The development of phonological awareness skills in preschool children: From syllables to phonemes

Lucy Hart Paulson

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THE DEVELOPMENT OF PHONOLOGICAL AWARENESS SKILLS

IN PRESCHOOL CHILDREN:

FROM SYLLABLES TO PHONEMES

by

Lucy Hart Paulson

B.S. University of Illinois, 1979

M.S. University of Illinois, 1980

presented in partial fulfillment of the requirements

for the degree of

Doctor of Education

The University of Montana

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12-15-04

Date
Phonemic awareness skills in children entering kindergarten predict later reading success. This causal comparative study sought to gain a deeper understanding of the phonological awareness skills that lead to phonemic awareness in young children considering age and levels of linguistic complexity within the component skills of rhyming, alliteration, blending, and segmenting.

Eighty typically developing 4- and 5-year-old children who had not entered kindergarten participated in the study. A collection of 10 tasks, taken from the Individual Growth and Development Indicators (IGDIs), the Dynamic Indicators of Basic Early Literacy Skills (DIBELS), and the Phonological Awareness Test, was used to measure phonological and phonemic awareness. Levels of linguistic complexity included detection and production for the skill of rhyming and detection and categorization for the skill of alliteration. The skills of blending and segmenting included levels of syllables, onset and rime units, and phonemes.

Results for one-way MANOVAs and univariate ANOVAs for each dependent variable indicated a significant difference between age groups at year and half year increments in each of the phonological awareness component skills (p < .001). Important and significant differences were found between the levels of linguistic complexity with 8 of the 10 subskills with the exception of syllable and phoneme segmenting. A hierarchy of difficulty for skill acquisition was identified for the group as a whole and for each group by year of age describing which skills were easiest and the most difficult. The results provide a development continuum of phonological awareness skills and subskills leading to phonemic awareness in young children prior to entering kindergarten.
ACKNOWLEDGMENTS

I would like to express my deep gratitude and sincere appreciation to the members of my dissertation committee. Dr. Rhea Ashmore, who served as my advisor and chair of the dissertation committee, guided me through every step of the way and helped to keep a true course on this journey from start to finish. Dr. Carolyn Lott was ever present with her support, advice, and guidance. Dr. David Schuldberg provided vital assistance in the study design, the analyses, and the interpretation of the results. Dr. Darrell Stolle, who served as the comprehensive examination chair, was always available to share his wisdom, his resources, and his support in many ways. Dr. Rick van den Pol recognized the potential for this journey to occur and facilitated the steps along the way. Thank you all so much.

Because of the cooperation and assistance provided by the directors and staff at the childcare facilities, along the parents who agreed to allow their children to participate, this study was able to be completed. Thank you all for your help and your participation.

To all the families who have shared their children with me throughout my career and my colleagues who shared their skills, knowledge, and friendship with me. I have learned so much from you about how language works and how literacy develops. I will always be indebted.
Finally and most importantly, I would like to thank my family, Mitch, Lara, and Lynnea, along with my siblings, and especially my dad who made this journey a possibility because of the sacrifices you made and your unending support.
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DEDICATION

To my dad, Olin Hart, who knew I would do this before I did.
Chapter 1

INTRODUCTION

Purpose Statement

The purpose of the study is to determine levels of phonological awareness skill development in young children in the preschool years and identify the skills that lead to phonemic awareness. The results from the study enhance the existing body of literature defining phonological and phonemic awareness and explaining when children develop these early literacy skills. This information contributes to the knowledge of literacy development by identifying the skill sets that are precursors to the skills that predict reading success.

Background of the Study

Literacy, broadly defined as the ability to read and write, is a critical component of the foundation for academic achievement and represents not only one of the most complex acts performed by humans but one crucial to both educational outcomes and life chances (Adams, 1990, 2002; Berninger & Richards, 2002; Gillon, 2004; Moats, 2000; McCardle, Scarborough, & Catts, 2001; Neuman & Dickinson, 2002; Shaywitz, 2003; Snow, Burns, & Griffin, 1998; Torgesen, 1998). Assuming that the appropriate exposure and instruction are present, literacy is usually acquired in a relatively predictable manner beginning at birth and continuing throughout life (Snow et al. 1998; van Kleeck, 1998).
Emergent literacy has been defined as the skills, knowledge, and attitudes that are developmental precursors to reading and writing, as well as the environments that support these developments (Sulzby & Teale, 1991; Teale & Sulzby, 1986). The notion of emergent literacy implies a continuum (with no clear demarcation) between prereading and reading (Lonigan, Burgess, & Anthony, 2000) in which literacy-related behaviors and activities taking place during the preschool period are essential aspects of the course of literacy development (Storch & Whitehurst, 2002).

Early and emergent literacy behaviors are seen in very young children, typically, 2- to 3-year-olds as they attempt reading and writing acts without the awareness or understanding of letter-sound relationships and behaviors observed in 4- to 5-year-old children for whom an awareness and understanding of letter-sound relationships have begun to develop (Snow et al., 1998). Typically developing older preschool children and kindergarteners often move from emergent literacy into conventional literacy stages of traditional reading and writing (Kaderavek & Justice, 2000). This process builds as children develop their oral language structures, gain an awareness of the sound structure of language (phonological awareness), and find meaning in the symbols around them (Lonigan, Bloomfield, Anthony, Bacon, Phillips, & Samwel, 1999; Snow et al., 1998; Whitehurst & Lonigan, 1998).

More than one in three children experience significant difficulties in learning to read (Adams, 1990; National Institute of Child Health and Human Development [NICHD], 2000; Whitehurst & Lonigan, 1998). According to the 2002 national report card on reading by the National Assessment of Educational Progress (NAEP), most children (64%) were less than proficient in reading even after 12 years of attempts to
teach them. Nearly 36% of fourth graders were below the basic level of reading. Of the children who experienced serious problems with reading, from 10 to 15% eventually dropped out of high school and only 2% completed a 4-year college program. Surveys of adolescents and young adults with criminal records showed that about half of the youths with a history of substance abuse had reading problems (NICHD, 2000). A social educational project entitled “Children of the Code” reports that, statistically, more American children suffer long-term life-harm from the process of learning to read than from parental abuse, accidents, and all other childhood diseases and disorders combined. In purely economic terms, reading-related difficulties cost our nation more than the war on terror, crime, and drugs combined (Boulton, 2004).

There is strong continuity between the skills with which young children enter school and their later academic performance (Catts, Fey, Zhang, & Tomblin 2001; National Reading Panel, 2000; Snow et al., 1998; Wagner, Torgesen, Rashotte, Hecht, Barker, & Burgess, et al., 1997; Whitehurst & Lonigan, 1998). One of the most compelling findings from recent reading research is that children who get off to a poor start in reading rarely catch up (Juel, 1988; Torgesen, 1998). The most common cause of reading disabilities is a weakness in the ability to process the phonological features of language (Torgesen, 1999). Shaywitz (2003) reported that the “vast majority (88%) of the dyslexic population share a common phonologic weakness” (p. 101).

A comprehensive review of research about beginning reading by Adams (1990) established that early written word identification depends on phonological awareness, a component of phonological processing. Her review had a major impact on subsequent reading-based research. The past decade has seen an explosion of knowledge concerning
the significance of phonological processing and awareness abilities, print knowledge, and oral language for the development of reading (e.g., Metsala & Ehri, 1998; Snow et al., 1998). According to Richgels (2001), the last dozen years can be characterized, without too much exaggeration, as the "Age of Phonemic Awareness." The specification of the role of phonological processing in the earliest stages of reading acquisition is a notable scientific success story (Stanovich, 1992).

Phonological processing refers to the ability to understand and use the sound system of our language to process written and oral information. According to Wagner and Torgesen (1987), phonological processing refers to activities that require sensitivity to, manipulation of, and use of the sounds in words. Research has identified three interrelated clusters of phonological processing abilities: phonological memory, phonological naming, and phonological awareness (Wagner & Torgesen, 1987; Wagner, Torgesen, & Rashotte, 1994; Whitehurst & Lonigan, 2002).

Phonological memory is the ability to immediately recall sound-based information from short-term memory (Whitehurst & Lonigan, 2002). Phonological naming, also called lexical retrieval, is the ability to efficiently retrieve phonological information which is stored in long-term memory (Allor, 2002; Whitehurst & Lonigan, 2002). Phonological awareness (also referred to as phonological sensitivity) is the awareness (sensitivity) of and the ability to detect and to manipulate the sound structures of oral language (Chard & Dickson, 1999; McBride-Chang, Wagner, & Chang, 1997; Stanovich, 1992; van Kleeck, 1998; Whitehurst & Lonigan, 2002; Yopp & Yopp, 2000).

An important aspect of phonological processing that describes the interconnectedness of the three components is phonological representation, which is the
quality or distinctness of a given word stored in memory and the ability to access this representation in a conscious manner (Gillon, 2004). Elbro, Borstrom, and Peterson (1998) described the distinctness of phonological representation in terms of its separation from words with similar phonological properties. The process by which the representations of spoken words change over time from holistic units to more fine-grained segmental units depends largely on vocabulary growth (Metsala & Walley, 1998). This restructuring of phonological representations to segmental units is necessary for the development of explicit phoneme awareness (Rvachew, Nowak, & Clouier, 2004; Walley, Metsala, & Garlock, 2003). Unless children have phonological representations of spoken words that are segmentable in nature, they can not be expected to identify or manipulate individual phonemes of the word in a conscious manner. If children have distinct phonological representations of spoken words, then they may more easily access the phonological segments of the representations (Gillon, 2004).

