and encouragement made the completion of this research possible. Thank you also to my children, Alyssa, Kristian and Celynne who patiently watched as I worked at the computer and cooperated when deadlines had to be met. Finally, my gratitude goes to my parents whose many words of encouragement and endless hours of "baby-sitting" were of tremendous help.

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GLOSSARY OF TERMS

Onset: consonant or consonant cluster preceding the vowel in a syllable (e.g.: "b" at).

Phonemic Awareness: the ability to manipulate the sound structure of language in order to complete activities such as rhyming segmentation (i.e.: breaking words into their component sounds) or deletion (i.e.: omitting sounds from various sound combinations and determining what sound combination is left).

Phonological Impairment: an immature and sometimes deviant pattern of pronunciation present in physically normal children. With phonological impairments patterns of mispronunciation, or groups of mispronounced sounds are considered instead of single sounds that are mispronounced. Typically, a phonological impairment is a more severe form of mispronunciation

than the mispronunciation of single sounds.

Phonological Processing: the use of the sound structure of one's oral language in processing orally presented information (e.g.: determining the beginning sound of a syllable and segmenting it from the rest of the syllable).

Rime: the vowel plus any consonant following the initial consonant(s)s of a syllable (e.g.: b - "at").

Rhyming: the manipulation of phonemes in a rule governed manner involving both sound segmentation (i.e.: "b"- at) and the addition of a replacement sound (i.e.: "c" - at). This is the most rudimentary form of phonemic awareness.

Chapter One

Introduction

Background and Premise for this Study

Recently, in the field of Speech Language Pathology and fields related to it, there has been increased interest in phonemic awareness in young children. Phonemic awareness is the ability to manipulate the sound structure of one's language in order to complete activities such as rhyming, segmentation (i.e.: breaking words into their component sounds) or deletion (i.e.: deleting sounds from various sound combinations and determining what is left) (Hurford, 1990). Thus, tasks of phonemic awareness require children to adopt a metalinguistic stance, by encouraging one to think about language and/or words as tangible objects that can be manipulated. Language, therefore becomes an object of reflection (Bird, Bishop and Freeman, 1995). Various tasks of phonemic awareness differ in terms of the amount of explicit awareness of phonemic units they require and in their demands on memory, attention and vocabulary (Cataldo and Ellis, 1988; Tunmer 1991).

Research on normally developing children has shown that phonemic awareness increases with exposure to reading (Bird et al., 1995; Calfee, Lindamood and Lindamood, 1973). However, phonemic awareness, in its most rudimentary form,

is apparent in typically developing preschoolers and is positively correlated with later reading ability (Bradley and Bryant, 1985; Mann 1991; Torgesen, Wagner, and Rashotte, 1994). Such knowledge is believed to be necessary as it allows the child learning to read to easily become familiar with the correspondences between phonemes (making up the sound structure of the language) and graphemes or letters and groups of letters (e.g.: ch, ph) that represent a single phoneme (Bird et al., 1995). Thus, they are able to rely on previously established knowledge (knowledge of the phonological structure of language) to expand their knowledge of unknown information (graphemes).

Rhyming, a most rudimentary form of phonemic awareness, has been observed prior to exposure to reading instruction, in the preschool years (Bradley and Bryant 1978, 1983, 1985; Kirtley, Bryant, MacLean and Crossland, 1990; Knafle, 1973, 1974; Lenel and Cantor, 1979; Sanches and Kirshenblatt-Gimblett, 1976; Tunmer and Rhol, 1990; Van Kleek and Sheule, 1987). Rhyming ability is directly related to early reading, primarily with respect to decoding. That is, the integrity of rhyming ability is related to the integrity of early reading ability (Blachman 1991; Bryant, Bradley, MacLean and Crossland, 1989; Bryant, MacLean and Bradley,

1990; MacLean, Bryant and Bradley, 1987). Stuart and Coltheart (1988) and Goswami (1991) found that basic phonemic awareness (i.e.: the ability to divide words into the onset sound and the remaining group of sounds - "h" - "at" , as is required in rhyming) in preschool children, was related to their subsequent progress, specifically during their first year of learning to read.

Evidence for the importance of phonemic awareness in literacy acquisition is also found in studies of children with reading and spelling difficulties. In many cases, these children do very poorly on tests of phonemic awareness with persisting deficits even after the resolution of the reading problem (Bird et al., 1995). Moreover, a deficiency in rhyming ability in preschool and school aged children has been linked to early reading difficulties (Blachman, 1991; Bradley and Bryant, 1978, 1983; Bryant et al., 1989; MacLean et al., 1987; Kirtley et al., 1989, Stahl and Murray, 1994; Savin, 1972).

Rhyming appears to develop spontaneously in typical pre-school children as a result of their exposure to nursery rhymes, stories focusing on rhyme and alliteration, word games and songs (Bryant, MacLean, Bradley and Crossland, 1990). Indeed, such children appear to be very aware of rhymes, dabble in them and enjoy them (Tunmer and Rhol,

1990). However, there are children who do not develop adequate phonemic awareness (i.e.: skill with rhyming) despite their exposure to previously mentioned childhood stimulation and do not demonstrate an ability or desire to engage in rhyming activities. And, as stated previously, a delay in phonemic awareness appears to inhibit adequate reading development, making the phenomenon of spontaneous phonemic awareness development very worthy of consideration.

An underlying component of phonemic awareness is phonological processing. That is, in order to manipulate and break words or sound strings into their component parts, one must adequately and accurately process the phonological information supplied. Interestingly, children manifesting early reading/decoding difficulties tend to manifest significant phonological processing deficits (Brady, Shankweiler and Mann, 1983; Fowler, 1991; Hurford and Sanders, 1990; Hurford, Gilliland and Ginavan, 1992; Jorm, 1983a, 1983b; Mann, Liberman and Shankweiler 1987; Pumfrey and Reason 1991; Tallal, 1980). This complements previously cited literature and research demonstrating that children experiencing reading/decoding difficulties manifested deficiencies in phonemic awareness.

Children who have also been studied with respect to phonological processing are those manifesting phonological impairments (children with significant pronunciation difficulties and intelligibility problems). Indeed, such children show more variability and are less competent than normally developing children with phonological processing skills (Bird et al., 1995; Broen, Strange, Doyle and Heller, 1983; Hoffman, Daniloff, Bengoa and Schukers, 1985; Jameison and Rvachew, 1992, Morgan, 1984; Ohde and Sharf, 1988; Raaymakers and Crul,1988; Rvachew and Jameison, 1989; Smit and Bernthal, 1983; Webster and Plante, 1992).

Webster and Plante (1992) attempted to combine the concepts of phonemic awareness, phonological processing and phonological impairment into a practical research project. In doing so, Webster and Plante reasoned that phonologically impaired children tend to demonstrate a disrupted phonological processing system and may, therefore, demonstrate difficulties with phonemic awareness tasks. It was further reasoned that if these children did demonstrate difficulties with phonemic awareness they could be at risk for early reading difficulties. This research was completed with school aged children in grades one to three. Indeed, Webster and Plante found that children with phonological

impairments scored significantly lower than phonologically normal peers on tasks of segmentation (the breaking up of words into their constituent phonemes or sounds). Bird et al. (1995) also completed research tying the concepts of phonological processing, phonological impairments, and literacy development together with children with phonological impairments. The children ranged in age from 5 years to 7 years, 4 months. Bird, et al. also found a significant difference between normally developing children and their peers with phonological impairments in phonemic awareness development. The children with phonological impairments performed more poorly on the tasks of phonemic awareness employed (rhyme matching, onset matching - grouping objects that begin with the same sound, and onset segmentation and matching - segmenting the initial sound from an auditorally presented name and selecting objects that have the same onset). Bird, et al. suggested that both a phonological impairment and literacy problems arise from a failure to analyze syllables into smaller phonological units (as is fundamental to any phonemic awareness task from rhyming to segmentation).

Such research has tremendously practical ramifications as phonemic awareness instruction has been shown to be

beneficial as it increases ability with phonemic awareness in both school aged and pre-school children. Moreover, the benefits are generalized to early decoding (Ball and Blachman, 1991; Blachman, Ball and Black, 1994; Bradley and Bryant 1983; Bryant and Bradley, 1985; Byrne and Fielding-Barnsley, 1993; Iverson and Tunmer, 1993; Williams, 1980). There are a number of programs developed to enhance the development of phonemic awareness in both school aged and preschool children (Ball and Blachman, 1991; Blachman et al., 1994).

The progression of the ideas presented thus far is as follows. Phonemic awareness is an important skill and plays a vital role in the development of reading. It has been shown to develop as a result of exposure to beginning reading and to be a precursor to reading in its most rudimentary forms. Phonemic awareness begins to spontaneously develop in the preschool years in normally developing children as a result of exposure to childhood literature, rhymes and songs.

There are, however, children who do not appear to develop adequate phonemic awareness and are therefore at risk for later reading/decoding difficulties. It has been reasoned that children experiencing difficulties with phonemic awareness and reading may not be processing

phonological information accurately. Children demonstrating phonological impairments have also been shown to be less competent at tasks of phonological processing and may be at risk for later reading difficulties.

Current research has combined the concepts of phonemic awareness, phonological processing and phonological impairments to demonstrate that children with phonological impairments do significantly poorer on tasks of phonemic awareness than do peers with normal phonological development. This research has been completed with school aged children ranging in age from 5 years to 8 years, 6 months (kindergarten to grade three). As phonemic awareness is known to be present in preschool children (usually in the form of rhyming) and instructional programs aimed at improving phonemic awareness have been developed for preschool as well as school aged children, a logical expansion to the present research would be to study phonemic awareness in preschool children. Specifically, preschool children with phonological impairments could be compared to peers with normal phonological development, with respect to phonemic awareness development. Indeed, if a significant difference is found between the two groups, with the phonologically impaired group performing more poorly,

phonemic awareness instruction could be provided to children with phonological impairments during preschool classes, speech pathology sessions, work with tutors and at home.

Purpose of this Study

The purpose of this research was to further investigate the significance of phonemic awareness in the reading process specifically with respect to rhyming. Webster and Plante's (1992) and Bird et al.'s (1995) research was expanded upon by focusing on the pre-school population with respect to phonological development and phonemic awareness. Specifically, the present research compared pre-school, pre-literate children manifesting a phonological impairment with pre-school, pre-literate children manifesting normal phonological development on rhyme detection (a receptive rhyming task) and rhyme formulation (an expressive rhyming task) activities. In addition, three supplementary questions were considered. Is the severity of the phonological impairment related to performance on the rhyming tasks? Is there a relationship between language development (within the domains of expressive vocabulary, receptive vocabulary and general comprehension of language), and performance on the rhyming tasks? And, is there a relationship between age and performance on the rhyming tasks?

Chapter Two

Literature Review

Introduction

The first section of this literature review, entitled, "Rhyming and Reading" investigates the development of rhyming in children. Rhyming ability is considered to be a preschool skill and is apparent in children as young as 2 years, 8 months of age. The ability to rhyme marks the beginnings of phonemic awareness development. The significance of rhyming is readily apparent in the literature, and this is explored in the next section of the literature review. Specifically, rhyming has been linked to beginning reading and plays a vital, indispensable role in literacy development. Rhyming ability in the preschool years has been touted as one of the best discriminators of good versus poor readers. Indeed, poor readers are found to do significantly worse on rhyming tasks than good readers.

As phonemic awareness is a manifestation of phonological processing ability
(i.e.: before manipulating the sounds of one's language, the sounds must be adequately processed), issues of phonological processing are explored in the second section of the

literature review, entitled, "Phonological Processing". Beginning in the 1970's research began to indicate that children experiencing reading difficulties tend to manifest significant phonological processing deficits. In 1992, Webster and Plante completed a landmark study which combined all of the notions from the research surrounding rhyming and phonemic awareness, reading difficulties, phonological processing and finally, phonological impairments. Although research completed prior to this study did not indicate that children with phonological impairments would experience significant academic difficulties, Webster and Plante (1992) reasoned that such children have phonological processing deficits and would therefore have difficulties with phonemic awareness and ultimately, with learning to read. This research and related research are presented in the section entitled "Phonological Processing".

The third section of the literature review entitled, "Studies Looking at the Relationship Between Phonological Impairment and Phonemic Awareness" documents two recently completed studies, by Webster and Plante (1992) and Bird et al. (1995). These studies were explored in detail as they provide the foundation upon which the current study is based.

The fourth and final section of the literature review entitled, "Teaching", explores issues of phonemic awareness instruction. This section is encouraging, as the literature documented states that phonemic awareness can be taught to children who demonstrate deficits in this area. Such literature helps the value of the research presented in the previous three sections to be realized, as phonemic awareness instruction can be programmed into many instructional contexts (e.g.: speech language therapy, preschool special needs programs and home stimulation).

A summary of the documented literature is presented in the fifth section of the review. This summary reviews the progression of the literature review, as seen by this investigator, and introduces the basis for the present study.

Rhyming and Reading

The Development of Rhyming Ability and What Such Development Indicates

It became apparent, through an early observational study (Chukovsky 1963), and more recently, (Bradley and Bryant, 1978,1983, 1985; Kirtley et al., 1989; Knafle, 1973, 1974; Lenel and Cantor, 1979; Van Kleek and Sheule, 1987), that rhyming ability is present in early childhood (3

to 4 years and as early as 2 years, 8 months). The presence of this ability must not be undervalued as it requires a significant amount of insight into language. Van Kleek and Sheule (1987) and Sanches and Kirshenblatt-Gimblett (1976) assert that competent rhyming ability (i.e.: the ability to formulate rhyming words) is indicative of control of the language's phonology. These notions are strongly echoed by Bradley and Bryant (1985). Rhyming production involves the manipulation of phonemes in a rule governed manner as both phoneme segmentation and phoneme addition are required to complete rhyming tasks. For example, in order to formulate a word to rhyme with "fan", the initial phoneme "f" must be segmented and deleted and a new phoneme (e.g.: "m") inserted to form "man". Spontaneous commenting on rhyme (e.g.: "boodle and noodle - that sounds the same") may be present as early as 2 years 8 months (Van Kleek and Sheule, 1987).

Given these notions, Bradley and Bryant (1985) argue it is fair to assume that rhyming ability is a remarkable achievement on the part of young children. They also conclude that normally developing children are very aware of rhymes, dabble in them and enjoy them. As a result, they begin to significantly expand their knowledge of the phonological structure of their language (Tunmer and Rhol, 1990). The integrity of this pre-school skill therefore,

asserts tremendous influence over the continued development of more complex phonemic awareness (e.g.: segmentation, deletion etc.), and the eventual development of reading.