The linguistic structures of oral language that can be divided into smaller components and manipulated include: sentences into words, words into syllables, intrasyllabic units (onset and rime), and individual phonemes (speech sounds) (Chard & Dickson, 1999; Hempenstall, 1997, 2003). Operationally, the skills that represent phonological awareness are rhyming, alliteration, blending (synthesizing linguistic units), and segmenting (analyzing linguistic units) (Chard & Dickson, 1999). The most sophisticated level of phonological awareness is phonemic awareness, the understanding that words are made up of individual phonemes and the ability to manipulate these phonemes either by segmenting, blending, or changing individual phonemes within words to create new words (Chard & Dickson, 1999; Ehri, Nunes, Wilows, Schuster,
Yaghoub-Zadeh, & Shanahan, 2001; Lonigan, Burgess, Anthony, & Barker, 1998; McBride-Chang et al., 1997; Sensenbaugh, 1996; Snow et al. 1998; Vandervelden & Siegel, 1997; van Kleeck, 1998; Yopp & Yopp, 2000). Table 1 outlines the linguistic levels of complexity and a simple representation of the components of phonological awareness that are included within the levels.

Table 1

Linguistic Levels and Phonological Awareness Components

<table>
<thead>
<tr>
<th>Linguistic Level</th>
<th>Phonological Awareness Component</th>
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<tr>
<td>Word</td>
<td>Rhyming</td>
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<td>Alliteration</td>
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<td>Syllable</td>
<td>Blending</td>
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<td>Segmenting</td>
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<td>Intrasyllable (Onset-Rime)</td>
<td>Blending</td>
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<td>Phoneme</td>
<td>Blending</td>
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<td>Segmenting</td>
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A convergence of research findings using a variety of populations and diverse methods suggests that phonological awareness plays a critical and causal role in the normal acquisition of reading (Adams, 1990; Anthony & Lonigan, 2004; Ball, 1993; Blachman, 1994; Blaiklock, 2004; Byrne & Fielding-Barnsley, 1991; Gillon, 2004; Lonigan et al. 2000; National Reading Panel, 2000; Oudeans, 2003; Snow et al., 1998; Stanovich, 1992; Wagner et al., 1994). The three components of phonological processing are strongly related to subsequent decoding abilities, and, in the absence of intervention, individual differences in these processes are highly stable from the late preschool period.
forward (Whitehurst & Lonigan, 1998). These studies have shown that children who are better at detecting and manipulating syllables, rhymes, or phonemes learn to read more quickly. This relationship is present even after variability in reading skills due to factors such as intelligence, receptive vocabulary, memory skills, and social class is partialed out (e.g., Bryant, MacLean, Bradley, & Crossland, 1990; Wagner & Torgesen, 1987; Wagner et al., 1994). Moreover, there is a core phonological deficit in nearly all poor readers regardless of whether their reading abilities are consistent or inconsistent with their general cognitive abilities (Shaywitz, 2003; Stanovich, 1992; Stanovich & Siegel, 1994; Torgesen, 1999). However, one of the most exciting recent research findings is that phonological awareness development is relatively simple to manipulate, and increases in phonological awareness skill development result in improved reading skills (Oudeans, 2004; Gillon, 2004)

Research findings indicate that the variance common to phonological awareness tasks measuring different levels of linguistic complexity represents the predictive aspect of the phonological awareness construct (Lonigan et al., 1998; Wagner et al. 1997). Yopp (1988) found that rhyme detection, alliteration detection, phonemic isolation, and phoneme segmentation each demonstrated high construct validity. Phonological awareness is one of the strongest longitudinal predictors of reading success in children (Catts et al., 2001; Ehri et al., 2001; Gillon, 2004; Honig, 1997; McBride-Chang et al., 1997; National Reading Panel, 2000; Wagner, et al., 1997).

The ability of phonological awareness to predict reading success is paralleled only by knowledge of the letter names and sounds of the alphabet and is an even better predictor than general cognitive ability (McBride-Chang et al., 1997). Phonological
awareness has been found to be a stronger predictor of reading success than environmental print (Molfese, Molfese, Modglin, Walker, & Neamon, 2004).

However, the majority of predictive studies have involved either school-age children or relatively small samples. The small number of studies that have examined phonological awareness in preschool-age children indicate that: (a) some level of phonological awareness can be measured in children as young as three years (Chaney, 1992; Fox & Routh, 1975; Lonigan et al., 1998; MacLean, Bryant, & Bradley, 1987), (b) phonological awareness measured in very young children is significantly related to subsequent phonological sensitivity (Bryant et al., 1990; Burgess & Lonigan, 1998; Lonigan et al., 2000; MacLean et al., 1987; Wagner et al., 1997), and (c) phonological awareness measured in preschool-aged children is related to both concurrent and subsequent reading-related knowledge and word decoding ability (Bryant et al., 1990; Chaney, 1992; Lonigan et al., 1998).

Questions concerning the nature of preschool phonological awareness leading to phonemic awareness, as a component of emergent literacy for later reading, are important. Studies demonstrate that there are highly stable individual differences in these abilities from kindergarten forward (Wagner et al., 1994, 1997). Such findings suggest that the preschool period is an important source of development in skills associated with later reading (Lonigan et al., 2000). The illumination of the nature and development of preschoolers’ emergent literacy skills may facilitate an understanding of how and when children learn these skills and which children may go on to develop reading problems and associated academic, social, behavioral, and emotional difficulties (Anthony, Lonigan, Burgess, Driscoll, Phillips, & Cantor, 2002). Distinguishing predictors of phonological
awareness may help educators and researchers identify those children at-risk for reading
disabilities even before formal reading instruction begins. More systematic research is
needed concerning the developmental of these emergent literacy skills in preschool-age
children (McCardle et al., 2001).

Problem Statement

Research has demonstrated that the phonemic awareness skills in kindergarten
children predict reading success later in school. The skills leading to phonemic awareness
begin in preschool with the development of phonological awareness. Studies supporting
the concept that phonological awareness develops during the preschool years described
phonological awareness development using broad age ranges, included partial skill sets,
and at times, did not consider the hierarchy of linguistic difficulty within the subskills.
More research is needed to identify the development of the subskills of all the
components of phonological awareness considering the linguistic complexity within
specific age ranges.

Research Question

Consideration of the existing body of empirical literature in reading acquisition
resulted in a primary research question which led to this research study. The primary
research question looks at the levels of skill and subskill development, within a general
hierarchy of linguistic complexity of phonological awareness, that lead to phonemic
awareness in the areas of rhyming, alliteration, blending, and segmenting in 4- and 5-
year-old children prior to entering kindergarten.

This research study revolves around three specific research questions. These
questions are based on the evidence from a review of the literature presented in chapter 2.
The first research question addresses the impact that age has on the development of phonological awareness. The second and third research questions involve the levels of development within linguistic complexity of the identified components of phonological awareness.

Subsidiary questions. The subsidiary questions are:

1. Is there an important and statistically consistent difference between the average scores on the phonological awareness skills in children who are four years of age and children who are five years of age?

2a. Is there an important and statistically consistent difference between the average raw scores of the rhyming subskills of detection and production by 4- to 5-year-old children?

2b. Is there an important and statistically consistent difference between the average raw scores of the alliteration subskills of detection and categorization by 4- to 5-year-old children?

3a. Is there an important and statistically consistent difference between the average raw scores of blending syllables, blending onset-rime units, and blending phonemes by 4- to 5-year-old children?

3b. Is there an important and statistically consistent difference between the average raw scores of segmenting words into syllables, segmenting words into onset-rime units, and segmenting words into phonemes by 4- to 5-year-old children?
Definition of Terms

Terms relating to phonological and phonemic awareness are as follows:

Alliteration is a phonological awareness skill that requires the identification and
production of words that begin with the same sound.

Alphabetic Principle is an understanding of the correspondences between letters or
groups of letters and their pronunciations.

Blending is a phonological awareness skill that requires combining a sequence of isolated
syllables or phonemes together to produce a word. This skill is also referred to as
synthesizing.

Deletion is a phonological awareness skill in which a sound or syllable is deleted from a
word and a new word is said (i.e., “say stop,” now say “stop” without the /s/).

Elision (deletion) is a phonological awareness skill in which a word is said minus a
specific sound.

Isolation is a phonemic awareness skill in which a phoneme is isolated from the rest of a
word (i.e., say the first sound in “cat”).

Manipulation is a group of phonological and phonemic awareness skills including
deletion, isolation, and substitution.

Onset is the beginning consonant or consonant cluster of a word (i.e., /c/ in cat, /sl/ in
slide).

Phoneme is an individual speech sound.

Phonemic Awareness is the awareness of the sound structure of language and the ability
to reflect on and consciously manipulate the sounds of speech.
**Phonics** is a component of reading instruction that describes sound-symbol relationships in terms of spelling patterns.

**Phonological Awareness** is the awareness of the sound structure of language and the ability to reflect on and consciously manipulate the syllables and sounds of speech.

**Phonological Processing** is the ability to understand and use the sound system of our language to process written and oral information.

**Phonological Representation** is the quality or distinctness of a given word stored in memory and the ability to access this representation in a conscious manner.

**Phonological Sensitivity** (synonymous to phonological awareness) is an ability to manipulate the sound structure of oral language (e.g., identifying words that rhyme, blending phonemes together to form words, deleting word sounds from words to form new words).

**Phonology** is the study of the sound system of language and the rules used to put sounds together to make words.

**Rime** is the ending part of a word including the vowel and final consonant sound(s) (i.e., /at/ in cat, /ide/ in slide).