Although rhyming is a remarkable skill, especially for the preschool child, Bird et al. (1995) play down the enthusiasm communicated by the aforementioned researchers by cautioning that rhyming is qualitatively different from other forms of phonemic awareness (segmentation and omission) and represents only the most fundamental type of phonemic awareness. The complexity of a phonemic awareness task may be determined by the size of the phonological unit that must be identified (i.e.: individual phonemes versus a group of phonemes within the syllable). Treiman (1991) notes that rhyme detection (discriminating which words rhyme from those that do not) requires the child to segment the *onset* (consonant or consonant cluster preceding the vowel - b at) and the *rime* (the vowel plus any following consonants - b at) of a syllable. The rime and the onset are intrasyllabic (within the syllable) units. Bird et al. (1995) note that Treiman's (1991) research indicates that typical children are able to tell that two words share the same onset (e.g.: plan/plow) or rime (hat/mat) before they can segment the onset or rime into component and individual

phonemes (single sounds). Therefore, it cannot be assumed that a child who can match words on the basis of rime (e.g.: finding that "bat" and "cat" rhyme because of the similar rime) or onset (e.g.: finding that "car" and "cook" start with the same sound) is proficient at identifying individual phonemes. Treiman's (1991) work suggests that most children have some awareness of intrasyllabic units (as is required in rhyming) before they start learning to read, but awareness at the phonemic level begins much later. This later development is probably a consequence of becoming literate (Bird et al, 1995).

The Significance of Rhyming Ability

It has been found that rhyming ability at age 3 and 4 years is related to beginning word reading (Blachman, 1991; Bryant et al., 1989; MacLean, et al., 1987). Specifically, rhyming ability is important to further linguistic development in two ways; (a) as a precursor to further phonemic awareness which typically develops in the year that follows, and (b) as a direct aid to reading as rhyming words often have similar spellings and can be grouped or categorized based on spelling. In a similar vein, Goswami (1991) has provided evidence that beginning readers can make use of analogies with known words when learning to read or spell unfamiliar words. For instance knowledge, of the word

"bag" can help a child read the word "rag" based on the identical rime, "ag", in both words. Furthermore, young children make more analogies in reading when the shared letter sequence between analogous words is at the end of the words rather than at the beginning; more analogies are made between beak and peak than between beak and bean. In order to formulate such analogies, the child must have some awareness of how to decompose words into smaller units (i.e.: onsets and rimes) and how to relate these strings (Goswami, 1991). Importantly, the level of phonemic awareness necessary for the identification of rhymes is probably sufficient for the formulation of the analogies required in this basic decoding (Bird et al., 1995). The ability to segment words by individual phonemes appears later, possibly as a consequence of learning to read. As this early stage progresses, the children are formulating grapheme-phoneme correspondences and laying the foundations for further reading development (Stuart and Coltheart, 1988). Indeed, Stuart and Coltheart argue that the achievement of basic phonemic awareness (e.g.: identification of rhyme) changes the way that children view printed words, making them sensitive to both regularities and irregularities in orthography. Rather than relying

solely on whole word recognition, this basic phonemic awareness allows children to take a more systematic approach to decoding. These notions are echoed by Webster and Plante (1992) who assert that children with poor phonemic awareness appear to rely on a whole word processing strategy when decoding at the single word level as opposed to phonological processing/phonemic awareness.

Based on the information provided by researchers such as Bird et al. (1995), Goswami (1991), Stuart and Coltheart (1988), and Treiman (1991), the progression of basic decoding and phonemic awareness development may be summarized as follows:

1. In the preschool (pre-literate) years, rudimentary phonemic awareness develops (as a result of exposure to nursery rhymes, songs and poems). A child at this level becomes able to break syllables into the onset and the rime. A child operating at this level will be able to complete rhyming activities (Bird et al., 1995; Treiman, 1991). Examples of rhyming activities are: rhyme identification, rhyme formulation, and filling in the blanks with rhyming words.

2. Children rely on this knowledge to form analogies and decode or spell unfamiliar words (Goswami, 1991; MacLean et al., 1987). Familiarity at this level allows

the child to strengthen their knowledge of phoneme-grapheme correspondences (Stuart and Coltheart, 1988).

3. Children then develop more complex phonemic awareness and can operate at the phonemic level of awareness (i.e.: decomposing syllables/words into single sounds) and therefore, become more proficient with decoding (Bird et al., 1995; Treiman, 1991).

4. Following increased proficiency with decoding and phonemic awareness is automaticity, which allows the reader to devote more time and attention to higher level processes of text integration and comprehension (Stanovich, 1986a; Stanovich, 1986b). Thus, rhyming is seen to be a very basic but vital component in the development of phonemic awareness and decoding. Stanovich (1986b) warns that inadequate development at this most basic level leads to a causal chain of escalating negative side effects. During early reading acquisition, children with poorly developed phonemic awareness begin to be exposed to much less text than normally developing children and are often given reading materials that are too difficult for them. As a result, these children have fewer opportunities to practice their emerging reading skills. These in turn delay the development of automaticity and speed at the level of

decoding. Too much energy and concentration is, therefore, donated to decoding and not enough is devoted to comprehension and the integration of ideas presented in the text (Stanovich, 1986b).

Ellis and Large (1987) suggest that performance on rhyming activities (e.g.: rhyme generation and detection of rhyming versus non-rhyming words) is one of the best discriminators of good versus poor readers. Finally, pre-literate measures of phonemic awareness (e.g.: rhyming) are found to predict achievement in reading more accurately than do many common correlates of school achievement tests, IQ scores, age and socio-economic status (Share, Jorm, MacLean, and Matthews, 1984).

The Significance of Rhyming Ability as Evidenced Through Experimentation With Reading Disabled Versus Normal Readers

Evidence for the importance of phonological awareness in literacy acquisition also comes from studies of children with reading and spelling difficulties (Bird et al., 1995). In many cases these children do very poorly on tasks of phonemic awareness (Snowling, 1991).

Bradley and Bryant (1985) caution that experimentation comparing reading disabled with normal readers on any skill must prove a causal relationship. They argue that in

experimentation comparing the rhyming ability of disabled readers and normal readers of same age and intelligence, cause and effect cannot be disentangled. That is, the reading disabled children's poor rhyming skills could have led to their slow progress in reading. Alternatively, the children's relatively poor reading levels could account for their insensitivity to rhyme. Essentially, any difference found between the normal and disabled readers could be attributed simply to reading level and the resulting experiential differences. Bradley and Bryant (1985) therefore assert that the solution to this dilemma is to compare disabled and normal readers at the same level of reading. This rules out the possibility that any differences between the groups are the by-product of different reading levels, hence, the difference may be isolated as cause.

Employing these methods, Bradley and Bryant (1978, 1983) and Kirtley et al. (1989), found that reading disabled children are at a striking disadvantage when categorizing words on the basis of common sounds (i.e.: rhyming). These results are substantiated with early notions presented by Savin (1972).

Phonological Processing

Disabled Readers and Phonological Processing Ability

Delving deeper into issues of phonemic awareness one comes across concepts involving phonological processing. Phonological or phonemic processing refers to the use of phonological information (i.e.: sound structure of one's oral language) in processing orally presented information (Wagner, Torgesen, Laughon, Simmons and Rashotte, 1993). Wagner and Torgesen (1987) describe three independent but compatible bodies of research. The first and seemingly most well-developed centers on the concept of phonemic awareness, (the awareness of, and access to, the sound structure of one's language) (Mattingly, 1972). This awareness is demonstrated by the adequate processing of the differing characteristics of the phonemes in one's spoken language (Hurford, 1990). Moreover, once a child is able to capitalize upon this information and apply it in various situations (e.g.: realizing that there is a sound sequence common to the words "cat" "hat" and "rat"), decoding written language is the next logical progression (Goswami, 1986). These concepts echo those of previously presented research results which focused upon the phonemic awareness skill of rhyming.

The second body of research centers on the construct of phonological coding in working memory (Wagner et al., 1993). Here, it is reasoned that there is a separate phonological memory store in short term memory that is capable of holding spoken material during ongoing processing (Baddeley, 1982; Jorm 1983b; Jorm and Share, 1983; Mann and Liberman, 1984). Also, the difficult tasks of combining the verbally presented sounds into words and matching these with the semantic counterparts is completed. Both tasks are vitally essential to the successful completion of phonemic awareness tasks and early decoding (Baddeley, 1982; Jorm 1983b; Jorm and Share, 1983). Indeed, there appears to be a significant correlation between difficulties with phonemic awareness and deficient verbal short term memory (Mann and Liberman, 1984). Moreover, the child experiencing specific learning difficulties such as reading delays may be limited in the phonological short-term store of working memory (Jorm, 1983b; Mann and Liberman, 1984; Pumfrey and Reason, 1991). Pumfrey and Reason (1991) caution that a great deal of research using both testing and teaching methodologies needs to be completed to illuminate the specifics of these issues.

The third and final body of research centers on the construct of the retrieval of phonological codes from a long term memory store (Jorm, 1983b; Jorm and Share, 1983; Mann, 1984; Stanovich, 1986b; Wagner et al., 1993). Here, pronunciations of letters, word segments or whole words are retrieved from long term memory storage. The efficiency with which children are able to retrieve phonological codes associated with the auditorally or visually presented phonemes, word segments or whole words should influence the degree to which phonological information is used in phonological processing and decoding (Wagner et al., 1993). Children experiencing phonemic awareness and reading delays may suffer from a degraded phonological representation system in long term memory (Jorm, 1983a; Jorm and Share, 1983; Mann, 1984). Jorm and Share (1983) go on to argue that it is auditory processing deficits, in particular, that are the source of degraded or deficient phonological encoding and representation in long term memory.

Wagner et al. (1993) indicate that differing phonological tasks require individual combinations of the aforementioned processing components (i.e.: phonemic awareness, working memory, long term memory retrieval). However, all processing components play a role in any activities requiring auditory processing (e.g.: digit

recall, rhyming, segmentation, decoding etc.). Jorm and Share (1983) explain that the three components have reciprocal relationships with one another that can be best summarized as follows. Efficient and accurate phonological representation in long term memory allows for adequate phonological storage in working memory and therefore competent phonemic awareness.

Considering phonological processing as a general entity, many researchers have demonstrated that the phonological processing abilities may be causally related to the normal acquisition of beginning reading skills (Bryant and Bradley, 1985; Bryant et al., 1989; Jorm, 1983b; Jorm and Share, 1983; Stanovich, 1986b; Wagner and Torgesen, 1987; Wagner et al., 1993). Accurate phonological processing allows a child to analyze the phonetic code efficiently and to possess adequate phonemic awareness, which in turn, leads to accurate decoding (Stanovich, 1986a; Tallal, 1980).

Exploration of populations of children experiencing reading/decoding difficulties, has demonstrated that it is such children who tend to manifest significant phonemic processing deficits (Brady, Shankweiler and Mann, 1983; Fowler, 1991; Hurford, Gilliland and Ginavan, 1992;

Hurford and Sanders, 1990; Jorm, 1983a; Jorm, 1983b; Mann, Liberman and Shankweiler 1987; Pumfrey and Reason, 1991; Tallal 1980). In light of this, Wagner et al. (1993) caution that information regarding the specific characteristics of the relationship between phonological processing and the steps to efficient reading acquisition (i.e.: phonological processing, phonemic awareness, various language skills and early decoding) require substantiation.

A second group of children who appear to demonstrate difficulties with phonemic or phonological processing are those manifesting significant pronunciation difficulties or delays. The following section explores this phenomenon.

Children With Productive Phonological Impairments and Phonemic Awareness

Although poor articulation is sometimes caused by physical disability such as cleft palate or hearing loss, in the majority of children, specific problems with speech sound production do not have a physical basis (Bird et al., 1995). It appears therefore, that poor articulation, and in particular, phonological impairments are the result of inadequate processing of auditory information (Bird et al., 1995; Webster and Plante, 1992)

Children with phonological impairments, are physically normal children who display immature and sometimes deviant

phonological processes or phonological patterns of pronunciation (Bird et al., 1995). A phonological pattern includes a number of phonemes that are categorized based on various characteristics (i.e.: manner of articulation, place of articulation, presence or absence of voicing) and a phonological process is a deviation of one or more of these characteristics (Hodson and Paden, 1983). Thus, groups of phonemes or sounds rather than individual phonemes are considered. Examples of phonological processes are, *gliding* - where phonemes such as /w/ or /y/ are substituted for phonemes in another group, *stopping* - where a hard stop phoneme such as /t/ is substituted for a softer air flow phoneme such as /s/, *backing* - where back phonemes /k/ or /g/ are substituted for front phonemes such as /t/ or /d/, *fronting*- where the opposite to backing occurs, *assimilations* - where different phonemes in a word are produced similarly resulting in a mispronunciation of the word (e.g.: dog -> gog). A child demonstrating a phonological delay may manifest one or many of these processes as well as ones unique to his or her repertoire (Hodson and Paden, 1983). When considering the severity of the deviancy, norms for typical phonological development of

children and typical adult patterns are considered (Grunwell, 1981; Weber, 1969).

As with children with reading delays, some research has indicated that children manifesting pronunciation difficulties show more variability and may be less competent than normally developing children with phonological processing skills (Broen et al., 1983; Hoffman et al., 1985; Jameison and Rvachew, 1992; Morgan, 1984; Ohde and Sharf, 1988; Raaymakers and Crul, 1988; Rvachew and Jameison, 1989; Smit and Bernthal, 1983; Webster and Plante, 1992)

Based on the notion that children with pronunciation difficulties may exhibit less competence with phonological processing, Webster and Plante (1992) reasoned that because phonemic awareness appears to depend on the ability to effectively and accurately process phonological information, children with phonological impairments, are less competent, and may experience difficulty with phonemic awareness tasks. This is because phonemic awareness appears to depend on the ability to effectively and accurately process phonetic information. Webster and Plante go on to argue that the presence of a phonological impairment may hinder ability with phonemic awareness tasks as it could preclude efficient phonological coding/processing in working memory. Indeed,

Jorm and Share's (1983) explanation of the inter-relationship between the three components of phonological processing appears applicable when considering the phonologically impaired population. Specifically, children experiencing a phonological impairment may experience auditory perceptual deficits leading to degraded phonological representation/encoding in long term memory which, in turn, interferes with adequate phonological storage and representation in working memory, and finally, compromises phonemic awareness.

With the use of standardized testing and careful task manipulations, Webster and Plante (1992) were able to demonstrate a significant positive relationship between output productive phonology (i.e.: integrity of phonological development) and performance on various tasks of segmentation (a common phonemic awareness task involving the separation of component sounds or phonemes within a sound sequence - bat -> "b" - "a" - "t") in children aged 6 years, 5 months to 8 years, 6 months. Further, it was found that as speech intelligibility (pronunciation ability) increased, there was an accompanying increase in segmentation ability. Thus, it may be surmised that as phonological processing ability increases along with

intelligibility of speech or phonological development, phonemic awareness skills are also facilitated (Webster and Plante, 1992). Webster and Plante (1992) concede that replication of their results is required. They argue that if additional research confirms the finding that phonological impairments are related to phonemic awareness deficits, educational professionals (i.e.: teachers, speech language pathologists, educational psychologists, etc.) should routinely screen the integrity of phonemic awareness skills in children with phonological impairments.