**Segmentation** is a phonological awareness skill that requires the analysis of speech and breaking it into individual words, syllables, or phonemes. This skill also is referred to as analysis.

**Substitution** is a phonemic awareness skill in which sounds are switched within a word (i.e., say “tap,” switch the first sound to the last and the last sound to the first).
Limitations and Delimitations

In order to better interpret results and to add to the literature base, limitations and delimitations are presented.

Limitations. Limitations of the study are as follows:

1. Child development is a complex occurrence with many influential factors. Characteristics, such as socioeconomic level and ethnicity, may play a role in the development of phonological and phonemic awareness skills. This study did not control for these influences.

2. Reading is a complex act involving many interrelated skill sets including phonological awareness. This study does not consider other skill sets in relation to the development of phonological awareness.

3. Generalizability will be limited to populations that are similar to the characteristics of the study sample. Participants in this study were children meeting the outlined criteria who attended childcare facilities in western Montana.

4. Assessment information is dependent, in part, on the measures used to collect the data. The measures of this study are a collection of tasks gathered from assessments that have already been developed. Validity of the assessment measures is discussed. This study uses components from three measures which may affect the validity. The need for developing valid and reliable assessments for preschool children continues.

Delimitations. This study is delimited by the following:

1. Phonological awareness is only a component of early and emergent literacy development. The results of this study did not address the relationship between
phonological awareness and other early literacy components such as oral language or print development.

2. Age is a focus of this study. Participants were limited to children who are 4-to 5-years of age and had not entered kindergarten.

3. Tasks chosen to assess phonological awareness skills in preschool children have been based on a review of the literature.

Summary

In a collaborative summary of reading researchers, early childhood educators, and reading specialists, McCardle et al.(2001) reported that further studies on early and emergent literacy skills were needed to provide a greater theoretical and empirical basis for prevention and intervention efforts and to expand on current means of identifying children at risk of reading difficulties. Preschool developmental levels must be more clearly determined to identify typical development and to help predict future reading differences.

Phonological awareness is an important aspect of early literacy that is related to reading success later in school. A more consistent definition and understanding of the components and levels of complexity have developed within the literature. This study identifies developmental trends of the components of phonological awareness considering the linguistic levels of complexity in preschool children who are 4- to 5-years of age prior to entering kindergarten.
Chapter 2

REVIEW OF THE LITERATURE

Research has identified general foundation skills needed to support early and emerging literacy development in preschool-aged children, including phonological awareness (Snow, Burns, & Griffin, 1998). One critical breakthrough in the reading field is how important being able to hear and manipulate the discrete sound parts of words, phonemic awareness, is to learning to read (Gillon, 2004; Honig, 1997). Children’s level of phonological and phonemic awareness knowledge can be easily enhanced, unlike some factors related to reading development, such as children’s home, cognitive abilities, and experiences (Blachman, 1994; Gillon, 2004; Lundberg, Frost, & Petersen, 1988).

This chapter presents a comprehensive review of the literature describing phonological and phonemic awareness including defining characteristics; linguistic aspects that influence complexity, skill, and subskill components; and the development of phonological awareness in preschool-aged children. The review includes secondary sources which are compilations and reviews of the research and primary sources of articles from refereed journals describing research conducted in the area of phonological awareness. A conclusion drawn from the literature review is that there is considerable variation in the definition and description of phonological awareness. These variations influence the factors describing linguistic complexity, impact what skills and subskills...
were identified, and provide variability in the design of studies resulting in partial understanding of how phonological awareness develops in young children.

Comparison of Phonological and Phonemic Awareness Definitions

Within the literature, considerable variability exists regarding the definition of phonological and phonemic awareness, the specific skills of each, and when children typically develop these skills. Stanovich noted in 1992 that little consensus in the terminology had been used when referring to various aspects of phonological awareness, and researchers have “argued intensively” about the meaning of the term and about the nature of the tasks used to measure it. He went on to say that this lack of consensus, concerning the terminology referring to the various aspects of phonological awareness as well as the tasks to measure it, has led to confusion.

In 1996, Sensenbaugh reported that the terms phonological awareness and phonemic awareness have been widely used and, perhaps incorrectly, used interchangeably. Chard and Dickson (1999) stated that many misconceptions about phonological awareness continue to persist, especially understanding the difference between phonological awareness, phonemic awareness, and phonics.

Variations in definition may stem from different conceptualizations of phonological awareness. Some investigators, who primarily have supported the view that phonological awareness develops as a consequence of reading instruction, confined the use of “phonological awareness” to refer to the ability to and manipulate words at the level of phonemes (Burgess & Lonigan, 1998). Other investigators, who support the position that phonological awareness enables or at least facilitates the development of reading, used “phonological awareness” to refer to a wider range of tasks requiring
sensitivity to a broader range linguistic levels and oral language structures including rhymes and syllables (Burgess & Lonigan, 1998).

A stronger consensus of a more consistent definition of phonological awareness and phonemic awareness has been described in the literature with a view that phonemic awareness is a component skill of phonological awareness (National Reading Panel, 2000; Sensenbaugh, 1996; Stanovich, 1992). Phonological awareness is the ability to attend to and manipulate the units of speech (Allor, 2002; McBride-Chang, Wagner, & Chang, 1997; Shaywitz, 2003; Vandervelden & Siegel, 1997) with an understanding of different ways that oral language can be divided into smaller components and can be manipulated (Chard & Dickson, 1999). This understanding involves an awareness that words consist of syllables, onsets and rimes, and phonemes (McBride-Chang et al., 1997; Sensenbaugh, 1996). At the most linguistically difficult level, phonological awareness involves the ability to recognize and manipulate phonemes (i.e., phoneme awareness) (McBride-Chang et al., 1997).

Stanovich (1992) described a synonymous term for phonological awareness in phonological sensitivity as the conscious awareness of the sound component of words including the skills related to syllable segmentation, rhyming, and phoneme segmentation. Phonological sensitivity, according to Lonigan, Burgess, Anthony, and Barker (1998) refers to a global set of processing abilities that require sensitivity to speech sounds. Higher levels of sensitivity require more explicit analyses of smaller-sized phonological units (e.g., phonemes), and more primitive levels of phonological sensitivity require a more shallow level of analysis of larger sound units (e.g., syllables). Phoneme segmentation, phoneme counting, and phoneme reversal tasks represent the higher level...
of sensitivity, whereas rhyming or syllable segmentation tasks represent a more primitive level.

In 1990, Adams described five levels of phonological awareness (although she used the term “phonemic awareness”) abilities that included rhyming, alliteration, blending and segmenting syllables, phonemic segmentation, and phonemic manipulation. Yopp and Yopp (2000) identified more specific skills of phonological awareness referring to a sensitivity to any size unit of sound, including the ability to generate and recognize rhyming words, count syllables, separate the beginning of a word from its ending, and identify each of the phonemes in a word.

Phonemic awareness, a component of phonological awareness, is defined as the understanding that words are made up of individual sounds or phonemes, and the ability to focus on and manipulate these phonemes either by segmenting, blending, or changing individual phonemes within words to create new words (Chard & Dickson, 1999; Ehri, Nunes, Wilows, Schuster, Yaghoub-Zadeh, & Shanahan, 2001; McBride-Chang et al., 1997; Shaywitz, 2003; Stanovich, 1992; Vandervelden & Siegel, 1997). Phonemic awareness includes an awareness that the speech stream consists of a sequence of sounds – specifically phonemes (Yopp & Yopp, 2000). The phonemic awareness skill which allows a child to engage in phonemic segmentation is the most difficult and hence latest aspect of phonological awareness to develop (van Kleeck, 1998).

Some controversy regarding when phonological awareness develops has been reported in the literature. Much of the debate is a result of different perceptions of the definition. Hempenstall (2003) and Wasik (2001) continue to use the term phonemic awareness in describing a broader notion of rhyme, alliteration, blending, and
segmenting. In a joint position statement on learning to read and write, the National Association for the Education of Young Children (NAEYC) and the International Reading Association (IRA) (1998) defined phonemic awareness as a child’s understanding and conscious awareness that speech is composed of identifiable units, such as spoken words, syllables, and sounds. The position statement goes on to state that training studies have demonstrated that these skills can be taught to children as young as age 5 although the appropriateness of such training for younger-age children “is highly suspect” (p. 34). The definition used by NAEYC and IRA refers to phonological awareness. However, the concern expressed about the appropriateness of training children younger than 5 years of age included a description of activities that focused on a more complex level of phonemic manipulation skills – not broader phonological awareness skills. This definition has provided cause for confusion for many early childhood educators.

As more research has been conducted, a stronger consensus has developed describing phonological awareness as a broader concept which encompasses phonemic awareness. Understanding and acknowledging the view or representation of these terms used by the authors is important in interpreting research studies examining phonological and phonemic awareness.

*Linguistic Skills of Phonological and Phonemic Awareness*

Phonological awareness is a multilevel skill of breaking down words into smaller linguistic or phonological units. The units that are most widely accepted include: (a) syllabic: the awareness of syllables in words, (b) intrasyllabic: the awareness of onset and rime units, and (c) phonemic: the awareness of individual sounds in words (Gillon, 2004;
The syllable is thought to be the primary linguistic processing unit for English, as it is distinguished by a number of auditory cues including rhythm and stress (Goswami, 2002). Each syllable unit is a salient peak of acoustic energy (Liberman, Shankweiler, Fischer, & Carter, 1974). Additionally, the syllable is a natural phonological unit that some have argued is even more salient than the word (Adam, 1990). Awareness of the syllabic unit is attained early because it is the easiest to detect (Goswami, 2002). It seems likely that syllabic awareness is a stage from which awareness of the smaller units such as onsets, rimes, and phonemes develops (Burt, Holm, & Dodd, 1999). According to Anthony, Lonigan, Burgess, Driscoll, Phillips, and Cantor (2002), sensitivity to syllables, onset and rime units, and phonemes represents the same underlying phonological ability, and correlational studies show that children’s lower levels of phonological sensitivity are related to their subsequent higher levels of phonological sensitivity (Anthony et al., 2002).

Rhyming, alliteration, blending, and segmenting have been identified as the major skill areas of phonological awareness (Adams, 1990; Ball, 1993; Chard & Dickson, 1999; Moats, 2003; van Kleeck & Schuele, 1987; Yopp, 1988). Awareness of these levels of linguistic phonological units can be measured by a wide variety of tasks that have been designed to investigate the ability to detect, segment, or manipulate the units at the specified level, each of which involves different cognitive skills (Burt et al., 1999).

It is important to point out that the cognitive demands made by these different tasks vary so that performance may reflect not just phonological awareness per se but
also extraneous task demands (Goswami, 2002). Metsala (1999) observed that young children performed better on phonological awareness task items that involved highly familiar real words than they did on test items involving words that are lower in familiarity or non-words. Furthermore, the proximity of a non-word to a real word influenced phonological awareness task performance, and words and non-words that have many real words that are phonologically similar (e.g., vat: cat, hat, mat, sat) were easier target items in phonological awareness tasks than words that have very few phonological "neighbors" (e.g., deaf: ref, Jeff). Such findings suggest that spoken words for which children are likely to have fully specified phonological representations can be more easily accessed in phonological awareness tasks (Metsala, 1999).

Rhyming is one of the first phonological awareness skills to develop (Snyder & Downey, 1997). Bryant (1990) reported that rhyme may be the entry point for phonological awareness development. Young children become sensitive to rhyme at an early age (Apel, 1998; Ball, 1993; Braungger, Lewis, & Hagans, 1997; Bryant, 1990; Chard & Dickson, 1999; MacLean, Bryant, & Bradley, 1987; van Kleeck, 1998), and they are able to detect rhyme even when other phonological skills are too difficult (Whitehurst & Lonigan, 1998). Subskills in the progression of rhyme development include detection or matching words that rhyme and production of words that rhyme (Bradley & Bryant, 1985; Foy & Mann, 2001; MacLean et al., 1987). Bryant, MacLean, Bradley and Crossland (1990) reported a significant relationship between nursery rhyme knowledge at age 3 and success in reading and spelling at ages 5 and 6, even after factors such as social background and intelligence were controlled.
Alliteration is a phonological awareness skill in which children focus on the beginnings of words and categorize words by their initial sound (Moats, 2003). Gillon (2004) described alliteration as phoneme detection and sound or phoneme categorization. This skill requires sensitivity to word parts that are smaller than a syllable (Ball, 1993). Individual differences in appreciation of alliteration influence later development of individual differences in reading skills (Bryant et al., 1990).

Blending is the ability to combine a sequence of isolated syllables or sounds together to produce a recognizable word (Torgesen, Morgan, & Davis, 1992). The development of blending follows the linguistic progression of larger to smaller units of speech (Adam, 1990; Anthony et al., 2002). Sound blending reflects the abstract nature of reading (Ball, 1993; Moats, 2003) and is related to a child’s ability to decode printed words (Catts, 1991; Moats, 2003).

Segmenting is a phonological awareness skill that refers to the explicit identification of individual syllables and sounds in words (Torgesen et al., 1992). When children acquire this skill, they are able to analyze the components of a word and pull it apart (segment) into syllables, onsets and rimes, or individual phonemes. Phoneme segmentation is a skill that appears to be closely related to success in beginning reading (Ball, 1993; Hodson, 1994; Stanovich, 1992; Yopp, 1988) and is also an important step to learning letter/sound correspondences (Catts, 1991; Moats, 2003). Table 2 lists the phonological awareness components and levels of linguistic complexity.
Table 2

Components and Levels of Linguistic Complexity of Phonological Awareness

<table>
<thead>
<tr>
<th>Component</th>
<th>Skill Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rhyming</td>
<td>Detection/Matching, Production</td>
</tr>
<tr>
<td>Alliteration</td>
<td>Detection/Matching, Categorization</td>
</tr>
<tr>
<td>Blending</td>
<td>Syllables, Onset/rime, Phoneme</td>
</tr>
<tr>
<td>Segmenting</td>
<td>Syllables, Onset/Rime, Phoneme</td>
</tr>
<tr>
<td>Manipulation</td>
<td>Isolation, Deletion, Substitution</td>
</tr>
</tbody>
</table>

Review of Research on Phonological Awareness Development

Qualitative and quantitative research on phonological awareness have identified a variety of skills and a range of linguistic complexity affecting development and acquisition of these skills in young children. Although most of the research examining phonological awareness has used school-aged children, a small number of studies have looked at the development of phonological awareness in preschool-aged children. Of these studies, a variety of skills and subskills was used to assess a wide age range of children. Some studies used a limited or partial selection of skills. At times, the linguistic complexity was not considered. Some of the studies included tasks that required other language-related or phonological processing skills, which may have confounded the
results. Other studies reported the results in broad, not specific, age ranges. Care must be taken in interpreting the results as studies investigating phonological awareness have not always distinguished between the phonological unit targeted or the task used to assess awareness of it. Differences in the level of phonological units targeted and the types of tasks used in studies make it difficult to combine the results to determine normative information about development as measured by specific tasks (Burt et al., 1999).

A review of studies that included assessing phonological awareness in preschool children revealed an array of purposes, a selection of skills, a variety of tasks designed to measure the skills, and a range of ages of young children participating in the investigations. Twelve studies were identified that included the assessment of some component of phonological awareness in preschool children. The following sections describe the purpose and results of each study and then provide a comparison of tasks and a summary of skill attainment for each phonological awareness component. Table 3 presents a summary of the studies assessing phonological awareness in preschool children.

A study conducted by MacLean, Bryant, and Bradley (1987) looked at phonological development in children as young as three and assessed their knowledge of rhyme to determine if this knowledge predicted their phonological awareness. A strong and highly specific relationship was found between knowledge of nursery rhymes and the development of phonological awareness.
### Table 3

#### Summary of Studies Assessing Phonological Awareness in Preschool Children

<table>
<thead>
<tr>
<th>Study</th>
<th>Sample Size</th>
<th>Age in Years</th>
<th>Rhyming</th>
<th>Alliteration</th>
<th>Blending</th>
<th>Segmenting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maclean, Bryant, &amp; Bradley (1997)</td>
<td>35</td>
<td>2.0</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Longan, Burgess &amp; Barker (1998)</td>
<td>65</td>
<td>4.0</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Burgess &amp; Longan (1998)</td>
<td>115</td>
<td>4.0 to 5.0</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Badian (1998)</td>
<td>30</td>
<td>4.0</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Wood &amp; Terrell (1998)</td>
<td>30</td>
<td>4.0</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Burt, Holm, Dodd (1999)</td>
<td>57</td>
<td>4.0</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Longan, Burgess, &amp; Anthony (2000)</td>
<td>96</td>
<td>Time 1</td>
<td>4.0 to 5.0</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Longan, Burgess, &amp; Anthony (2000)</td>
<td>97</td>
<td>Time 1</td>
<td>4.0 to 5.0</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Foy &amp; Mann (2001)</td>
<td>40</td>
<td>4.0 to 6.0</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Foy &amp; Mann (2001)</td>
<td>109</td>
<td>4.0 to 5.0</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Storch &amp; Whitehurst (2002)</td>
<td>626</td>
<td>4.0 to 5.0</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Carroll, Snowling, &amp; Stevenson (2003)</td>
<td>67</td>
<td>Time 2</td>
<td>3.0 to 4.0</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Mann &amp; Foy (2004)</td>
<td>99</td>
<td>4.0 to 6.0</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
</tbody>
</table>

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Lonigan, Burgess, Anthony, and Barker (1998) examined the interrelatedness of children’s phonological awareness (sensitivity) across different levels of linguistic complexity. The results demonstrated that children as young as 4 years of age begin to show stability in their phonological sensitivity across different tasks and across time and identified a linear trend of increasing skill competency across age level. Within a similar time frame, Burgess and Lonigan (1998) designed a study that examined the relationship between phonological sensitivity and letter knowledge in 4- and 5-year-old children in a one year longitudinal study. The results indicated that a reciprocal relation between reading and phonological sensitivity is present relatively early in the development of literacy skills prior to the onset of formal reading instruction.

Badian (1998) studied the role of preschool phonological and orthographic skills in the prediction of reading. Syllable segmentation was the only skill assessed. The conclusion was made that this skill alone was inadequate as a measure of phonological awareness and a recommendation was made that rhyming, blending, and onset-rime tasks be used.

In a study designed to provide a profile of pre-literate phonological awareness, Wood and Terrell (1998) assessed 4-year-old preschool children. Results suggested that young children can develop phonemic awareness before beginning reading or attending school, and that children’s pre-literate rhyme detection ability was the best predictor of initial reading development.

Burt, Holm, and Dodd (1999) reported developmental data for phonological awareness and processing skills of 4-year-old children. The results indicated that girls
and boys performed similarly, socioeconomic status affected performance, and age was significantly correlated with performance on tasks.