Bird et al. (1995) suggested that not all children with pronunciation difficulties will present with phonological processing difficulties and this is dependent on the nature of the impairment. Specifically, children with *phonological impairments* (i.e.: difficulties with phonological patterns as described above) have difficulty identifying the smaller segments of syllables. These children operate with larger units than the phoneme, and therefore fail to recognize when words share common onsets or rimes. At an age when most children are discovering that letters can represent individual phonemes, children with phonological impairments cannot even complete the most rudimentary tasks of phonemic awareness (e.g.: rhyme identification) (Bird et al., 1995).

Going beyond phonemic awareness to overall academic performance, retrospective studies have not found a connection between early articulatory delays and later academic achievement (Hall and Tomblin, 1978; Shriberg and Kwiatkowski, 1988) However, these studies were fraught with methodological difficulties and were rather superficial in nature (i.e.: questionnaires and old school records were employed). It was noted by this investigator that these studies looked at overall academic functioning (i.e.: language arts, social studies, and mathematics) rather than studying specific issues such as decoding and early literacy development.

Employing direct observations and numerous assessment tools, Snowling and Hulme (1989) completed a single subject study where a child with a significant phonological impairment was observed in terms of specific academic ability. Snowling and Hulme demonstrated that output phonology is strongly linked to underlying phonologically based tasks such as decoding. Specifically, impaired phonological development severely impairs efficient decoding.

Approaching the issue of phonological impairment and academic performance in the reverse, many authors have

commented that children with reading disabilities, or children experiencing various reading difficulties are more likely than normal readers to present with pronunciation delays (Bryant and Bradley, 1985; Beech, 1985; Moseley, 1990). Finally, Catts (1993) commented that children, with phonological impairments, who demonstrate sequential errors (e.g.: assimilations - dog -> gog, and metathesis - dog -> god) have a high incidence of reading disabilities .

The inter-relationships between phonological processing, output phonological development, phonemic awareness and ultimately, reading are presented repeatedly in the literature and are in serious need of further exploration (Catts, 1993).

Studies Looking at the Relationship Between Phonological Impairments and Phonemic Awareness

This section has been included to document in detail the studies upon which the current research project is based.

Webster and Plante (1992)

Webster and Plante's study is entitled, "Effects of Phonological Impairment on Word, Syllable, and Phoneme Segmentation and Reading". Webster and Plante assert that theirs is the first study to directly examine the effects of phonological impairment on phonemic awareness. The purpose

of their study was to compare phonologically impaired children with phonologically normal children on tasks of sentence, syllable, and phoneme segmentation and on a task of single word recognition.

Twenty two children ranging in age from 6 years, 5 months to 8 years, 10 months were included. Eleven children comprised the phonologically impaired group (children manifesting a significant phonological delay) and 11 children comprised the phonologically normal group.

To be included all subjects had to score within normal limits on the Test of Nonverbal Intelligence, Peabody Picture Vocabulary Test, and the Test of Auditory Comprehension of Language. The 11 children with phonological impairments were matched to the 11 children with normal phonological development on the basis of nonverbal mental age as determined by the Test of Nonverbal Intelligence.

All subjects were tested individually in one session in a quiet area. Following the administration of the aforementioned language and intelligence tests, the following series of experimental tasks was employed all of which required non-verbal responses: sentence to word segmentation, word to syllable segmentation, word to phoneme

segmentation, pseudoword to phoneme segmentation and single word recognition.

Three types of analyses were used to study the data. The first of these was matched-pairs t-tests. The phonologically normal children performed significantly better than the children with phonological impairments, on the pseudoword segmentation task, the sentence to word segmentation task and the word to phoneme segmentation task. There were no significant differences between the groups on the word recognition task and the word to syllable segmentation tasks. Correlational analysis, the second method of analysis used, revealed that as speech intelligibility increased, there was an accompanying increase in segmentation ability particularly with the word to phoneme and pseudoword to phoneme tasks. Finally, multiple regression analyses revealed that mental age or amount of education in months failed to be significant predictors of segmentation ability.

Webster and Plante (1992) concluded that phonemic awareness is closely associated with productive phonological ability, independent of mental age and educational experience. However, they cautioned that the generalization of the results is mitigated by the small sample size used and that substantiation of results is required.

Bird, Bishop and Freeman (1995)

A more recent study was completed by Bird, Bishop and Freeman (1995). It is entitled, "Phonological Awareness and Literacy Development in Children with Expressive Phonological Impairment". One of the questions asked by these researchers was, do children with phonological impairments do poorly on tests of phonological segmentation that do not require expressive output? The tasks used assessed the ability to identify rime and onset in contrast to identifying individual phonemes.

The phonologically impaired group consisted of 31 boys ranging in age from 5 years to 7 years, 4 months. Nineteen of these children had pure expressive phonological impairment and the remainder had phonological impairments plus additional language problems. Each of the children in the phonologically impaired group was matched with a normally developing child on measures of chronological age (within two months) and a measure of nonverbal ability. The tests used to classify children were; a phonological naming task, the Action Picture Test and the British Picture Vocabulary Scale. The phonemic awareness tasks were rime matching, onset matching, and onset segmentation and matching.

Bird et al. (1995) analyzed their data with an analysis of variance. They found that children with expressive phonological impairments have extreme difficulty in carrying out tasks that require them to segment and match onsets and rimes of words even when the task requires no speech output. Many children in the phonologically impaired group performed at chance levels on these tests while the children in the control group performed well above this level. It made little difference whether or not the phonological impairments were accompanied by broader language difficulties. Bird et al. (1995) pointed out that although many preschool children successfully perform the phonemic awareness tasks presented in this study, the children in the phonologically impaired group, who were exposed to schooling for one to two years, still had significant difficulty. Assessing the children in the phonologically impaired group two years later, Bird et al. (1995) found that these children were experiencing significant literacy problems. They asserted that there was evidence to indicate that the problems experienced by these children were specifically linked to difficulties with the "alphabetic" stage of literacy, that is, learning the correspondences between phonemes and graphemes. In essence, they did not

appear to be able to break syllables into their constituent phonemes or sounds (Bird et al., 1995).

Teaching

Teaching Phonemic Awareness

The tremendous value of focusing on phonemic awareness issues comes to light when considering the research on teaching. In an attempt to explore various methods of improving basic decoding skills, researchers have sought to devise programs aimed at increasing the phonemic awareness of school aged children experiencing early reading difficulty (Bradley and Bryant, 1983; Bryant and Bradley, 1985; Iverson and Tunmer 1993; Williams, 1980). These researchers concluded that an explicit focus upon phonemic awareness skills greatly facilitates phonemic awareness and the benefits are generalized to general decoding skills. Interestingly, Iverson and Tunmer (1993) found that a focus upon common word elements in word families (phonograms), such as the letter sequence "ight" in "light", "fight" and "might", is extremely beneficial to children experiencing early decoding difficulty. Iverson and Tunmer (1993) reasoned that competence with the basic phonemic awareness skill of rhyming or phonogram use is a stepping stone to the development of more complex phonemic awareness tasks (e.g.:

segmentation, deletion, omission etc.). Specifically, mastery of this phonemic skill greatly facilitates the process of learning to isolate and recognize individual phonemes thus leading to the mastery of more complex phonemic awareness tasks (Iverson and Tunmer 1993; Treiman, 1984).

Lundberg, Frost and Petersen (1988) demonstrated that phonemic awareness (e.g.: rhyme, syllable identification, syllable synthesis and phoneme identification) can be developed prior to reading instruction (i.e.: in pre-literate pre-school children) and the resulting knowledge facilitates later reading acquisition. Moreover, Bryant and Bradley (1985) demonstrated that teaching a rhyming activity based on detecting the odd word out (e.g.: determining which word does not belong in a group such as "big", "fig", "cat", "wig"), to pre-school children increased overall rhyming ability and was beneficial to decoding and spelling in subsequent academic years.

Caution must be exercised when incorporating phonemic awareness instruction into any program aimed at increasing phonemic awareness and later reading development (i.e.: speech therapy for phonologically impaired children, preschool children at risk for later reading difficulties, children demonstrating poorly developed phonemic awareness).

Indeed, recent studies have indicated that phonemic awareness instruction alone may not be sufficient to ensure increased reading ability and should be accompanied by training in letter to sound mappings (Ball and Blachman, 1991; Blachman et al., 1994; Bradley and Bryant, 1983; Byrne and Fielding-Barnsley, 1993). This is not to say that phonemic awareness instruction cannot be provided in the preschool years, prior to exposure to the alphabet. Rather, a pedagogically sound method of phoneme awareness training is one that eventually makes explicit the complete letter to sound mappings in segmented words (Ball and Blachman, 1991).

Torgesen et al. (1994) concluded that phonemic awareness training should be included in any preventative or remedial program for children either at risk for reading difficulties (e.g.: phonologically impaired children) or children identified with reading disabilities. However, Torgesen et al. further suggested that training procedures that are more explicit or more intense than those typically found in the research literature may be required in order to have a substantial impact on the phonemic awareness of children with severe difficulties.

Summary

The ability to detect and formulate rhyme develops relatively early in a child's life (i.e.: as early as 2 years and 7 months) (Bradley and Bryant, 1978, 1983, 1985; Kirtley et al., 1989; Knafle, 1973, 1974; Lenel and Cantor, 1979; Van Kleek and Sheule, 1987). Competent rhyming can be considered a remarkable skill as it is a rudimentary form of phonemic awareness (Tunmer and Rohl ,1990) which requires that syllables be broken into intrasyllabic units - rime and onset (Bird et al., 1995). Rhyming therefore, asserts tremendous influence over the subsequent development of decoding and more complex phonemic awareness, where syllables must be broken down into individual phonemes (e.g.: segmentation and deletion) (Bird et al., 1995; Blachman, 1991; Bryant et al., 1989; MacLean et al., 1987). Following this, proficiency with decoding increases leading to automaticity and therefore, the development of higher level processes such as text integration and comprehension (Bird et al., 1995; Stanovich, 1986b; Treiman, 1991). Inadequate development at the fundamental level of rhyming leads to a causal chain with escalating negative side effects that are evidenced at all levels of literacy development (Stanovich, 1986b). These notions are substantiated with research studies by Bradley and Bryant

(1978, 1983), Kirtley et al. (1989) and Savin (1972) which conclude that children experiencing reading difficulties are at a striking disadvantage when categorizing words on the basis of common sounds (i.e.: rhyming).

In considering abilities with rhyming (a basic phonemic awareness skill) and reading, researchers have attempted to study phonological processing to determine if there is a relationship at this level. Indeed, it has been found that deficient phonological processing abilities, at the levels of phonemic awareness, short term working memory, and long term memory may be causally related to the difficulties with beginning reading skills (Brady et al., 1983; Bryant and Bradley, 1985; Bryant et al., 1989; Fowler, 1991; Hurford and Sanders, 1990; Hurford, Gilliland and Ginavan, 1992; Jorm, 1983a, 1983b; Jorm and Share, 1983; Mann Liberman and Shankweiler, 1987; Pumfrey and Reason, 1991; Stanovich, 1986b; Tallal, 1980; Wagner and Torgesen 1987, Wagner et al., 1983) A second body of research has generalized the study of phonological processing skills to the phonologically impaired population (i.e.: children manifesting deviant patterns of pronunciation). As with children with reading delays, those manifesting pronunciation difficulties show more variability in

phonological processing skills and appear to be less competent than normally developing children (Broen et al., 1983; Hoffman et al., 1985; Jameison and Rvachew 1992; Morgan, 1984; Ohde and Sharf, 1988; Raaymakers and Crul, 1988; Smit and Bernthal, 1983; Rvachew and Jameison, 1989; Webster and Plante, 1992).

Presuming that children with phonological impairments also have difficulty with phonological processing, Webster and Plante (1992) found that such children performed significantly worse, than children without phonological impairments, on various tasks of segmentation. Bird et al. (1995) compared children with phonological impairments to normally developing children on the pre-school task of rime and onset matching. They found that phonologically impaired school aged children ranging in age from 5 years to 7 years 4 months, performed significantly worse than their normally developing peers. Bird et al. (1995) reasoned that children with phonological impairments are unable to identify the intrasyllabic units (i.e.: rime and onset) of syllables and process larger units than onsets, rimes and therefore individual phonemes. Bird et al. (1995) found in a follow-up assessment of the children with phonological impairments (two years later) that they experienced significant difficulties in their development of literacy.

Presumably, the inability to process phonological information adequately (i.e.: as required in basic phonemic awareness tasks) presents an obstacle in the development of literacy (Bird et al., 1995). As these studies are the first ones to focus explicitly on the phonologically impaired population and phonemic awareness, replication is required.

Of great importance is the fact that phonemic awareness can be successfully taught to children experiencing difficulty. Indeed, explicit focus upon phonemic awareness skills in an instructional context greatly facilitates phonemic awareness. This is true even with preschool children. Moreover, the benefits are generalized to decoding skills. When coupled with letter to sound mappings phonemic awareness training is at its most effective (Ball and Blachman, 1991; Blachman, et al., 1994; Bradley and Bryant, 1983; Byrne and Fielding-Barnsley, 1993). Indeed, Torgesen et al. (1994) concluded that as the development of phonemic awareness is crucial in the development of literacy, phonemic training should be included in any preventative or remedial program for children either at risk for reading difficulties, (i.e.: phonologically impaired

preschool children)or children identified with reading disabilities.

The Present Research

The present research investigated the relationship between phonological impairment and the development of rhyming in preschool children. The foundations for this study were explored in the literature review and can be summarized as follows:

- Rudimentary phonemic awareness develops in the preschool years in the form of rhyming (i.e.: identification of onset and rime). Rhyming ability is a basic but vital component in the development of literacy and is very worthy of attention. The ability to rhyme therefore signifies the basic ability to process phonological information by identifying intrasyllabic units (i.e.: rime and onset).

- Recent research (Webster and Plante, 1992; Bird et al., 1995) indicated that a group of children who may be at particular risk for reading difficulties is the phonologically impaired population as their phonological processing abilities are less competent than their normally developing peers. Indeed, such research showed that school aged children with phonological impairments, performed significantly worse on tasks of phonemic awareness as they appeared unable to process phonological information beyond

the syllable level (i.e.: they were not able to adequately identify intrasyllabic components of syllables such as rime and onset). This phenomenon occurred even when children had been exposed to reading instruction for one or two years (Bird et al., 1995).