In 2000, Lonigan, Burgess, and Anthony conducted a study to examine the nature of preschool emergent literacy, as well as the joint and unique predictive significance of preschool emergent literacy skills for later reading. The results of this study demonstrated that the developmental origins of a large component of children's reading skills in kindergarten and first grade can be found in the preschool period. A number of emergent literacy skills present during the preschool period (i.e., phonological sensitivity, letter knowledge) reflected highly stable individual differences and had substantial unique predictive relations with later reading abilities. In contrast, other emergent literacy skills, such as environmental print and concepts about print, although present during the preschool period and relatively stable, did not appear to be uniquely predictive of children's later reading.

Another study by Anthony, Lonigan, Burgess, Driscoll, Phillips, and Cantor (2002) investigated the relationship of sensitivity to words, syllables, rhymes, and phonemes within older and younger preschool-aged children who completed measures of phonological sensitivity and print knowledge. The results of this study indicated that phonological sensitivity can be measured by a variety of tasks (e.g., detection, blending, elision) that differ in linguistic complexity (e.g., word, syllable, onset-rime, phoneme). The findings support a developmental conceptualization of phonological sensitivity, and these different tasks and levels of linguistic complexity do not represent distinguishable phonological abilities. Tasks that required sensitivity to phonemes were simply beyond the capacity of many preschool children.
Looking at phonological awareness from another angle, Foy and Mann (2001) looked at aspects of spoken language skills that contribute to phonological awareness development as manifested in rhyme and phoneme awareness. The results revealed a pattern of associations between spoken language and aspects of phonological awareness. Similarly, Storch and Whitehurst (2002) examined code-related and oral language precursors to reading in a longitudinal study. Results demonstrated that the relationship between code-related precursors (phonological awareness) and oral language is strong during preschool, and there is a high degree of continuity over time of both code-related and oral language abilities.

Carroll, Snowling, Hulme, and Stevenson (2003) designed a short-term longitudinal study that examined the development of phonological awareness skills in preschool children. The results suggested that preschool phonological awareness can be divided into an early implicit sensitivity to sound similarity and a later explicit awareness of phonemes. Implicit, large-segment sensitivity is a skill that grows out of normal language development.

In an attempt to better understand the development of phonological awareness, Mann and Foy (2003) examined the interrelations of speech skills and letter knowledge to phonological awareness and early reading skills of 4- to 6-year-olds. The results indicated that rhyme and phoneme awareness appeared to involve different concomitants and were differentially associated with very early reading abilities. Phoneme awareness was consistently the stronger predictor of emerging reading skill in children on the brink of kindergarten entry.
A study conducted by Dickenson, McCabe, Anastasopoulos, Peisner-Feinberg, and Poe (2003) looked at interrelationships among vocabulary, phonological awareness, and print knowledge among preschool-aged children attending Head Start. The results of this study further established the interrelatedness of the early literacy components of oral language, phonological awareness, and print development. The skills measured within these three areas were a sampling of the range of skills known to contribute to each area of early literacy. Phonological awareness skills measured were rhyming and deletion tasks. The sample chosen for the study included children in Head Start who generally live in families with low socioeconomic status (SES). Poverty is a well established risk factor in the development of language and early literacy skills in young children. These results were reported as composites providing little developmental detail on the level of skill development young children typically have and so were not used in the comparison.

*Rhyming.* In studies examining rhyming, MacLean and his colleagues (1987) were one of the first groups to examine this skill. They designed a rhyme detection measure using an oddity task with pictures (choose which one does not rhyme) and a rhyme production task. Lonigan et al. (1998) used the rhyme oddity detection task patterned after MacLean et al. (1987) with a large sample size of 2-, 3-, 4-, and 5-year-old children. The same year using the same rhyme oddity task, Burgess and Lonigan examined a group of 4- to 5-year-old children. In 2000, Lonigan et al. reported results of a longitudinal study using the same oddity task with a group of mostly 2- to 3-year-old children who completed a similar battery of assessments approximately 18 months later. In a related research project reported at the same time, a group of mostly 4- to 5-year-old children...
completed a similar battery on two occasions 12 months apart. Burt et al. (1999) also used a rhyme oddity task with 4-year-old children.

In 2002, Anthony et al. reported results for a group of older 4-to 6-year-old preschool children and a group of younger 2- to 3-year-old preschool children. This study used the same rhyme oddity task (which word does not rhyme) developed by MacLean et al. (1987) and a rhyme matching task (which word does rhyme) using the same words and pictures. Wood and Terrell (1998) used a rhyme matching task with a group of 30 4-year-old children, and a similar matching task was used by Carroll et al. (2003) with a group of 3- to 4-year-old children in two sessions 8 months apart. A study by Foy and Mann (2001) and Mann and Foy (2003) examined different groups of 4- to 6-year-olds using a rhyme matching task and a production task, and then each time reported the results as a composite.

The rhyme oddity and matching tasks follow a similar format by having the child select a picture from a field of two or three that does not rhyme (oddity) or that does rhyme (matching) with a target word. The oddity task requires a child to understand the negation concept, as well as rhyming, to be successful. Children in the Anthony et al. (2002) study, which included both an oddity and matching rhyme task, had higher levels of accomplishment on the matching task. The Wood and Terrell (1998) study used semantic distracters, possibly making the task more difficult.

Of these 10 studies, as presented in Table 4, the sample size ranged from 30 to 149, and the number of trials presented ranged from 5 to 16 items. A composite of the results suggests that the percentage correct on the rhyme oddity task was approximately 35 to 50% for 3-year-olds, 40 to 60% for 4-year-olds, and 50 to 80% for 5-year-olds. On
the matching task, the percentage correct was approximately 25 to 55% for 3-year-olds, approximately 50 to 70% for 4-year-olds, and approximately 60 to 70% for 5-year-olds. In the one study that looked at rhyme production as an isolated skill, 3-year-olds produced a word that rhymed about 30% of the time (MacLean et al., 1987).
Table 4

Studies Including Assessment of Rhyme in Preschool Children

<table>
<thead>
<tr>
<th>Study</th>
<th>Sample</th>
<th>Age (years)</th>
<th>Task</th>
<th>Trials</th>
<th>Percent Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>MacLean, Bryant, &amp; Bradley (1987)</td>
<td>66</td>
<td>3</td>
<td>Oddity</td>
<td>10</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Production</td>
<td>5</td>
<td>30</td>
</tr>
<tr>
<td>Lonigan, Burgess, &amp; Barker (1998)</td>
<td>35</td>
<td>2</td>
<td>Oddity</td>
<td>11</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>56</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>82</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>65</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burgess &amp; Lonigan (1998)</td>
<td>115</td>
<td>4 to 5</td>
<td>Oddity</td>
<td>11</td>
<td>59</td>
</tr>
<tr>
<td>Lonigan, Burgess, &amp; Anthony (2000)</td>
<td>96</td>
<td>2 to 5</td>
<td>Oddity</td>
<td>11</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 to 6</td>
<td></td>
<td></td>
<td>63</td>
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<td></td>
<td></td>
<td>4 to 5</td>
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<td>50</td>
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<td></td>
<td></td>
<td>5 to 6</td>
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<td>81</td>
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<td>4 to 6</td>
<td></td>
<td></td>
<td>49</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 to 3</td>
<td>Matching</td>
<td>11</td>
<td>53</td>
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<td></td>
<td></td>
<td>4 to 6</td>
<td></td>
<td></td>
<td>68</td>
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<tr>
<td>Carroll, Snowling, Hulme &amp; Stevenson (2003)</td>
<td>67</td>
<td>3</td>
<td>Matching</td>
<td>16</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td>66</td>
</tr>
<tr>
<td>Wood &amp; Terrell (1998)</td>
<td>30</td>
<td>3 to 4</td>
<td>Matching</td>
<td>16</td>
<td>59</td>
</tr>
<tr>
<td>Burt, Holm, &amp; Dodd (1999)</td>
<td>57</td>
<td>4</td>
<td>Oddity</td>
<td>12</td>
<td>40</td>
</tr>
<tr>
<td>Foy &amp; Mann (2001)</td>
<td>40</td>
<td>4 to 6</td>
<td>Oddity</td>
<td>13</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Production</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mann &amp; Foy (2003)</td>
<td>99</td>
<td>4</td>
<td>Oddity</td>
<td>13</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Production</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In Preventing Reading Difficulties in Young Children, Snow et al. (1998) reported that 3- to 4-year-old children may attend to rhymes in salient words. In a descriptive
study, van Kleeck (1998) reported that children ages 2 to 4 years of age could spontaneously produce rhymes. Typical age attainment described by Moats (2003) indicated that 4-year-old children match and enjoy rhyme and 5-year-old children produce words that rhyme.

Within the literature, a wide range of skill attainment has been documented within the linguistic complexity of rhyming tasks. There is a general increase in skill development based on age, and it appears that children are able to match rhymes better than they are able to produce them. More information is needed to identify what children know about rhyming before they enter kindergarten.