- As all of the research with the phonologically impaired population and their development of phonemic awareness has been done with school aged children, a logical expansion was to focus upon preschool children manifesting phonological impairments. This was possible as the most rudimentary and vital component of phonemic awareness (i.e.: rhyming) develops in the preschool years in typical children. The benefits of early identification of delays in phonemic awareness are obvious as instruction programs aimed at preschool children have been successful (Lundberg et al., 1988, Bryant and Bradley, 1985). Indeed, phonemic awareness training could be incorporated into preschool speech language therapy (such as that provided at the Alberta Children's Hospital) and pre-school programs, if it is found that children with phonological impairments are deficient in phonemic awareness.

The present study was designed in a similar fashion to Webster and Plante's (1992) and Bird et al.'s (1995) studies

that compared children with phonological impairments to children with normal phonological development on tasks of phonemic awareness. The data was analyzed to assess if there were significant differences between the two groups. However, the present study focused upon preschool children rather than school aged children. Such comparison comprised the main purpose of this study. This was stated in the form of a null hypothesis.

The investigator also asked questions that could be answered by analyzing the data gathered during this study. It was anticipated that such analyses could provide information to supplement the results of the comparison of rhyming skills between the two groups. Moreover, the answers to these questions could perhaps provide the foundation for further study. With the first question, the relationship between the severity of phonological impairment and performance on the rhyming tasks was analyzed. Webster and Plante (1992) also included this question in their study, and this investigator sought to determine if their results could be replicated. The second question analyzed the relationship between performance on the language tests and performance on the rhyming tasks. This question was included to serve as a foundation for further study. If it was found that performance on the rhyming tasks was affected

by language development, additional study of this relationship would be warranted. Finally, the third question sought to analyze the relationship between age and performance on the rhyming tasks. During a child's pre-school years, many developments and changes occur. Therefore, this question was addressed to ascertain if rhyming ability changes during the time between 3 years, 6 months and 4 years, 6 months.

The null hypothesis guiding this study was:

> Pre-school children with a phonological impairment will not perform significantly different from pre-school children with normal phonological development on rhyme detection and rhyme formulation tasks.

The questions also investigated during this study were as follows:

1. Is the severity of phonological impairment related to performance on the rhyming tasks?
2. Is there a relationship between language development (within the domains of expressive vocabulary, receptive vocabulary and auditory comprehension) and performance on the rhyming tasks?
3. Is there a relationship between chronological age and performance on the rhyming tasks?

Chapter Three

Methodology

Subjects

The children comprising the phonologically impaired group were recruited from the Phonology Grouping of Speech and Language Services from the Speech Language Pathology Department of the Alberta Children's Hospital. These children had been identified as having phonological impairments with normal language development (e.g.: vocabulary and receptive language) by a certified Speech Language Pathologist in the Speech and Language Department of the Alberta Children's Hospital. Initial contact with the parent(s) was made by the Speech Language Pathologist, treating the child. Interested parents contacted the investigator by telephone. During this conversation, the investigator explained the study further, answered questions put forth by the parent(s), discussed the consent forms to be signed at the initial meeting and scheduled an appointment to meet the child.

The children comprising the phonologically normal group were recruited through an advertisement placed in daycares and pre-schools in the city of Calgary, and community establishments such as leisure centres and parishes. Interested parents contacted this investigator by

telephone, and the procedure described for the recruitment of the phonologically impaired group was used.

Subject Selection

Inclusion criteria were:

1. performing within normal limits on receptive language (auditory comprehension) as tested by the *Test of Auditory Comprehension of Language - Revised* (Carrow, 1973), expressive and receptive vocabulary (as tested by the *Gardner Expressive One Word Picture Vocabulary Test - Revised* (Gardner, 1990) and the *Peabody Picture Vocabulary Test - Revised* (Dunn and Dunn, 1981).

2. performing at the pre-reading level as determined by the *Classroom Reading Inventory*. (Silvaroli, 1986).

3. children in the phonologically impaired group had to score in the moderate, severe or profoundly delayed ranges as determined by the *Computer Analysis of Phonological Development (CAPP)* (Hodson and Paden, 1983).

Children in the phonologically normal group had to score within the normal range on the CAPP (Hodson and Paden, 1983).

Sixteen children were included in this study. Eight children comprised the phonologically impaired group

and eight children comprised the phonologically normal group. Each group contained four males and four females.

All of the children recruited were included in this study. The subjects ranged in age from 3 years, 3 months to 4 years, 6 months. The average age of the children in the phonologically impaired group was 47 months or 3 years, 11 months. The average age of the children in the phonologically normal group was 46.4 months or 3 years, 10.4 months.

None of the included children manifested identifiable neurological, visual, emotional, behavioral or hearing impairments.

Instruments

Receptive Language Tests

The *Peabody Picture Vocabulary Test - Revised (PPVT - R)* (Dunn and Dunn, 1981) is a non-verbal test, where pointing is the only response required. Each test plate contains four pictures (3 foils and 1 correct picture). The examinee is required to point to the picture that matches the word uttered by the examiner. The examiner must be careful not to cue the correct answer with a glance toward the correct picture. The only prompts that can be offered by the examiner are those encouraging the examinee to look

at all of the pictures, or a repetition of the stimulus word when the examinee does not respond initially.

A basal level is established on the PPVT-R with the lowest eight consecutive correct responses and the ceiling is established when six out of any group of eight are incorrect.

The PPVT-R was standardized on a representative national sample of children and youth and a selected sample of adults based on population data from the 1970 U.S. Census. Forty-two hundred youths were included in the standardization sample - 200 persons in each of 21 age groups ranging from 2 years, 6 months to 18 years, 11 months. There were 100 males and 100 females in each of the groups. Approximately 100 published studies have reported reliability data on the original PPVT. Bochner (1975) reported on 32 selected studies published between 1965 and 1974. Immediate re-test reliability coefficients ranged from .72 to .84 when the time interval between test and re-test was less than two weeks. Delayed re-test reliability was .72 for less than one year time interval, and .59 for more than one year time interval.

The PPVT -R correlates most highly with other measures of vocabulary such as the Expressive One Word Picture

Vocabulary Test - R (Gardner, 1990). Here, correlation was found to be .70 when considering reliability (Gardner, 1990). The correlation with measures of intelligence or measures of achievement is not as strong.

The *Test of Auditory Comprehension of Language - Revised (TACL-R)* (Carrow, 1973) is a receptive language test. It is a nonverbal picture pointing assessment similar to the PPVT-R. The examiner utters a word, phrase or statement and the subject is to point to the corresponding picture. Each test plate contains the correct picture and three foils. There are three sub-tests in the TACL-R measuring three levels of language comprehension. The first level entitled, WORD CLASSES AND RELATIONS, measures vocabulary and basic relationships between words in phrases. The second level, GRAMMATICAL MORPHEMES, measures the comprehension of various grammatical forms (e.g.: pronouns, present tense forms, past tense forms, prepositions). The third level, entitled, ELABORATED SENTENCES, measures the ability to process and comprehend long and sometimes complicated sentences (e.g.: The girl standing on the corner by the hamburger stand waved to the taxi driving by).

A basal is established when four consecutive responses are correct and a ceiling is reached when three out of four consecutive responses are incorrect.

Studies looking at the validity of the TACL-R have found that it successfully differentiates children with disorders (i.e.: speech and language) from children without (Rizzo and Stephens, 1981; Zinkus and Gottlieb, 1980). The TACL-R correlates with a number of measures of language expression such as the Carrow Expressive Language Inventory (Howell, Skinner, Gray and Broomfield, 1981), McCarthy Scales (Davis and Walker, 1976).

Carrow (1973) found that the test re-test reliability of the TACL-R was .94 when the interval between testing was less than two weeks. Anderson Hess and Richardson (1980) found the test re-test reliability with a 35-39 day interval to be .91. Both of these results were statistically significant.

The TACL-R was standardized on 1003 subjects selected via stratified random sampling procedures. This information was based on information obtained from the Bureau of the Census of Statistical Abstracts (1981).

Expressive Language Test

The *Expressive One Word Picture Vocabulary Test - Revised (EOWPVT-R)* (Gardner, 1990) is an expressive vocabulary test. This assessment involves the spontaneous naming of single pictures (e.g.: airplane, watch, dog etc.).

The examiner merely presents the stimulus picture to the subject and waits for him or her to name it, or prompts a response by saying "What is this?". A basal level is established when eight consecutive pictures are named correctly and the ceiling in reached when eight consecutive responses are incorrect.

When considering reliability, it is noted that the EOWPVT-R's correlation with the PPVT-R is .70 (Gardner ,1990). The EOWPVT-R correlates similarly with the Receptive One Word Picture Vocabulary Test with a value of .61 (Gardner, 1990). Both of these values were found to be statistically significant (Gardner, 1990).

Reliability coefficients were calculated using the Kuder Richardson formula (KR 20) which provided split half reliabilities (internal consistency of the test). Values range from .84 to .92 with a median reliability of .90 (Gardner, 1990).

The EOWPVT-R was standardized on 1,118 children in the San Francisco Bay area ranging in age from 2 years to 11 years, 11 months. Forty nine percent of the children were males and 51 % were females.

Phonological Development Test

The *Computerized Assessment of Phonological Processes (CAPP)* (Hodson and Paden, 1983) is a test designed to

determine the level of phonological development. Fifty items are used as stimuli. The examiner shows the objects to the child one at a time and asks the child to name it. The child's utterance is transcribed (in phonologically correct form) on to the test form. Once all of the items have been named and transcribed, they can be entered into the computer program for phonological analysis. The computer then formulates a composite phonological deviancy score (based on number of phonological deviations and age) which corresponds to a severity level (i.e.: mild, moderate, severe and profound). Hodson and Paden (1983) derived these formulas based on information gathered from the children on their caseloads. The number of children used to compile data was not specified.

At the time that this investigation was completed, there was no reliability or validity data available.

Rhyming Activities

1. The *rhyme detection task,* a receptive task where the child detects the odd word from a group of three, was based on that of Bradley and Bryant (1985). Here, the examiner uttered three words, two of them rhyming and one not. As the words were being said, corresponding pictures were presented. The child was required to point to the picture

of the odd word out or to say which word did not rhyme. Pictures and words were taken from "Phonics Fun K-1," (Wilson, Thaxton and Kallas, 1988). Fifteen groups of words were presented.

2. A *rhyme formulation task*, an expressive task involving the child's spontaneous formulation of a rhyming word to the presented one, was used. Here, the examiner uttered a stimulus word and the child was required to formulate an utterance that rhymed. The subject's utterance had to rhyme with the stimulus word, however, it did not have to be a real English word. The stimulus words were familiar one syllable words, and were taken from a word list provided in "Phonics Fun K-1" (Wilson et al., 1988). Fifteen stimulus words were presented, there were no accompanying stimulus picture for this activity.

Please refer to Appendix A for the lists of words used in each rhyming activity.

Procedure

Informal assessment of each child's phonological development was completed through talking with parents, information gathered by the referring Speech Language Pathologist and brief observation of the child by the investigator (typically at the initial appointment). A temporary judgment regarding group membership (i.e.:

phonologically impaired versus phonologically normal) was made. This judgment was confirmed by the Computer Analysis of Phonological Processes (Hodson and Paden, 1983) .

The Classroom Reading Inventory (Silvaroli, 1986) was administered at this time.

The Expressive One Word Picture Vocabulary Test - Revised (Gardner, 1990) and the Peabody Picture Vocabulary Test - Revised (Dunn and Dunn, 1981) and the Test of Comprehension of Language - Revised (Carrow, 1973) were then administered to all involved children .

The same order of test administration was followed for each child.

The researcher did not administer any of these tests if they had been administered by a Speech Language Pathologist in the six months previous to the child's involvement in this study. If any of these had been administered the results were considered valid and included as data for the child. Finally, the two rhyming activities (rhyme formulation and rhyme oddity) were administered.

The following data was gathered for each child:

1. phonological development ranking (i.e.: normal, moderate, severe, or profound).

2. age equivalent scores, percentile rankings and standard scores
   for performance on each of the PPVT, EOWPVT-R and the TACL-R
3. a raw score out of 15 on each of the rhyming activities (rhyme detection and rhyme formulation).

All of the above activities were completed in one session lasting approximately one and a half to two hours. The sessions with the children in the phonologically impaired group were conducted in the Speech and Language Pathology Department of the Alberta Children's Hospital. The investigator was able to borrow office space for this purpose. Due to the shortage of office space however, children in the phonologically normal group were assessed in the investigator's home or in the child's home. In these cases, a quiet, non-distracting location (i.e.: a den or separate room) was used.

Parents were invited to attend the sessions with their child.

Record Keeping

The responses were kept in the strictest confidence. The results were explained to the parent, and a brief report was provided. With the written permission of the

parent, a copy of the report and the test protocol was given to the treating Speech Language Pathologist for inclusion in the child's Speech and Language file.

Analysis

Prior to comparing the rhyming abilities of the phonologically impaired and the phonologically normal groups, these groups were compared with respect to age and language functioning (as determined by the language tests used). A t-test was used to compare mean ages for each group and to compare the means of the standard scores obtained by each group on the language tests.

To compare the rhyming abilities of the two groups of children, a t-test was used. Thus, a mean for both groups, on each of the rhyming activities (rhyme formulation and rhyme detection) was calculated. Three t-tests were completed; one comparing the mean scores of both groups on the rhyme formulation activity, the second comparing the mean scores of both groups on the rhyme detection activity, and the third comparing the combined mean scores (rhyme formulation and rhyme detection) for both groups. Such testing was considered sufficient to address the hypothesis.

To determine if the severity of phonological impairment was related to performance on the rhyming tasks, a correlational analysis was completed. Phonological severity was ranked as follows; normal - 1, moderate - 2, severe - 3, profound - 4. Once the severity levels were ranked, the Pearson Product Moment Correlation Coefficient was used to determine the significance of the correlation. Regression analysis was also completed to determine if the independent variable (severity of phonological impairment) had any predictive value for performance on the rhyming tasks. ANOVA values were also calculated to assess the fit of the model (i.e.: severity of phonological impairment has a relationship with performance on rhyming). These methods were employed by Webster and Plante (1992).

In addressing question number two, the Pearson Product-Moment Correlation Coefficient was used to determine if there was significant correlation between various aspects of language functioning, as determined by the standardized tests employed, and performance on rhyming activities. Regression analysis was employed here in the same manner as for question one. The predictive value of language functioning (independent variable) for performance on rhyming (dependent variable) was therefore assessed.

To address question three, the Pearson Product Moment Correlation Coefficient was used to determine if there was a significant correlation between age and performance on the rhyming tasks. Regression analysis was employed here as well. Therefore, the predictive value of age (independent variable) for performance on the rhyming tasks (dependent variables) was assessed.

When employing these methods of analysis three assumptions must be made, random selection of subjects, normal distribution of abilities around the mean of the populations and the homogeneity of variance.

The results obtained in this study are exploratory in nature and form a base from which further research can expand. It cannot be assumed that these results completely represent the populations from which the subjects were drawn.

Chapter Four

Results

Summary of Information for all Children in the Study

There were 16 children involved in this study, eight in each of the two groups. All of the children in the phonologically normal group were judged to manifest normal phonological development by the Computer Analysis of Phonological Processes (CAPP). Of the eight children in the phonologically impaired group, three were found to have a moderate phonological delay, three children demonstrated a severe phonological delay and two children demonstrated a profound phonological delay.

Table 4.1 records the mean ages for the phonologically normal and the phonologically impaired groups and the means of the standard scores obtained in the language tests administered to each of the children involved in this study. The normal range for standard scores for the EOWPVT -R and the PPVT is 85 to 115 with the mean being 100. The normal range for the PPVT is -1.00 to +1.00 with the mean being 0.00.

The means of the standard scores on all of the language tests were analyzed using a t-test to determine whether or not there were significant differences between the

phonologically impaired and the phonologically normal groups on any of these measures.

Table 4.1

Mean Ages and Means of Standard Scores Obtained on the Language Tests - Phonologically Impaired Group versus Phonologically Normal Group

	PI Group (n = 8)	PN Group (n = 8)	t scores
Age	47 months	46.4 months	0.357
EOWPVT-R	107.4	112.9	0.7
PPVT	105.5	102.8	0.404
TACL-R	0.1	0.2	0.429

Note. EOWPVT-R = Expressive One Word Picture Vocabulary Test - Revised, PPVT = Peabody Picture Vocabulary Test, TACL-R = Test of Auditory Comprehension of Language - Revised, PN = phonologically normal group, PI = phonologically impaired group.

There were no significant differences between the groups for age or on any of the language tests. With the comparison of age the following was found, $t = 0.357$, $p = 0.732$. With the comparison of standard scores on the EOWPVT, the following was obtained, $t = 0.7$ and $p = 0.506$.

When comparing the means of the standard scores on the PPVT, the following was found, $t = 0.404$, $p = 0.698$. When comparing means of the standard scores on the TACL-R, the following was found, $t = 0.429$ and $p = 0.681$.

Table 4.2 presents data on the relationship between gender and performance on the rhyming tasks. There were four girls and four boys in each of the two groups. Both correlational data and regression analysis data are presented.

Table 4.2

Relationship Between Gender and Performance on the Rhyming Tasks - Correlation Coefficients and Regression Analysis

rhyme formulation task	rhyme detection task
$r = -0.184$	$r = -0.161$
$F = 0.491$	$F = 0.373$
$r^2 = 0.00$	$r^2 = 0.00$

The correlation between gender and rhyme formulation was not significant, ($r = -0.184$, $p = 0.495$). As well, the correlation between gender and rhyme detection was not significant ($r = -0.161$, $p = 0.551$).

With regression analysis, significance was not achieved for the relationship between gender and performance on rhyme formulation, ($F[1,14] = 0.491$, $p = 0.495$; $r^2 = 0.00$). The

ANOVA indicated that the fit of the model was not significant. Gender did not account for any of the variance on the rhyme formulation task (as indicated by the r^2 value), and was therefore not a significant predictor of performance on this task. As well, significance was not achieved for the relationship between gender and performance on the rhyme detection task, ($F[1,14] = 0.373$, $p = 0.551$; $r^2 = 0.00$). The ANOVA indicated that the fit of the model was not significant. Gender did not account for any of the variance on performance on the rhyme detection task (as indicated by the r^2 value), and was therefore not a significant predictor of performance on this task.

As gender was not found to be a significant predictor of performance on either of the rhyming tasks, separate analyses were not performed for boys and girls.

Group Mean Comparisons

Table 4.3 presents the means of performance on the rhyme detection and rhyme formulation tasks for each of the groups. The average scores obtained on the rhyming tasks by each group are presented. The variance and range for each of these are also presented. Finally, t scores, comparing the means of performance on the two rhyming tasks, and the average of scores, are presented.

Table 4.3

Mean Performance Scores and t Scores for Rhyming Tasks - Phonologically Impaired Group versus Phonologically Normal Group

Rhyming Task	PN	PI	t score
rhyme formulation			
mean	2.750	8.125	2.387*
variance	22.786	26.696	
range	14	13	
rhyme detection			
mean	3.5	8.5	4.537**
variance	5.143	2.571	
range	7	5	
average of scores			
mean	3.125	8.313	3.213 *
variance	9.482	9.210	
range	10.5	9	

Note. PI = phonologically impaired, PN = phonologically normal, *$p < .05$, ** $p < .01$.

A t-test was used to investigate if the null hypothesis, children in the phonologically impaired group will not differ significantly from children in the phonologically normal group on the rhyming tasks, could be supported or rejected. As is seen in Table 4.3, the two groups differed significantly on both of the rhyming tasks,

thus the null hypothesis was rejected. The phonologically normal children performed significantly better than the phonologically impaired group on both rhyming tasks, rhyme formulation (t= 2.387, p = 0.048), rhyme detection (t = 4.537, p = 0.003), and, on the average of both rhyming scores (t = 3.213, p = 0.015).

Six of the eight children in the phonologically normal group successfully responded to phonemic cueing as a form of instruction for the rhyme formulation task. An example of phonemic cueing is, "Tell me a word that rhymes with cat - h___ ." Here, the child would have used the information to fill in the rime ("at") of the word, as the onset "h" had already been given. None of the children in the phonologically impaired group appeared to benefit from this type of cueing, as they could not successfully fill in the rime of the word. The investigator attempted phonemic cueing two to three times for each child.

Severity of Phonological Impairment and Performance on Rhyming Tasks

The raw performance scores, obtained on each of the rhyming tasks were averaged for each of the subgroups (i.e., normal, moderate, severe and profound), and are listed in Table 4.4. The children in the phonologically impaired

group were placed into either the moderate, severe or profound subgroups, according to their performance on the CAPP. There were three children in the moderate subgroup, three children in the severe subgroup and two children in the profound subgroup. All of the children in the phonologically normal group were placed into the normal subgroup.

The relationships between the severity interval assigned to each child (independent variable) and the performance on rhyming tasks (dependent variables) are also presented in Table 4.4. The Pearson Product Moment Correlation Coefficient was used to determine correlation once the data had been ranked, (the normal subgroup was assigned a 1, the moderate subgroup was assigned a 2, the severe subgroup was assigned a 3 and the profound subgroup was assigned a 4). Regression analysis was also completed, the r^2 and F ratios are presented in Table 4.4.

Table 4.4

Mean Performance Scores on Rhyming Activities for Each of the Subgroups and the Relationship Between Rhyming Activities and Severity of Phonological Delay - Correlation Coefficients and Regression Analysis

rhyme task	mod. n = 3	sev. n = 3	pro. n = 2	norm. n = 8	r^2	r	F Ratio
r.f.	0.6	5.3	2.0	8.125	0.083	-0.380	2.366
r.d.	2.16	4.0	2.5	8.5	0.516	-0.741*	17.016*

Note. r.f. = rhyme formulation task, r.d. = rhyme detection task, * $p < 0.01$. The mean scores presented for each group on both of the rhyming tasks represent the average score out of a possible maximum of 15.

As seen in Table 4.4, the correlation between severity of phonological impairment (i.e.: normal, moderate delay, severe delay or profound delay) and performance on the rhyme formulation task was not significant ($r = -0.380$, $p = 0.146$).

With regression statistics, significance was not achieved for the relationship between severity of phonological impairment and performance on the rhyme

formulation task ($F[1,14] = 2.366$, $p = 0.146$; $r^2 = .083$). The r^2 value indicates that severity of phonological impairment accounts for less than one tenth of the variability in performance on the rhyme formulation task.. The fit of the model, as indicated by the ANOVA, was not found to be significant. Therefore, the severity of phonological impairment is a poor predictor of performance on the rhyme formulation task.

In contrast, the correlation between severity of phonological impairment and performance on the rhyme detection task was significant, ($r= -0.741$, $p = 0.001$). Therefore, as the severity of phonological impairment increases, from normal to profound, performance on the rhyme detection task decreases.

With the regression statistics, significance was achieved for the relationship between severity of phonological impairment and performance on the rhyme detection task, ($F[1,14] = 17.016$, $p = 0.001$; $r^2 = 0.516$). As seen with the r^2 value, the severity of phonological impairment was found to explain approximately half of the variability of performance on the rhyme detection task. The fit of the model, as assessed by the ANOVA, was found to be good. Therefore, the severity of phonological impairment

was a good predictor of performance on the rhyme detection task.

Performance on Language Tests and Performance on Rhyming Tasks

Table 4.5 documents the correlation coefficients and regression analyses between the performance on the rhyming tasks (dependent variables) and performance on the language tests (independent variables).

Table 4.5

Relationship Between Performance on Language Tests and Performance on Rhyming Activities: Correlation Coefficients and Regression Analyses

	Dependent Variables	
Independent Variables	rhyme formulation	rhyme detection
EOWPVT-R	$r = 0.684^*$ $r^2 = 0.441$ $F = 12.854^*$	$r = 0.393$ $r^2 = 0.094$ $F = 2.553$
PPVT	$r = 0.168$ $r^2 = 0.00$ $F = 0.408$	$r = -0.059$ $r^2 = 0.00$ $F = 0.049$
TACL-R	$r = 0.455$ $r^2 = 0.151$ $F = 3.658$	$r = 0.260$ $r^2 = 0.001$ $F = 1.018$

Note. EOWPVT = Expressive One Word Picture Vocabulary Test - Revised, PPVT = Peabody Picture Vocabulary Test, TACL-R = Test of Auditory Comprehension of Language - Revised, * $p < 0.01$.

A significant correlation between EOWPVT-R and performance on the rhyme formulation task was found ($r = 0.684$, $p = 0.004$). For the regression analysis, significance was achieved for the relationship between performance on EOWPVT and performance on the rhyme formulation task ($F[1,14] = 12.854$, $p = 0.003$; $r^2 = 0.441$). The score on the EOWPVT explained just less than half of the

variance on the rhyme formulation task, as indicated by the r^2 value. The fit of the model, as indicated by the ANOVA is good. Expressive vocabulary development (as determined by the EOWPVT) was found to be a good predictor of performance on the rhyme formulation task..

The correlation between PPVT and performance on the rhyme formulation task was not significant ($r = 0.168$, $p = 0.533$). With regression analysis, significance was not achieved for the relationship between PPVT and performance on the rhyme formulation task ($F[1,14] = 0.408$, $p = 0.533$; $r^2 = 0.00$). Performance on PPVT did not explain any of the variance on the rhyme formulation task, as determined by the r^2 value. The fit of the model was not significant, as indicated by the ANOVA. Receptive vocabulary development (as determined by the PPVT) was a poor predictor of performance on the rhyme formulation task.

The correlation between performance on the TACL-R and performance on the rhyme formulation task was not significant ($r = 0.455$, $p = 0.076$). With regression analysis, significance was not achieved ($F[1,14] = 3.658$, $p = 0.076$; $r^2 = 0.151$). Therefore, the TACL-R score explained only slightly more than one tenth of the variance of performance on the rhyme formulation task (as seen with

the r^2 score). The ANOVA indicated that the fit of the model is poor, therefore, auditory comprehension, as measured by the TACL-R was not a significant predictor of performance on the rhyme formulation task.

None of the language scores were significantly correlated to performance on the rhyme detection task. With the EOWPVT - R, the following was found, ($r = 0.393$, $p = 0.133$). The correlation between the PPVT and rhyme detection and the TACL-R and rhyme detection were, ($r = -0.059$, $p = 0.827$) and ($r = 0.260$, $p = 0.330$) respectively.

With regression analysis, significance was not reached for the relationships between performance on the rhyme detection task and any of the language tests. The following was found, ($F[1,14] = 2.553$, $p = 0.132$; $r^2 = 0.094$) for EOWPVT and rhyme detection, ($F[1,14] = 0.049$, $p = 0.827$; $r^2 = 0.00$) for PPVT and rhyme detection, and ($F[1,14] = 1.018$, $p = 0.33$; $r^2 = 0.001$) for the TACL-R and rhyme detection. Therefore, none of the language domains tested, (i.e.: expressive and receptive vocabulary and auditory comprehension) were significant predictors for performance on the rhyme detection task, and accounted for a very small portion, if any, of the variance for performance on this task.

Age and Performance on Rhyming Task

Table 4.6 presents the data looking at the relationship between age and performance on the rhyming tasks. Both correlational analyses and regression analyses are documented.

Table 4.6

Relationship Between Age and Performance on Rhyming Tasks: Correlation Coefficients and Regression Analysis

Rhyme Formulation Task	Rhyme Detection Task
$r = 0.022$	$r = 0.341$
$r^2 = 0.00$	$r^2 = 0.053$
$F = 0.007$	$F = 1.847$

The correlation between age and performance on the rhyme formulation task was not significant, ($r = 0.022$, $p = 0.936$). As well, the relationship between rhyme detection and age was not significant, ($r = 0.341$, $p = 0.196$).

Regression analysis indicated that significance was not achieved for the relationship between age and performance on rhyme formulation task, ($F[1,14] = 0.007$, $p = 0.936$; $r^2 = 0.00$). The ANOVA indicated that the fit of the model is poor. Moreover, age did not account for any of the variance on the rhyme formulation task (as seen with the r^2 value),

and was a poor predictor of performance on this task. Likewise, significance was not achieved for the relationship between age and rhyme detection ($F[1,14] = 1.847$, $p = 0.196$; $r^2 = 0.053$). Age accounted for approximately one twentieth of the variance on the rhyme detection task (r^2 value) and was a poor predictor for performance on this task. The fit of the model was not good, as indicated by the ANOVA.

The data from all of the 16 children involved in the study was considered here. Webster and Plante (1992) and Bird et al. (1995) used this method of analysis in their studies. However, when the phonologically impaired group was considered separately from the phonologically normal group, the results differed from those presented in Table 4.6.

Table 4.7 presents the Pearson Product Moment Correlation Coefficients and Regression Analyses for the relationships between age and performance on the rhyming tasks. The phonologically normal group was considered separately from the phonologically impaired group.

Table 4.7

Relationship Between Age and Performance on Rhyming Tasks - Phonologically Impaired Group and Phonologically Normal Group Separated: Correlation Coefficients and Regression Analysis

	Rhyme Formulation Task	Rhyme Detection Task
Phonologically Normal Group	$r = 0.076$ $r^2 = 0.00$ $F = 0.034$	$r = 0.722^*$ $r^2 = 0.441$ $F = 6.517^*$
Phonologically Impaired Group	$r = 0.012$ $r^2 = 0.00$ $F = 0.001$	$r = 0.606$ $r^2 = 0.262$ $F = 3.793$

Note. $^*p < 0.05$

Importantly, the correlation between age and performance on the rhyme detection task was significant for the phonologically normal group, ($r = 0.722$, $p = 0.043$). The correlation between age and performance on the rhyme formulation task was not significant, ($r = 0.0076$, $p = 0.859$).