**Alliteration.** Seven of the studies examined alliteration as a component in identifying phonological awareness in preschool children. MacLean et al. (1987) designed and used an alliteration oddity task (identify the picture of a word that does not start with the same sound) and a production task for 3-year-old children, and they repeated the oddity task when the children were 4 years old. Lonigan et al. (1998) adapted the oddity alliteration task used by MacLean et al. (1987) with 2-, 3-, 4-, and 5-year-old children. Burgess and Lonigan (1998) used the same adapted alliteration oddity task with 4- to 5-year-old children. In 2000, Lonigan et al. used the same oddity task with 2- to 5-year-old children and repeated the task 18 months later. In a related study, they examined 4- to 5-year-olds using the same oddity task and repeated it 12 months later. Burt et al. (1999) used an oddity task with 4- to 5-year-old children. Wood and Terrell (1998) used a matching task with 4-year-olds and included semantic distracters in the choices. Carroll et al. (2003) used a matching task with 3- to 4-year-olds and repeated the task twice at four month intervals.
Of these seven studies, as summarized in Table 5, the sample size ranged from 30 to 115, and the number of trials ranged from 5 to 16. A composite of the results suggests that the percentage correct on the alliteration oddity task was approximately 30 to 50% for 3-year-olds, 35 to 55% for 4-year-olds, and 50 to 80% for 5-year-olds. On the matching task, the percentage correct was around 50% for both 3- and 4-year-olds. In the one study that looked at alliteration production as an isolated skill, 3-year-olds were able to produce a word that started with the same beginning sound about 30% of the time.

Table 5

Studies Including Assessment of Alliteration in Preschool Children

<table>
<thead>
<tr>
<th>Study</th>
<th>Sample</th>
<th>Age (years)</th>
<th>Task</th>
<th>Trials</th>
<th>Percent Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>MacLean, Bryant, &amp; Bradley (1987)</td>
<td>66</td>
<td>3</td>
<td>Oddity</td>
<td>10</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Production</td>
<td>5</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Oddity</td>
<td>10</td>
<td>55</td>
</tr>
<tr>
<td>Lonigan, Burgess, &amp; Barker (1998)</td>
<td>35</td>
<td>2</td>
<td>Oddity</td>
<td>11</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>56</td>
<td>3</td>
<td>Oddity</td>
<td>11</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>82</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>65</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burgess &amp; Lonigan (1998)</td>
<td>115</td>
<td>4 to 5</td>
<td>Oddity</td>
<td>11</td>
<td>50</td>
</tr>
<tr>
<td>Lonigan, Burgess, &amp; Anthony (2000)</td>
<td>96</td>
<td>2 to 5</td>
<td>Oddity</td>
<td>11</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>97</td>
<td>3 to 6</td>
<td>Oddity</td>
<td>11</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 to 5</td>
<td>Oddity</td>
<td>11</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 to 6</td>
<td>Oddity</td>
<td>11</td>
<td>79</td>
</tr>
<tr>
<td>Carroll, Snowling, Hulme &amp; Stevenson (2003)</td>
<td>67</td>
<td>3</td>
<td>Matching</td>
<td>16</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>Matching</td>
<td>16</td>
<td>54</td>
</tr>
<tr>
<td>Wood &amp; Terrell (1998)</td>
<td>30</td>
<td>3 to 4</td>
<td>Matching</td>
<td>8</td>
<td>48</td>
</tr>
<tr>
<td>Burt, Holm, &amp; Dodd (1999)</td>
<td>57</td>
<td>4</td>
<td>Oddity</td>
<td>12</td>
<td>36</td>
</tr>
</tbody>
</table>

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Within the literature, Snow et al. (1998) reported that 3- to 4-year-old children may attend to beginning sounds in salient words. Ball (1993) reported that alliteration develops in children at around 3 years of age, while Moats (2003) reported an age of 4 years for this to develop.

Of the studies that examined alliteration, as with rhyming, a wide range of skill attainment was documented. There is a general increase in skill development based on age. More information is needed to identify what children know about alliteration before they enter kindergarten.

**Blending.** Five studies were identified that examined the phonological awareness skill of blending. Four of the studies used the same format in assessing blending in which the children were required to combine word elements to form a word. There were a few practice trials and a range of test trials. The practice items and around half of the trials were presented verbally and with pictures. The trials included compound words (e.g., foot – ball), words broken into syllable units (e.g., mom – my), and words broken into phoneme units (e.g., h – a – t).

Lonigan et al. (1998) reported a composite score (combining words, syllables, and phonemes) for 2-, 3-, 4-, and 5-year-old children. That same year, Burgess and Lonigan used a similar procedure and reporting with 4- to 5-year-old children.

Lonigan et al. (2000) used a similar, but modified, procedure with 2- to 4-year-old children and repeated the procedure 18 months later. In a related study, they examined another group of 4-to 5-year-olds and repeated the procedure one year later. Additional items were included in the second session to reduce the chances of children scoring at ceiling levels. Two years later, the core team of Anthony, Lonigan, Burgess, along with
Driscoll, Phillips, and Cantor examined 2- to 3-year-old and 4- to 5-year-old children. The items included blending 11 compound words, 3 words from syllables, 3 words from onset and rime units, and 4 items from words with 3 or 4 phonemes. Additionally, a multiple-choice blending task was used in which the children were asked to choose from a group of three pictures (labeled by the examiner) the word segmented by syllable, onset-rime, and phoneme units. The results for these studies were reported in mean scores for the age groups by linguistic level.

Wood and Terrell (1998) examined blending with a group of 4-year-old children who were asked to blend words that were broken into syllables, onset-rime units, and phonemes. The mean scores were reported for each linguistic level.

A mixture of procedures and linguistic levels was used in these studies. The sample size ranged from 30 to 149 children. Some of the studies reported scores for a range of ages; others reported combined scores for the skill of blending and not by the linguistic level. Sometimes the trials included pictures; sometimes they did not. The trial size varied from 4 to 20 items. These differences make comparisons challenging. A summary of the results suggests that children gain skills as they get older, and larger linguistic units (i.e. syllables) are easier than smaller units (phonemes). Generally, 3-year-olds blended words around 25%, syllables 20 to 50%, onset-rimes 20%, and phonemes 5 to 35% of the time. Four-year-olds blended words around 50 to 70%, syllables 40 to 75%, onset-rimes 20%, and phonemes 10 to 45% of the time. Five-year-olds blended words around 90%, syllables 70 to 80%, onset-rimes 40%, and phonemes 30 to 45% of the time. A summary of these studies is presented in Table 6.
## Table 6
### Studies Including Assessment of Blending in Preschool Children

<table>
<thead>
<tr>
<th>Study</th>
<th>Sample</th>
<th>Age (years)</th>
<th>Task</th>
<th>Trials</th>
<th>Percent Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lonigan, Burgess, &amp; Barker (1998)</td>
<td>35</td>
<td>2</td>
<td>Blending</td>
<td>22 Total</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>56</td>
<td>3</td>
<td></td>
<td>(14</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>82</td>
<td>4</td>
<td>(words, syllables, phonemes)</td>
<td>4</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>65</td>
<td>5</td>
<td></td>
<td>4 )</td>
<td>73</td>
</tr>
<tr>
<td>Burgess &amp; Lonigan (1998)</td>
<td>115</td>
<td>4 to 5</td>
<td>Blending</td>
<td>18</td>
<td>68</td>
</tr>
<tr>
<td>Lonigan, Burgess, &amp; Anthony (2000)</td>
<td>96</td>
<td>2 to 5</td>
<td>Words</td>
<td>10</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Syllables</td>
<td>4</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phonemes</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Time 2</td>
<td>3 to 6</td>
<td>Words</td>
<td>10</td>
<td>73</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Syllables</td>
<td>4</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phonemes</td>
<td>4</td>
<td>32</td>
</tr>
<tr>
<td>Lonigan, Burgess, &amp; Anthony (2000)</td>
<td>97</td>
<td>4 to 5</td>
<td>Words</td>
<td>10</td>
<td>77</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Syllables</td>
<td>4</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phonemes</td>
<td>4</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>Time 2</td>
<td>5 to 6</td>
<td>Words</td>
<td>10</td>
<td>94</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Syllables</td>
<td>7</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phonemes</td>
<td>20</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Syllables</td>
<td>7</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Onset/Rime</td>
<td>4</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phonemes</td>
<td>9</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Words</td>
<td>11</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Syllables</td>
<td>7</td>
<td>78</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Onset/Rime</td>
<td>4</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phonemes</td>
<td>9</td>
<td>46</td>
</tr>
<tr>
<td>Wood &amp; Terrell (1998)</td>
<td>30</td>
<td>4</td>
<td>Syllables</td>
<td>8</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Onset/Rime</td>
<td>6</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phonemes</td>
<td>6</td>
<td>10</td>
</tr>
</tbody>
</table>

Typically, children are able to blend syllables, followed by onset and rime units, and then individual sounds within a single syllable word (Adam, 1990; Anthony et al.,

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Children as young as 3 years of age can be taught to blend syllables into words (Hodson, 1994). Moats (2003) reported that 5 ½- to 6-year-old children are able to blend onset and rime units and begin to blend phonemes.

These studies demonstrated a general increase in skill development based on age and competency levels with larger to smaller linguistic units. The variations in the procedures, even within study procedures, can affect children's performance. More information is needed to identify what children know about blending within a linguistic hierarchy before they enter kindergarten.

**Segmenting.** Several studies included the phonological awareness skill of segmenting with a variety of linguistic levels and tasks. Badian (1998) conducted a study which included 4- to 5-year-old children six months before they entered kindergarten on a syllable tapping measure used to assess phonological awareness. Children were asked to tap out the number of syllables in 10 words. Badian concluded that syllable segmentation alone with this age group was insufficient as a measure of phonological awareness. Wood and Terrell (1998) examined segmenting looking at the range of linguistic units of words in sentences, syllables in words, onset and rime units, and phonemes using familiar words with 4-year-old children. In another study, Burt et al. (1999) examined syllable and phoneme segmentation of 4-year-old children using low-frequency words used to avoid any familiarity effect. Storch and Whitehurst (2002) examined a large sample of 4-year-old children attending Head Start. The number of trials was not included in the task description.

The studies designed to measure segmenting as a skill used similar procedures. However, this skill was not included in the majority of the studies. The sample size
ranged from 30 to 626 children, and the trials ranged from 8 to 17 items. No 3-year-olds were included in these studies. Four-year-olds were able to segment words to syllables 60 to 70% of the time, onsets from rimes around 20% of the time, and phonemes between 10 and 20% of the time. Table 7 presents a summary of these studies.

Table 7

Studies Including Assessment of Segmenting in Preschool Children

<table>
<thead>
<tr>
<th>Study</th>
<th>Sample</th>
<th>Age (years)</th>
<th>Task</th>
<th>Trials</th>
<th>Percent Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Badian (1998)</td>
<td>238</td>
<td>4 to 5</td>
<td>Syllables</td>
<td>10</td>
<td>64</td>
</tr>
<tr>
<td>Wood &amp; Terrell (1998)</td>
<td>30</td>
<td>4</td>
<td>Words</td>
<td>17</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Syllables</td>
<td>8</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Onset/Rime</td>
<td>7</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phonemes</td>
<td>8</td>
<td>13</td>
</tr>
<tr>
<td>Burt, Holm, &amp; Dodd (1999)</td>
<td>57</td>
<td>4</td>
<td>Syllables</td>
<td>12</td>
<td>61</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phonemes</td>
<td>12</td>
<td>17</td>
</tr>
<tr>
<td>Storch &amp; Whitehurst (2002)</td>
<td>626</td>
<td>4 to 5</td>
<td>Words</td>
<td>(unspecified)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Syllables</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Syllable segmentation has been observed in preschool-aged children. Moats (2003) reported that 5-year-old children are able to count and clap syllables in words and by 6 years of age they are able to segment phonemes in simple syllables or words. Snow et al. (1998) reported that older preschool-aged children were capable of segmenting words into syllables. Van Kleeck (1998) reported that on average, 3-year-olds could segment over half the presented words into syllables and 4-year-olds could segment all the words presented (van Kleeck, 1998). Chard and Dickson (1999) reported that by the
end of kindergarten, children should be able to demonstrate phonemic blending and
segmenting and to make progress in using sounds to spell simple words.

Just as with blending, segmenting is easier using larger linguistic units (syllables)
and harder using smaller units (phonemes). More information is needed to identify what
children know about segmenting within a linguistic hierarchy before they enter
kindergarten.

Manipulation. Manipulation skills involve hearing a word and changing or
manipulating the sounds within the word in some manner. Sound manipulation skills
typically develop around 7 years of age (Moats, 2003) and appear to evolve with reading,
spelling, and training (Goswami, 2002). The investigation of these skills is not included
within the scope of this study.

Summary

A general consensus is that phonological awareness skills typically begin to
develop in young children well before they enter kindergarten. Skills include rhyming,
alliteration, blending, and segmenting within a linguistic hierarchy of word structures
such as syllables, onset-rime units, and phonemes. Phonemic awareness, defined as a
component of phonological awareness, focuses on individual phonemes and includes
phoneme blending, segmenting, and manipulation.

Many of the studies looking at the development of phonological and phonemic
awareness generally have included children already in kindergarten, with only a few
studies including preschool aged children. Also, many of the studies focused on a specific
skill or a set of skills often without considering a range of linguistic complexity
separately. Continued research is needed to identify the levels of phonological awareness
skill and subskill development within a general hierarchy of linguistic complexity that lead to phonemic awareness in the areas of rhyming, alliteration, blending, and segmenting in children 4 and 5 years of age prior to entering kindergarten.
Chapter 3

METHODOLOGY

Phonemic awareness development of children entering kindergarten has been identified as one of the best predictive skills in determining their reading ability when they are in second grade (Catts, Fey, Zhang, & Tomblin, 2001; National Reading Panel, 2000; Wagner, Torgesen, Rashette, Hecht, Barker, & Burgess, 1997). The purpose of this causal comparative study is to identify levels of phonological awareness skill development leading to phonemic awareness in 4- and 5-year-old children prior to entering kindergarten in the skills of rhyming, alliteration, blending, and segmenting and to determine the relationship of the general hierarchy of linguistic complexity.

This chapter presents the methodology, procedures, and instruments used in this study. The following sections include the statements of hypotheses, description of participants, description of research instrumentation, description of procedures, and treatment of the data.

Research Question and Hypotheses

The primary research question regards the levels of phonological awareness skill and subskill development within a general hierarchy of linguistic complexity that lead to phonemic awareness in the areas of rhyming, alliteration, blending, and segmenting in children 4 and 5 years of age prior to entering kindergarten.
Hypotheses. The hypotheses are as follows:

1. There will be an important and statistically consistent difference between the average scores on the phonological awareness skills in children who are 4 years of age and children who are 5 years of age.

2a. There will be an important and statistically consistent difference between the average raw scores of the rhyming subskills of detection and production by 4- to 5-year-old children.

2b. There will be an important and statistically consistent difference between the average raw scores of the alliteration subskills of detection and categorization by 4- to 5-year-old children.

3a. There will be an important and statistically consistent difference between the average raw scores of blending syllables, blending onset-rime units, and blending phonemes by 4- to 5-year-old children.

3b. There will be an important and statistically consistent difference between the average raw scores of segmenting words into syllables, segmenting words into onset-rime units, and segmenting words into phonemes by 4- to 5-year-old children.

Population and Sample

The population for this study included 4- and 5-year-old children prior to entering kindergarten who participated in childcare services in the Missoula area of western Montana. Licensed childcare facilities that served young children of the ages described in the purpose of the study were randomly selected to be included. A letter was obtained from each of the directors indicating approval to allow the study to take place within their
setting. Eight facilities were included in the study of which two were center-based and six were located in home-like settings.

The sample participants for this study included 80 children, 39 who were 4 years of age and 41 who were 5 years of age. None of the children had entered kindergarten, and all were considered to be typically developing with no known disabilities by their parents and care providers. Of the subjects in the 4-year-old group, 22 were girls, and 17 were boys. The 5-year-old group was comprised of 22 girls and 19 boys.

The sampling procedure was considered a convenience sample defined by Gall, Borg, and Gall (1996) as one that occurs when a researcher selects a sample that suits the purposes of the study and is convenient. Convenience sampling is considered appropriate when the population is specified to which the results would likely generalize, when the pertinent characteristics of the sample are described, and when the rationale for why the sample was well suited to the purpose of the study is provided (Gall et al., 1996). The University of Montana Institutional Review Board granted permission to conduct the study. The researcher used the permission form, included in Appendix A, to obtain consent from the parents or guardians of children who met the study criteria. The frequency distribution of the sample by age and gender is listed in Table 8.

Table 8

Frequency Distribution of Sample by Age and Gender

<table>
<thead>
<tr>
<th>Age</th>
<th>N</th>
<th>Females</th>
<th>Males</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-year-olds</td>
<td>39 (49%)</td>
<td>22 (56%)</td>
<td>17 (44%)</td>
</tr>
<tr>
<td>5-year-olds</td>
<td>41 (51%)</td>
<td>22 (54%)</td>
<td>19 (46%)</td>
</tr>
</tbody>
</table>

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Data Collection Procedures

The examiner of this study, a trained and qualified researcher with experience interacting with young children, engaged each child individually in a series of game-like activities designed to measure his/her phonological awareness skills. The sessions took place in a semi-private and quiet area of the childcare facility away from the other children.

Within the phonological awareness component skills, the hierarchical range of linguistic complexity included the subskills of detection and production for rhyming; detection and categorization for alliteration; and syllables, onset and rime units, and phonemes for blending and segmenting. The measurements used in this study to identify the levels of development of each subskill were a collection of phonological awareness tasks, based on similar studies described in the literature.

Each subskill level included two trial items with corrective feedback and re-administration, as needed, to establish an understanding of the task and 10 items without corrective feedback to allow for an adequate sampling of each child’s performance. Each of the subskill tasks required a subjective correct or incorrect response. Words used in each task are familiar and common in the expressive vocabulary of young children. The entire assessment took approximately 30 minutes to administer to each child and was conducted in one or two sessions based on each child’s attention and interest. When a second session was required to finish the assessment, it was completed within a 2-day period. Careful attention was given by the examiner to monitor nonverbal cues and to provide reinforcement for participation and not correctness of response.
Measures. The measurements used in this study to assess the identified subskills were a collection of phonological awareness tasks from three sources that have been developed to evaluate a variety of skills in young children: the Individual Growth and Development Indicators (IGDIS) (Missal & McConnell, 2004), the Phonological Awareness Test (PAT) (Robertson & Salter, 1997), and the Dynamic Indicators of Basic Early Literacy Skills (DIBELS) (Good & Kaminski, 2003).

Missal and McConnell (2004) reported the Individual Growth and Development Indicators (IGDIS) is a comprehensive standards-based assessment system that describes individual preschool children’s growth and development over time (both current status and rate of development). Three indicators included as measures of early literacy are picture naming, rhyming, and alliteration. Reliability for both rhyming and alliteration measures are reported to be stable over time. These measures were moderately to highly correlated with other language and phonological awareness measures. Concurrent validity for rhyming was reported to have moderate to high correlation with IGDI picture naming and alliteration tasks.