Regression analysis indicated that significance was achieved for the relationship between age and performance on

the rhyme detection task for the phonologically normal group, ($F[1,6] = 6.517$, $p = 0.043$; $r^2 = 0.441$). Age accounted for just less than half of the variance on the rhyme detection task and was therefore a good predictor of performance on this task for the phonologically normal group.

The relationship between age and rhyme formulation was not found to be significant with regression analysis, ($F[1,6] = 0.034$, $p = 0.859$; $r^2 = 0.00$). For the phonologically normal group, age accounted for a very small portion of the variance of performance on the rhyme formulation task (as seen with the r^2 value), and was a poor predictor of performance on this rhyming task.

The correlation between age and performance on either of the rhyming tasks was not significant for the phonologically impaired group, ($r= 0.012$, $p = 0.977$) for rhyme formulation and age, and ($r = 0.606$, $p = 0.111$) for age and rhyme detection.

Regression analysis indicated that significance was not achieved for the relationship between age and performance on the rhyme detection task for the phonologically impaired group, ($F[1,6] = 3.793$, $p = 0.111$; $r^2 = 0.262$). Age accounted for approximately one quarter of the variance on rhyme detection for the phonologically impaired group, and

was not a good predictor of performance on this rhyme task. Significance was not achieved for the relationship between age and rhyme formulation for the phonologically impaired group, ($F[1,6] = 0.001$, $p = 0.977$; $r^2 = 0.00$). Age did not account for any of the variance on rhyme formulation (as seen with the r^2 value) was not a good predictor of performance on this task. The results of the ANOVA is both cases indicated that the fit of the models was poor. Age was a poor predictor of rhyming ability for the phonologically impaired group.

Summary

There were no significant differences between the phonologically normal and phonologically impaired groups in age or language development. Gender did not have a significant relationship to performance on either of the rhyming tasks, therefore, the groups were not sub-divided, based on gender, during the analyses.

The data analyses indicated that there was a significant difference between the phonologically normal and phonologically impaired groups on rhyming ability. The phonologically normal group performed significantly better than the phonologically impaired group on both the rhyme

formulation and rhyme detection tasks. The null hypothesis was therefore rejected.

Secondly, severity of phonological impairment was significantly related to performance on the rhyme detection task. The severity of phonological impairment was found to be a good predictor of performance on the rhyme detection task. However, the relationship between severity of phonological impairment and rhyme formulation was not significant, thus, severity was not a good predictor of performance on rhyme formulation.

The correlational analysis indicated that there was significant correlation between expressive vocabulary development (as indicated by performance on the EOWPVT - R) and rhyme formulation. Expressive vocabulary development was found to be a good predictor of performance on rhyme formulation. However, the relationships between performance on the rhyme formulation task and performance on the PPVT or the TACL-R were not found to be significant. Receptive vocabulary and auditory comprehension ability, as tested by the PPVT and TACL-R respectively, were not found to be good predictors of performance on rhyme formulation.

There were no significant relationships between performance on the rhyme detection task and performance on any of the language tests (i.e.: EOWPVT - R, PPVT or TACL-

R). Language ability, as judged by the three assessment instruments used, was not found to be a good predictor of performance on the rhyme detection task.

There was no significant relationship between age and performance on either of the rhyming tasks when both groups of children were considered as one larger group. However, when the phonologically impaired and phonologically normal groups were considered separately, a significant relationship between age and performance on the rhyme detection task was found for the phonologically normal children. Age was found to be a good predictor of performance on rhyme detection for the phonologically normal group only. There was no significant relationship found between age and performance on the rhyme formulation task for the children in the phonologically normal group. Importantly, there were no significant relationships found between age and performance on either of the rhyming tasks for the phonologically impaired group.

Chapter Five

Discussion

The phonologically normal group did not differ significantly from the phonologically impaired group with respect to language development, or age. Further, gender was not found to be a good predictor of performance on the rhyming tasks.

The phonologically impaired group differed significantly from the phonologically normal group on rhyming ability. This held true for all measures taken, that is; comparison of rhyme formulation skill, comparison of rhyme detection skill and the average of both scores.

The rhyme detection activity showed the greatest difference between the groups, also, the least amount of variance was found with this task. This held true for both the phonologically normal and the phonologically impaired groups. However, the phonologically impaired group demonstrated slightly more variability than the phonologically normal group on the rhyme detection task. As the identification of rime in spoken words, which is required in the rhyme detection task, is a phonological processing skill (Bird et al., 1995), the present results appear to support prior research. Specifically, children manifesting pronunciation difficulties show more variability

and are less competent than their normally developing peers, with phonological processing skills (Broen et al., 1983; Hoffman et al., 1985; Jameison and Rvachew, 1992; Morgan, 1984; Ohde and Sharf, 1988; Raaymakers and Crul, 1988; Rvachew and Jameison, 1989; Smit and Bernthal, 1983; Webster and Plante, 1992).

The rhyme detection task, developed by Bradley and Bryant in 1985, has been used in various research projects (with pre-school and school aged children) to show significant differences in rhyming ability between children experiencing reading difficulties and those demonstrating age appropriate reading levels (with reading disabled children doing significantly poorer). The present research lends additional validity to this task as screening tool for assessing phonemic awareness in preschool children. Moreover, it effectively demonstrated that differences in ability between children with normal phonological development and those with impaired development exist.

Mild caution must be exercised when using the rhyme detection task as a screening device. The format of this task requires the children to be able to determine which of the group of three words does not belong and necessitates the use of exclusionary thinking. Therefore, an

introduction to exclusionary tasks may be helpful (i.e.: choosing an item that does not belong from a group of three or four items) prior to administering the rhyme detection task. Another introduction to exclusionary thinking, as required in the rhyme detection task, may include the teaching of appropriate cognitive strategies. At least four children in the phonologically normal group, and one child in the phonologically impaired group were informally noted by the investigator to spontaneously employ cognitive strategies such as rehearsal, grouping/pairing and repetition, during their completion of the rhyme detection task. These children were very successful with the rhyme detection task. This is certainly worthy of consideration during the establishment of programming for children with phonological impairments with respect to phonemic awareness training. Finally, Bryant and Bradley (1985) demonstrated that teaching a rhyming activity based on detecting the odd word out to pre-school children was successful, increased overall rhyming ability and was beneficial to decoding and spelling in subsequent academic years.

Although significant differences were found between the two groups with respect to rhyme formulation ability, a great deal of variability in performance was found for both groups. Interestingly, the variance for the phonologically

normal group was higher than the variance for the phonologically impaired group. Due to the large range in performance scores for both groups, the rhyme formulation task may be a less useful screening device than the rhyme detection activity.

Nonetheless, important information may be gleaned from the data obtained from the rhyme formulation task. Primarily, a number of children (six of the eight) in the phonologically normal group were found to benefit from phonemic cueing (e.g.: "tell me what rhymes with cat ... h__" where the child is required to add the rime "at") provided during the introduction of the rhyme formulation task. These children easily provided the rime required to complete this task. None of the children in the phonologically impaired group appeared to benefit from the phonemic cueing provided and did not respond by adding the rime. Similarly, Bird et al. (1995) argued that when comparing children who were phonologically normal with children with phonological impairments, the children with the phonological impairments gave the experimenter the impression that they had no idea of the concept of rhyme. The children with phonological impairments were unable to work out what was required and could not effectively use

feedback information regarding rhyming or examples (Bird et al., 1995).

This finding is consistent with Jorm and Share's (1983) notion that efficient and accurate phonological representation in long term memory is required for adequate phonological storage in working memory and therefore, competency with phonemic awareness tasks. Accurate phonological representation may help a child to benefit from phonemic cueing because the foundation for phonemic awareness is present. Conversely, a degraded phonological representation in long term memory would inhibit a child's ability to benefit from phonemic cueing as there is no base from which to successfully complete the sound manipulation required for rhyming. Support for Webster and Plante's (1992) presumption that children with phonological impairments suffer from degraded phonological processing system is found with the current investigation's findings. That is, inadequate processing of the phonemic cue presented by the investigator resulted in the cue being useless for the children with phonological impairments. These children could not rely on intact phonological representation in long term memory to help with adequate processing of the stimulus word and the phonemic cue (i.e.: seeing that the onset and rime had been separated and

a new onset was being provided by the examiner, requiring that the child supply the original rime, for example, "cat -> h__" is provided and the child must provide "at"). A degraded phonological processing system results in children with phonological impairments operating at the syllabic level, unable to break syllables down into their component phonemes.

Lending more evidence to the notion of a degraded phonological system is the fact that a number of children from the phonologically impaired group provided responses that were semantically related to the stimulus word, rather than words that rhymed with the stimulus word. When presented with a word such as "ball" a semantic response is "bounce". In such cases, the investigator tried to briefly point out the difference between rhyming and giving semantic matches. However, the children with phonological impairments did not appear to benefit from this and continued in their established pattern of responding (i.e.: giving semantically related answers). It must be noted that the investigator could not give more than two to three examples of rhyming or phonemic cueing as it was thought that a teaching effect might confound the results if more examples were used.

To analyze the data with respect to the relationship between the severity of phonological impairment and performance on the rhyming tasks, children in the phonologically normal group were given the severity rating of normal. Children in the phonologically impaired group were given severity ratings of moderate, severe or profound. With correlational analyses, it was found that the relationship between severity (i.e.: normal, moderate, severe or profound) and performance on the rhyme detection was significant. Regression analysis revealed that severity of phonological impairment was found to be a good predictor of performance on the rhyme detection task. As the severity of phonological impairment increased, performance on the rhyme detection task decreased.

These findings are somewhat similar to Webster and Plante's (1992) findings that as intelligibility increased (severity of phonological impairment decreased), performance on the phonemic task of segmentation increased as well. Webster and Plante (1992) argue that a significant relationship between the level of intelligibility (determined by severity of phonological impairment) and phonemic awareness (indicated here by performance on the rhyme detection task) may indicate that phonemic awareness boot-straps on the primary or overt phonological system.

They concede, however, that longitudinal research should be employed to track the development of children with phonological impairments relative to children of normal phonological development.

The rhyme detection task may be considered a valuable instrument when screening for phonemic awareness development in preschool children with phonological impairments, as the obtained data may be the start of the establishment of norms for normal phonemic awareness development between the ages of 3 years, 6 months and 4 years, 6 months. There appears to be a relationship between the severity of phonological impairment and performance on the rhyme detection task. Therefore, data could be gathered from children at various severity ratings to determine the range of performance for each level. Most importantly, data could be gathered from a large sample of phonologically normal preschool children to determine the range of normal phonemic awareness development. With this information, screening for normal development of phonemic awareness would be greatly facilitated.

The sample sizes for both the phonologically impaired and the phonologically normal groups in the present research project were too small to draw conclusions regarding the

level of impairment and normal levels of performance on rhyming tasks. However, the finding of a significant relationship in so small a sample suggests that there is a relationship between severity of impairment and phonemic awareness development. It should be more closely studied with a larger sample.

The Computer Analysis of Phonological Processes (CAPP) was suitable for the purpose of this study as it efficiently provided information regarding the severity of phonological impairment (i.e.: normal, moderate, severe or profound). Therefore, information comparing level of severity of phonological impairment and performance on the rhyming tasks was easily analyzed. However, the CAPP does not provide information regarding the unique features of a phonologically impaired child's speech patterns. Information regarding the role that various contexts play in error patterns (e.g.: Does the complexity of a word affect the production of certain phonemes?, Is phoneme production affected by the length of the utterance?) is not available and would have to be gleaned from more in-depth testing and perhaps, lengthy speech samples. Further, information regarding sequencing difficulties such as assimilation (dog -> gog) and metathesis (dog -> god) are not adequately assessed by the CAPP. Again, the presence of sequencing

difficulties would have to be determined by more in-depth study of a child's phonological patterns. Relationships between the unique features of a child's phonological impairment (e.g.: the role that various contexts play in speech production or the presence of sequencing difficulties) and performance on phonemic awareness tasks would be a fruitful research endeavor to further look at the relationships between phonological development and phonemic awareness.

To analyze the relationships between various aspects of language functioning and performance on rhyming tasks, data from all of the children was used. It is to be noted that all children included in this study scored within normal limits on all of the language assessment instruments (i.e.: EOWPVT - R, TACL-R, PPVT), however, the average range includes a fairly wide array of abilities. Indeed, scores ranged from low average to very high average on each of the tests. As a result, the data from this project could be analyzed with respect to language functioning and performance on the rhyming tasks.

A significant correlation was found between expressive vocabulary (EOWPVT - R performance) and performance on the rhyme formulation task. Regression

analysis indicated that expressive vocabulary development is a good predictor of performance on the rhyme formulation task. There were no significant relationships between receptive vocabulary functioning and rhyme formulation or between auditory comprehension and rhyme formulation. Therefore, although the presence of a phonological impairment appeared to significantly reduce the phonologically impaired group's ability to successfully and effectively complete the rhyme formulation task, expressive vocabulary development needs to be considered as well. The reason for the significant relationship between expressive vocabulary and rhyme formulation, may be the nature of the task. Completion of the rhyme formulation task requires the child to spontaneously provide a rhyming sequence of sounds. Indeed, as expressive vocabulary ability increases, the ability to formulate rhyming words or sequences of sounds may increase as well. The rhyme formulation task should not be used as the sole instrument in a phonemic awareness screening battery. However, as stated above, the rhyme formulation task gives valuable information regarding a child's understanding of the rhyme concept (e.g.: is the child supplying semantically related answers instead of rhyming words) and his or her ability to use training, phonemic cueing and feedback regarding performance to

respond to tasks of rhyme formulation and should be considered as a part of a screening battery.

In short, although there were no significant differences in expressive vocabulary development between the phonologically impaired and the phonologically normal groups, the children in the phonologically impaired group were more likely to give semantically related answers, not respond to feedback and phonemic cueing, and perform more poorly on the rhyme formulation task. The integrity of phonological development , and therefore, the integrity of phonological processing skills and phonological representation in long term memory, as pointed out by Jorm and Share (1983) and Webster and Plante (1992), must be considered as possible sources for the differences found between the groups.

Overall language functioning does not appear to be related to performance on the rhyme detection task. Indeed, the only variables, in this investigation, that appear to be related to performance are, the presence of a phonological impairment and the level of severity of that impairment.

It was found that age was not significantly related to performance on either of the rhyme formulation or rhyme

detection tasks. However, when the phonologically impaired and phonologically normal groups were separated, age was found to be significantly correlated to performance on the rhyme detection task for children in the phonologically normal group. Further, regression analysis indicated that, for the phonologically normal group, age was a good predictor of performance on the rhyme detection task. Therefore, as children with normal phonological development progressed in age from 3 years, 6 months to 4 years, 6 months, performance on the rhyme detection task increased. Conversely, this was not found with the children in the phonologically impaired group.

These findings lend support to prior research. That is, children with normal phonological development spontaneously develop basic phonemic awareness through exposure to typical childhood activities (e.g.: nursery rhymes, alliteration, songs, stories etc.) (Tunmer and Rhol, 1990). Further, proficiency with phonemic awareness increases as the child matures allowing preschool pre-literate children to become more proficient with identifying the onset and rime of syllables as they progress in age. The more complex skill of identifying the individual phonemes in words develops as a result of exposure to reading instruction (Bird et al., 1995; Treiman, 1991).

The same course of development does not occur with children with phonological impairments. It appears as if these children are not as capable of using typical childhood stimulation to further their development of basic phonemic awareness. The ability to identify the onset and rime of words does not appear to increase with age in the preschool years. Bird et al. (1995) proposed that for children with phonological impairments, the problem may be in the categorization of speech segments. Children with phonological impairments have difficulty identifying the smaller segments of syllables. Such children give the impression that they do not understand what is meant by the concept of rhyme despite being given examples with practice and feedback (Bird et al., 1995).

In summary, children with phonological impairments performed significantly worse, than children with normal phonological development, on rhyming tasks. The severity of phonological impairment was found to be a significant predictor of performance on the rhyme detection task. Further, age was found to be a significant predictor of performance on the rhyme detection task for children with normal phonological development. The rhyme formulation task demonstrated that children with phonological impairments are

less able to respond to phonemic cueing and feedback regarding rhyming, indicating a degraded phonological processing system.

Limitations of this Study

Although the results of this study found a significant difference between children with phonological impairments and children with normal phonological development on the development of phonemic awareness, generalization is limited due to the small sample size (i.e.: eight children in each group). This limited sample was a result of the stringent criteria established for children in the phonologically impaired group. It was difficult to find children manifesting significant phonological impairments who also scored within normal limits on tests of vocabulary and receptive language. It was important that the children in this study differed only in the area of phonological development, so that the impact of a phonological impairment on phonemic awareness could be studied. If the children with phonological impairments also manifested language delays, it would not be clear if the delayed phonemic awareness was affected by the phonological impairment, the language delay or a combination of both.

An important function of a larger sample size would be to determine if the strength of the difference in phonemic

awareness, between children with normal phonological development and those without, would be as great. Secondly, a larger sample size would have allowed for further investigation into the relationships explored in the present research. For example, would performance on the rhyme detection task still increase with age with a larger sample of children with normal phonological development? If so, perhaps some preliminary age norms could be established based on the findings. Or, would the relationship between the severity of phonological impairment and performance on the rhyme detection task still remain strongly significant? Again, a large sample size would allow for the establishment of performance norms if results were similar to this study.

A second limitation relates to the phonemic awareness tasks used in this investigation. As pre-school children are limited in their phonemic awareness development, rhyming appears to be one of the few tasks that they are capable of prior to exposure to written language. Therefore, the range of age appropriate tasks was limited. The rhyme detection task provided solid information and is believed to be a good screening tool. However, the rhyme formulation task was somewhat weaker in it's screening value. Specifically, although significant differences were found

between the groups, there was a great deal of variability in all performance scores (i.e.: in both the phonologically impaired and phonologically normal groups). Furthermore, performance on the rhyme formulation task appeared to be affected by the level of expressive vocabulary development. The reduction of such confounding factors, through adjustment to the rhyme formulation task, could provide more reliable information. It is unclear if pre-school children would be capable of completing tasks of onset matching and segmentation as presented by Bird et al. (1995). However, based on the notion that preschool children are able to segment the onset from the rime in syllables (Bird et al., 1995), it is conceivable that these are activities that could be included in further studies. Examples of other rhyme formulation activities are; using context to encourage rhyming (e.g.: "I have a bad cold, your hand I'd like to ____" - hold), and providing a list of two to three rhyming words and having the child add one more to the end of the list (e.g.: "cat, hat, bat, ____"). These activities could perhaps provide information in addition to the child's ability to use, feedback regarding performance, and phonemic cues to adjust his or her answer (as was provided by the rhyme formulation task).

In summary, although a significant difference was found between children with phonological impairments and children with normal phonological development on rhyming tasks, the small sample size limits the generalizability of the results. The number of phonemic awareness tasks that can be used with preschool children is limited to rhyming. Although the rhyme detection task provided solid information, the reliability of the rhyme formulation task was questioned. Other rhyme formulation tasks may be more appropriate for use in future research.

Implications for Further Research

The data collected for this project requires replication. To date, there has not been an adequate focus on the phonologically impaired population with respect to phonemic awareness and later reading development. As early detection of any delay is ideal, continued work with the pre-school population is important. Such research would complement work being done with school aged children with phonological impairments experiencing reading difficulties.

Additional research could provide insight into the most appropriate phonemic awareness screening tasks for the pre-school population. This would be particularly valuable within the domain of rhyme formulation. Are there rhyme

formulation tasks that are not affected by expressive vocabulary and do not show large variance? If so, would they show some of the characteristics of the rhyme detection task (i.e.: increased ability with age, increased ability with a decrease in severity of phonological impairment?). The establishment of a screening battery for phonemic awareness could be devised with the use of larger sample sizes and the addition of other phonemic awareness tasks (i.e.: in addition to the rhyme detection and rhyme formulation tasks used in this investigation).

The replication of the findings in this research could help with the establishment of performance norms for rhyming in pre-school children. However, a larger sample size must be employed. In this study it was found that as the age of the children in the phonologically normal group increased so did their performance on the rhyme detection task. It is necessary to determine if this holds true when a larger sample of children is used.

Of interest is the relationship between gender and performance on phonemic awareness. Although no relationships were found between gender and performance on rhyming with the sample used, this relationship should be analyzed with a larger sample. Many assessment instruments employed in Speech and Language Pathology distinguish

between male and female children in terms of norms for development. It is important to determine if there are gender differences in the development of phonemic awareness.

An important expansion to this project would be to include a teaching component. Investigations into the most effective methods of instruction, the ease or difficulty with which phonologically impaired children acquire phonemic awareness, whether or not such information is retained, and the quality of generalization to other tasks of phonemic awareness and decoding are warranted. Instruction focusing on phonemic awareness has been found to be successful with children with normal phonological development who demonstrate a delay with phonemic awareness. However, research into the various avenues mentioned above with the phonologically impaired population is necessary and would provide teachers, speech language pathologists and parents with valuable information.

A more in-depth look at phonological impairments, than provided in this study, and the relationship to performance on rhyming activities would provide greater insight into how unique features of phonological impairment influence phonemic awareness development. Such information could be provided by more in-depth assessment of phonological

impairments and the study of detailed language samples. Issues such as phoneme sequencing difficulties and the use of phoneme assimilation or metathesis should be explored in terms of their influence on phonemic awareness. It is anticipated that a child who manifests phonemic sequencing difficulties (e.g.: dog - > god) would have increased difficulty with phonemic awareness, for not only is that child operating at the syllabic rather than the phonemic level (Bird et al., 1995), and cannot break a syllable down into onset and rime, but the entire make-up of the syllable is not intact. If a child cannot adequately maintain the order of phonemes in a syllable, rhyming becomes very difficult if not impossible.

Finally, the data regarding severity of phonological impairment and performance on the rhyme detection task may provide a rudimentary base for the future development of norms for phonemic awareness development in preschool children.

Chapter Six

Summary and Conclusions

The purpose of this research was to determine if there was a significant difference between pre-school children with phonological impairments and pre-school children with normal phonological development on rhyming ability (a fundamental form of phonemic awareness). The null hypothesis was stated as, "Pre-school children with a phonological impairment will not perform significantly different from children with normal phonological development on rhyme detection and rhyme formulation tasks". Prior research indicated a significant difference between these groups in school aged children where children with phonological impairments performed significantly poorer, than children with normal phonological development, on tasks of phonemic awareness (Bird et al., 1995; Webster and Plante, 1992). Thus, the present research was an attempt to expand the research base to include pre-school children and to determine if differences in phonemic awareness could be detected at this early age. This information is valuable as children who are at risk for phonemic awareness delays, and therefore, at risk for later reading difficulties, may be detected earlier. As a result of early detection,

remediation may be provided by speech language pathologists, teachers, tutors and parents.

This research also sought to investigate the relationship between the level of severity of phonological impairment and performance on rhyme activities. The relationship between vocabulary development and rhyming ability, and the relationship between auditory comprehension of language and rhyming ability were also explored. Finally, the relationship between age and rhyming ability was investigated.

Pre-school children with phonological impairments were found to score significantly lower on rhyming tasks as compared to phonologically normal peers. These differences were seen on both the tasks of rhyme detection and rhyme formulation. As well, the differences were noted when an average of performance on the two tasks was used. Therefore, the null hypothesis was rejected.

Performance on the rhyme detection task decreased as the severity of phonological impairment increased. It was suggested by this investigator that the data from the rhyme detection task could be used to establish norms for phonemic awareness development in pre-school years. Of course, a much larger sample size must be employed prior to the formulation of adequate norms. Performance on the rhyme

detection task was unaffected by language development, as indicated by the assessment instruments used in this investigation.

Although the rhyme formulation task was related to development in expressive vocabulary, it provided valuable information regarding the child's level of understanding of the rhyming concept. This information was ascertained by the answer provided by the child (e.g.: is the response semantically related to the stimulus word, how does the child apply feedback and cueing when answering?). It was found that the children in the phonologically impaired group often supplied semantically related answers during this task. Moreover, the children with phonological impairments were unable to benefit from phonemic cueing and feedback regarding rhyming. This supported the findings of prior research, which suggested that phonologically impaired children cannot break syllables into their constituent phonemes, and cannot perform rhyming tasks which require the dividing of a syllable into the rime and onset. This is believed to indicate a degraded phonological processing system (Bird et al., 1995; Webster and Plante, 1992).

Age was found to be significantly related to performance on the rhyme detection task for the children in

the phonologically normal group only. No relationship was found between rhyme formulation performance and age. This supported prior research indicating that children with normal phonological development benefit from exposure to stories, songs, nursery rhymes and therefore, increase their phonemic awareness with progression in age. Children with phonological impairments do not appear to benefit from such exposure and do not increase phonemic awareness with progression in age. They are unable to progress beyond processing phonological information at the syllable level, and do not appear to develop the ability to break syllables down into onset and rime.

BIBLIOGRAPHY

Anderson, J.D., Hess, R., & Richardson, K. (1980). Test retest reliability of the test of auditory comprehension of language when it is used with mentally retarded children. Journal of Speech and Language Disorders 45, 195-200.

Baddeley, A. (1982). Reading and working memory. Bulletin of the British Psychological Society, 35, 414-417

Ball, E.W., & Blachman, B. (1991). Does phoneme awareness training in kindergarten make a difference in early word recognition and developmental spelling? Reading Research Quarterly, 26, 49-66.

Beech, J.R. (1985). Learning To Read: A cognitive Approach to Reading and Poor Reading, London: Croom Helm.

Bird, J., Bishop, D., & Freeman, N. (1995). Phonological awareness and literacy development in children with expressive phonological impairments. Journal of Speech and Hearing Research, 38, 446-462.

Blachman, B.A. (1991). Early intervention for children's reading problems: clinical applications of the research in phonological awareness. Topics in Language Disorders, 12, 51-65.

Blachman, B.A., Ball, E., & Black, R. (1994). Kindergarten teachers develop phoneme awareness. Reading and Writing: An Interdisciplinary Journal, 6, 1-18.

Bochner S. (1975). Reliability of the Peabody Picture Vocabulary Test: A review of 32 selected research studies published between 1965 and 1974. University of Hawaii.

Brady, S., Shankweiler, D., & Mann, V. (1983). Speech perception and memory coding in relation to reading ability. Journal of Experimental Child Psychology, 35, 345-367.

Bradley, L., & Bryant, P. (1978). Difficulties in auditory organization as a possible cause of reading backwardness. Nature, 271- 746-747.

Bradley, L., & Bryant, P. (1983). Categorizing sounds and learning to read - a causal connection. Nature, 301, 419- 421.

Bradley, L., & Bryant, P. (1985). Rhyme and Reason in Reading and Spelling. Ann Arbor: The University of Michigan Press.

Broen, P.A., Strange, W., Doyle, S., & Heller, J. (1983) Perception and production of approximant consonants by normal and articulation delayed preschool children. Journal of Speech and Hearing Research 26, 601-608.

Bryant, P., & Bradley, L. (1985). Children's Reading Problems, Oxford: Basil Blackwell Inc.

Bryant, P.E., Bradley, L., MacLean, M., & Crossland, J. (1989). Nursery rhymes, phonological skills and reading. Journal of Child Language, 16, 407-428.

Bryant, P., MacLean, M., & Bradley, L. (1990). Rhyme, language and children's reading Applied Psycholinguistics, 11, 237-252.

Bryant, P., MacLean, M., Bradley, L., & Crossland, J. (1990). Rhyme and alliteration, phoneme detection and learning to read. Developmental Psychology, 26, 429-438.

Byrne, B., & Fielding-Barnsley, R. (1993). Journal of Educational Psychology, 85, 104-111.

Calfee, R.C., Lindamood, P., & Lindamood, C. (1973). Acoustic phonetic skills and reading - kindergarten through twelfth grade. Journal of Educational Psychology, 3, 293-298.

Caltaldo, S., & Ellis, N. (1988). Interactions in the development of spelling, reading and phonological skills. Journal of Research in Reading, 11, 86-109.

Carrow, E. (1973). Test of Auditory Comprehension of Language, Allen Texas: DLM Teaching Resources.

Catts, H.W., (1993). The relationship between speech and language impairments and reading disabilities. Journal of Speech and Hearing Research, 36, 948-958.

Chukovsky, K. (1963). From 2-5. Berkeley: University of California Press

Davis, E.E., & Walter, C. (1976). Validity of the McCarthy Scales for southwestern rural children. Perceptual and Motor Skills, 42, 563-567.

Dunn L., & Dunn L. (1981). Peabody Picture Vocabulary Test - R Manual Minnesota: American Guidance Service.

Ellis, N., & Large, B. (1987). The development of reading: as you seek so shall you find. British Journal of Psychology, 78, 1-28.

Fowler (1991). How early phonological development might set the stage for phoneme awareness. In (EDs) Brady, S.A., & Shankweiler D. P., Phonological Processes in Literacy, New Jersey: Lawrence Erlbaum Associates, Inc., Publishers.

Gardner, M.F. (1990). Expressive One Word Picture Vocabulary Test. Novato, California: Academic Therapy Publications.

Goswami, U. (1986). Children's use of analogy in learning to read: a developmental study. Journal of Experimental Child Psychology, 42, 73-83.

Goswami, U. (1991). Learning about spelling sequences: the role of onsets and rimes in analogizes in reading. Child Development, 62, 1110-1123.

Grunwell, P. (1981). The nature of phonological disability in children. London: Academic Press Inc.

Hall, P.K., & Tomblin,J. (1978). A follow-up study of children with articulation and language disorders. Journal of Speech and Hearing Disorders, 51, 337-347.

Hodson, B.W., & Paden, E. (1983). Targeting Intelligible Speech: A phonological approach to remediation. San Diego, California: College Hill Press

Hoffman, P.R., Daniloff, R., Bengoa, D., & Shuckers, G. (1985). Misarticulating and normally articulating children's identification and discrimination of synthetic (r) and (w). Journal of Speech and Hearing Disorders, 50, 46-53.

Howell, D.C. (1989) Fundamental statistics for the behavioral sciences: second edition. Boston: PWS Publishing Company.

Howell, J.C., Skinner, C., Gray, M., & Broomfield, S. (1981). A study of the comparative effectiveness of different language tests with two groups of children. British Journal of Communication Disorders 16, 31-42.

Hurford, D.P. (1990). Training phonemic segmentation ability with a phonemic discrimination intervention in second and third grade children with reading disabilities. Journal of Learning Disabilities, 23, 564-569.

Hurford D.P., Gilliland C., & Ginavan S. (1992). Examination of the intrasyllable phonemic discrimination deficit in children with reading disabilities. Contemporary Educational Psychology, 17, 83-88.

Hurford D.P., & Sanders, R. (1990). Assessment and remediation of a phonemic discrimination deficit in reading disabled second and fourth graders. Journal of Experimental Child Psychology, 50, 396-415.

Iversen, S., & Tunmer, W. (1993). The psychology of reading and spelling disabilities, London: Routledge and Kegan Paul

Jamieson, D.G., & Rvachew, S. (1992). Remediating speech production errors with sound identification training. Journal of Speech-Language Pathology and Audiology, 16, 201-210.

Jorm, A.F., (1983)a. The Psychology of Reading and Spelling Disabilities, London: Routledge and Kegan Paul

Jorm, A.F., (1983)b. Specific reading retardation and working memory: a review. British Journal of Psychology, 74, 311-342.

Jorm, A.F., & Share D. (1983). Phonological recoding and reading acquisition. Applied Psycholinguistics, 4, 103-147.

Kirtley, C., Bryant, P., MacLean, M., & Crossland, J. 1989). Rhyme, rime and The onset of reading. Journal Of Experimental Child Psychology, 48, 224-245.

Knafle, J.D. (1973). Auditory perception of rhyming in kindergarten children. Journal of Speech and Hearing Research, 16, 482-487.

Knafle, J.D. (1974). Children's detection of rhyme. Journal of Speech and Hearing Research, 17, 367-372.

Lenel, J.C., & Cantor, H. (1979). Rhyme recognition and phonemic perception in young children. Journal of Psycholinguistic Research, 10, 57-67.

Lundberg, I., Frost, J., & Petersen, O. (1988). Stimulating phonological awareness. Reading Research Quarterly, 23, 263-284.

MacLean, M., Bryant, P., & Bradley, L. (1987). Rhymes, nursery rhymes, and reading in early childhood. Merrill Palmer Quarterly, 33, 255-281,

Mann, V.A. (1984). Longitudinal prediction and prevention of early reading difficulty. Annals of Dyslexia, 34, 117-137.

Mann, V.A. (1991). Phonological abilities: Effective predictors of future reading ability. IN L. Rieben and C.A. Perfetti (Eds.), Learning to read: Basic Research and its Implications. Hillsdale, NJ: Erlbaum.

Mann, V.A., & Liberman, I.Y. (1984). Phonological awareness and verbal short term memory. Journal of Learning Disabilities, 17, 592-599

Mann V.A., Liberman I., & Shankweiler, C. (1987). Children's memory for sentences and word strings in relation to reading ability. Memory and Cognition, 8, 329-335

Mattingly, I.G. (1972). Reading, the linguistic process and linguistic awareness. In (EDs) Kavanaugh, & J.F.,Mattingly, I. Language by Ear and by Eye, Cambridge, MA: The Massachusetts Institute of Technology Press.

Morgan, R.A. (1984). Auditory discrimination in speech impaired and normal children as related to age. British Journal of Disorders of Communication, 19, 89-96.

Moseley, D. (1990). Suggestions for helping children with spelling problems. In (EDs) Pumfrey, P.D., & Elliot, C. Children's Difficulties in Reading, Spelling and Writing: Challenges and Responses London: The Falmer Press

Ohde, R.N., & Sharf, D. (1988). Perceptual categorization and consistency of synthesized /r-w/ continuants by adults, normal children, and /r/ misarticulating children. Journal of Speech and Hearing Research, 31, 556-568.

Pumfrey, P.D., & Reason, R. (1991). Specific Learning Difficulties (Dyslexia) Challenges and Responses. London: Nfer-Routledge

Raaymakers, E., & Crul, T (1988). Perception and production of the final /s-ts/ contrast in Dutch by misarticulating children. Journal of Speech and Hearing disorders, 53, 262-270.

Rizzo J.M., & Stephens M. (1981). Performance of children with normal and impaired oral language production of a set of auditory comprehension tests. Journal of Speech and Hearing Disorders 46, 150-160.

Rvachew, S., & Jamieson, D. (1989). Perception of voiceless fricatives by children with a functional articulation disorder. Journal of Speech and Hearing Disorders, 54, 193-208.

Sanches, M., & Kirshenblatt-Gimblett, B. (1976). Children's traditional speech play and child language. In (ED) Kirshenblatt-Gimblett, B. Speech Play, Pennsylvania: University of Pennsylvania Press.

Savin, H. B. (1972). What the child knows about speech when he starts to learn to read. In (EDs) Kavanagh, J. F., Mattingly, I. Language by Ear and by Eye, Cambridge MA: The Massachusetts Institute of Technology Press.

Share D., Jorm, A., MacLean, M., & Matthews, A. (1984). Sources of individual differences in reading acquisition. Journal of Educational Psychology, 76, 1309-1324.

Shriberg, L.D., & Kwiatkowski, J. (1988). A follow-up study of children with phonologic disorders of unknown origin. Journal of Speech and Hearing Disorders, 53, 144-154.

Smit A.B., & Bernthal, J. E. (1983). Performance of articulation-disordered children on language and perception measures. Journal of Speech and Hearing Research, 26, 124-136.

Snowling, M. J. (1991). Developmental reading disorders. Journal of Child Psychological and Psychiatry and Allied Disciplines, 32, 49-77.

Snowling M., & Hulme C. (1989). A longitudinal case study of developmental phonological dyslexia. Cognitive Neuropsychology, 6, 379-401.

Stanovich, K.E. (1986)a. Cognitive processes and the reading problems of learning disabled children. In (EDs) Torgesen J.K., Wong, B. Psychological and Educational Perspectives on Learning Disabilities, ondon : Academic Press, Inc.

Stanovich, K. E. (1986)b. Matthew effects in reading: some onsequences of individual differences in the acquisition of literacy. Reading Research Quarterly, 21, 36-406.

Stahl, S. A., & Murray, B. (1994). Defining phonemic awareness and its relationship to early reading. Journal of Educational Psychology, 86 (2) 221-234,

Stuart, M., & Coltheart, M. (1988). Does reading develop in a sequence of stages? Cognition, 30, 139-181.

Tallal, P. (1980). Auditory temporal perception, phonics, and reading disabilities in children. Brain and Language, 9, 182-198.

Treiman, R. (1984). Onsets and rhymes as units of spoken syllables: evidence from children. Brain and Language, 9, 182-198.

Treiman, R. (1991). Phonological awareness and its roles in learning to read and spell. In D.J. Sawyer and B.J. Fox (Eds.), Phonological awareness in reading: The evolution of current perspectives. New York: Springer Verlag.

Torgesen, J.K., Wagner, R., & Rashotte, C. (1994). Longitudinal studies of phonological processing and reading. Journal of Learning Disabilities, 27, 276-286.

Tunmer, W.E. (1991). Phonological awareness and literacy acquisition. In L. Rieben and C.A. Perfetti (ED.s), Learning to read: Basic research and its implications. Hillsdale, NJ: Erlbaum.

Tunmer, W.E., & Rohl, M. (1990). Phonological awareness and reading acquisition. In (EDS.) Sawyer, D.J., & Fox, B. Phonological Awareness in Reading: The Evolution of Current Perspectives New York: Springer Verlag Inc.

Van Kleek A., & Sheule, C. (1987). Precursors to literacy: normal development. Topics in Language Disorders, 7, 13-31.

Wagner R.K., & Torgesen, J. (1987). The nature of phonological processing and its causal role in the acquisition of reading skills. Psychological Review, 101, 192-212.

Wagner, R.K., Torgesen, J., Laughon, P., Simmons, K., & Rashotte, C. (1993). The development of young readers' phonological processing abilities. Journal of Educational Psychology, 85, 83-103.

Weber J.L. (1969). Patterning of deviant articulation behavior. Journal of Speech and Hearing Disorders , 135-141.

Webster P.E., & Plante A. (1992). Effects of phonological impairment on word, syllable and phoneme segmentation and reading. Language, Speech and Hearing Services in Schools, 23, 176-182.

Wilson, B., Thaxton, K., & Kallas, E. (1988). Phonics Fun K-1. Greensboro, NC : Carson-Dellosa Publishing Company.

Williams, J.P. (1980). Teaching decoding with an emphasis on phoneme analysis and blending. Journal of Educational Psychology, 72, 1-15.

Zinkus, P.W., & Gottlieb, M. (1980). Patterns of perceptual and academic disorders related to early otitis media. Pediatrics, 66, 246-253.

Appendix A

Rhyming Tasks

Rhyme Detection Task:

Examiner: "Which word does not rhyme? Or Which one does not belong?"

Child: pointing response is acceptable - verbal response is also acceptable (i.e.: naming the odd word out)

Stimulus Groups

1. sock, clock, bat
2. cat, log, frog
3. tree, swing, bee
4. king, bag, flag
5. pail, tail, pen
6. jug, bug, ten
7. bell, tie, shell
8. rake, coat, boat
9. spoon, house, moon
10. car, net, star
11. rain, pail, plane
12. chain, hat, bat
13. can, fan, clock
14. ape, lock, block
15. ring, ball, king

Rhyme Formulation Task

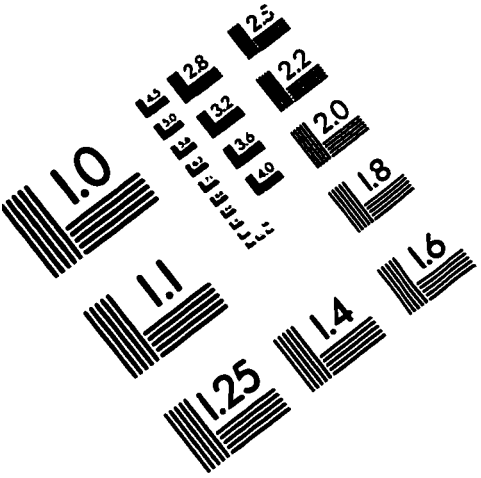
Examiner: "Tell me a word that rhymes with each of these words"

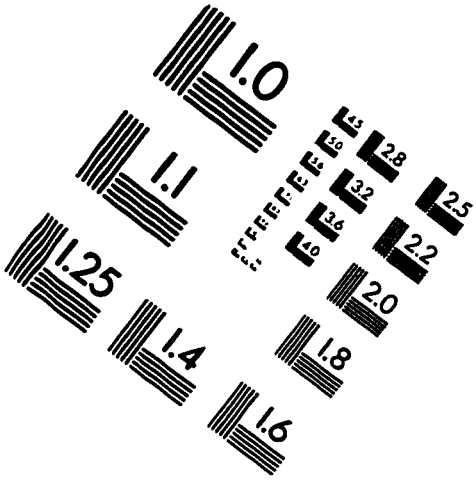
Child: formulates a rhyming word or sound sequence

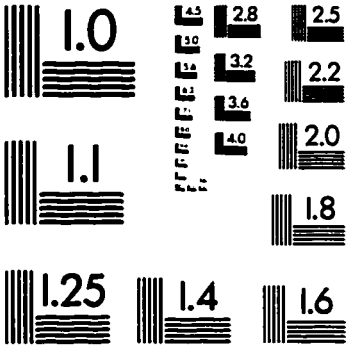
Word List:

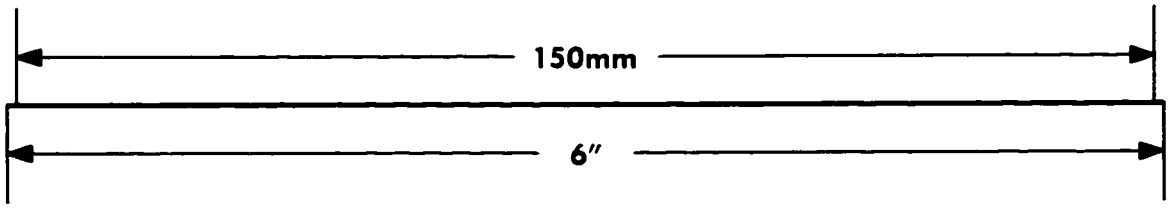
1. bag
2. jail
3. bake
4. ball
5. clam
6. can
7. cap
8. bar
9. bat
10. date
11. bread
12. bed
13. bee
14. bell
15. boat

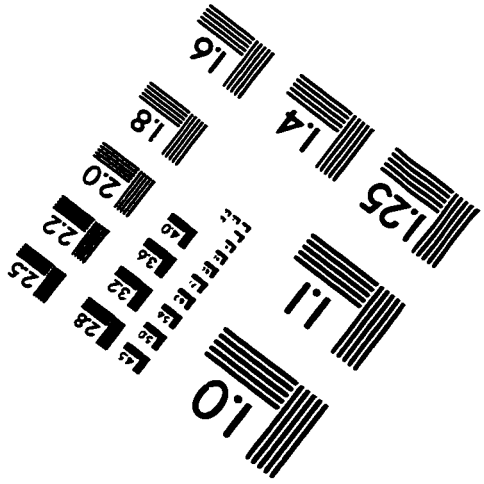
IMAGE EVALUATION
TEST TARGET (QA-3)

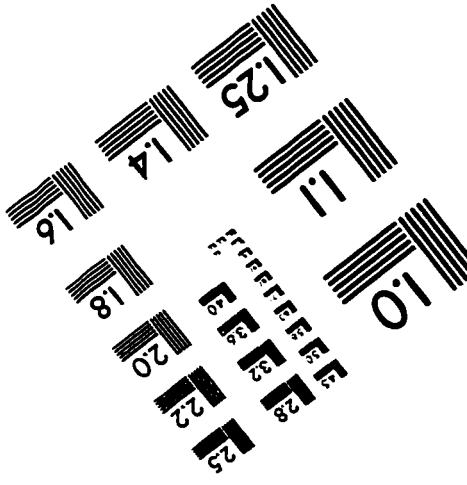












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