The Phonological Awareness Test (PAT) (Robertson & Salter, 1997) is an instrument that provides standardized scores based on age norms for a variety of basic to complex phonological awareness tasks. The normative sample included children 5 years to 9 years, 11 months of age. Scoring procedures used are stipulated in the test manual. The standardization sample included over 1200 children from around the country and representative of 1990 national census figures. Children with disabilities were not included in the normative sample.
The authors reported satisfactory levels of test-retest reliability for all age levels. Empirical validity was established by methods of internal consistency and contrasted groups. Acceptable levels of internal consistency were noted. The authors also reported good ability to discriminate between reading disabled and normal students at all age levels. The subtests include rhyme discrimination and production; segmenting of sentences, syllables, and phonemes; initial, final, and medial sound isolation; deletion of compound words, syllables, and phonemes; substitution of phonemes; and blending of syllables and phonemes. The subtests used in this study included rhyme production, blending of syllables and phonemes, and segmenting of syllables and phonemes.

The Dynamic Indicators of Basic Early Literacy Skills (DIBELS) (Good, & Kaminski, 2003) is a standardized, individually administered measure of the skills that underlie early reading success for children in kindergarten through third grade. The measures for kindergarten include Initial Sound Fluency, Letter Naming, Phoneme Segmentation Fluency, Nonsense Word Fluency, Retell Fluency, and Oral Reading Fluency. The measure used in this study was the Initial Sound Fluency (ISF) task that assesses a child’s ability to categorize a word by the initial sound (Good, Laimon, Kaminski, & Smith, 2002).

The ISF measure is a revision of the Onset Recognition Fluency (OnRF) measure with minor revisions (Good, Laimon, Kaminski, & Smith, 2002). Good and Kaminski used reliability and validity statistics calculated for the original Onset Recognition Fluency measure as estimates for DIBLES-ISF, in as much as this later version incorporated minimal revisions. Evidence of reliability and validity for the OnRF measure is adequate. Alternate-form reliability of the OnRF measure is .72 in January of
kindergarten. By repeating the assessment four times, the resulting average is estimated to have a reliability of .91. The concurrent validity of OnRF administered in January of kindergarten is .36 with the Woodcock-Johnson Psycho-Educational Battery readiness cluster and .48 with the DIBLES test of Phoneme Segmentation Fluency (PSF). Its predictive validity with respect to spring-of-first-grade reading on a curriculum-based measure of oral reading fluency (DIBLES-ORF) is .45 and .36 with the Woodcock-Johnson Psycho-Educational Battery total reading cluster score (Good, Laimon, Kaminski, & Smith, 2002). Table 9 summarizes the measures used in this study.

Table 9

Phonological Awareness Skill and Assessment Measure

<table>
<thead>
<tr>
<th>Skill</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rhyme Detection</td>
<td>IGDI</td>
</tr>
<tr>
<td>Rhyme Production</td>
<td>PAT</td>
</tr>
<tr>
<td>Alliteration Detection</td>
<td>IGDI</td>
</tr>
<tr>
<td>Alliteration Categorization</td>
<td>DIBELS</td>
</tr>
<tr>
<td>Blending of Syllables</td>
<td>PAT</td>
</tr>
<tr>
<td>Blending of Onset-Rimes</td>
<td>PAT</td>
</tr>
<tr>
<td>Blending of Phonemes</td>
<td>PAT</td>
</tr>
<tr>
<td>Segmenting of Syllables</td>
<td>PAT</td>
</tr>
<tr>
<td>Segmenting of Onset-Rimes</td>
<td>PAT</td>
</tr>
<tr>
<td>Segmenting of Phonemes</td>
<td>PAT</td>
</tr>
</tbody>
</table>
Rhyming skills include levels of rhyme detection and production. The detection measure is a forced-choice matching task which includes a selection of items with a representative phonetic inventory from the IGDI assessment. In the rhyme matching task, the child was shown a target picture and a set of three pictures all named by the examiner. The child was then asked to help a finger puppet, named Ryan Lion, identify the picture that rhymes (or sounds the same at the end) with the target picture. Corrective feedback was provided on the two practice items only. All 10 items were given. This task, in comparison to an oddity task, does not include the concept of “not” (as in which word does not rhyme with) which adds an additional receptive language component and may interfere with a true measure of rhyme.

The rhyme production measure was patterned after and adapted from the PAT. For this task, the child was asked to help the same finger puppet produce a word that rhymes with a given word. Only single-syllable words with a representative phonetic inventory were used. Corrective feedback was provided on the practice items only. The subtest was discontinued after 5 consecutive misses.

Alliteration skills include levels of detection and categorization. The detection task was patterned after the IGDI alliteration matching measure which required a forced-choice response. The items included a representative phonetic sampling. The child was shown a target picture and a set of three pictures named by the examiner. The child was asked to help a different finger puppet, named Zippy Zebra, identify the picture that begins with the same sound as the target picture. Corrective feedback was provided on the two practice items only, and all 10 items were given. In comparison to an oddity task, this procedure did not include the concept of “not” as well.
The alliteration categorization task was patterned after the Initial Sound Fluency measure of DIBELS. The child was shown a page of four pictures which were named by the examiner. The child was then asked to help the finger puppet identify the picture that begins with a given phoneme. Items included single syllable words that begin with a single consonant sound but no consonant blends. Corrective feedback was provided on the practice items only. All 10 items were given.

Blending skills include linguistic levels of syllables, onset-rime units, and phonemes patterned after the PAT. The researcher explained that a third finger puppet, named Mookie Monkey, needed help guessing what a particular picture was. The examiner said a word, containing 2 to 4 syllables, in a segmented manner with 1-second pauses and asked the child to identify the word by guessing the name of the picture. The picture of the item was shown to the child after each response. The same format was used with a set of monosyllabic words segmented into onset and rime units, and then a set of monosyllabic words segmented into phonemes. Each word was produced in a segmented manner. The child guessed what the word was and then was shown the picture for the word.

Words from the PAT were adapted to include items that are familiar to young children. Only monosyllabic words for the onset-rime and phoneme tasks were used. The phonetic inventory for each group of words included a representative sampling of speech sounds. Pictures of each of the items used after the child’s response provided reinforcement and engagement.

Segmenting skills include linguistic levels of segmenting syllables, onset and rime units, and phonemes patterned after the PAT. The researcher presented a picture and
demonstrated how a fourth finger puppet, Ellie Elephant, liked to talk in a very slow manner by segmenting a word into the linguistic unit being measured. The child was asked to “talk” like the puppet and segment the word for the presented picture into syllables, onset and rime units, or individual phonemes. The syllable segmentation task included words with 2 to 4 syllables. Onset-rime and phoneme segmentation included monosyllabic words with 2 or 3 phonemes. Words familiar to young children were used to reduce the influence of phonological memory.

A pilot study was conducted using the described data collection procedures to ascertain if revisions of the assessment tasks needed to be made. This process included a sample of 8 children. In an analysis of the results, no revisions were made to the data collection process.

Variables and levels of data. The independent variable is age with two levels: 4-to 5-year-old children. The dependent variables are the skills and subskills of rhyming with levels of detection and production, alliteration with levels of detection and categorization, and blending and segmenting each with levels of syllables, onset and rime units, and phonemes.

Null hypotheses. The following are the null hypotheses:

1. There will be no important and statistically consistent difference between the average scores of phonological awareness skills of rhyming, alliteration, blending, or segmenting in children who are 4 and 5 years of age.

2a. There will be no important and statistically consistent difference between the average scores of the linguistic levels of detection and production of rhyming.
2b. There will be no important and statistically consistent difference between the average scores of the linguistic levels of detection and categorization of alliteration.

3a. There will be no important and statistically consistent difference between the average scores of the linguistic levels of syllables, onset-rime units, and phonemes for the skills of blending.

3b. There will be no important and statistically consistent difference between the average scores of the linguistic levels of syllables, onset-rime units, and phonemes for the skills of segmenting.

*A priori definitions.* An important difference was defined as a difference of two points (raw score) on component skills on the mean scores of the phonological awareness measures between age groups and one point on component subskills on mean scores of the linguistic levels of detection and production for rhyming, detection and categorization for alliteration and syllables, onset and rime units, and phonemes for blending and segmenting. Alpha level was defined as $\alpha = .05$.

*A priori assumptions.* The assumption of normality was met by sufficient sample and equal size in each of the age groups.

*Data Analysis Procedures*

Inferential statistical analyses were carried out using the Statistical Package for the Social Sciences 12.0.1 (SPSS). Mean scores, standard deviations, and other descriptive statistics were calculated from the results of each phonological awareness skill measured for each age group. The scores were expressed in raw scores and also in percent correct. A multiple analysis of variance (MANOVA) was employed to evaluate mean differences between the two age groups on the relationship of the phonological
awareness skill and subskill development. A two-way analysis of variance (ANOVA) was used to investigate the influence of gender on phonological awareness development. Finally, an ANOVA was then used to identify the relationship between the subskill levels of linguistic complexity within each phonological awareness component skill. The scores were transformed into z-scores allowing a direct comparison of the subskills to be made. A Guttman scaling analysis was used to describe a developmental hierarchy of the subskills.

Summary

Phonological awareness skills demonstrated by preschool-aged children are related to later development of reading (Ehri et al., 2001; Lonigan et al., 1998; Snow et al., 1998; van Kleeck, 1998). Using the planned statistical procedure with a group of 4- to 5-year old children, the intent of this study is to gain a deeper understanding of young children's phonological awareness skill development within a hierarchy of linguistic complexity. This knowledge adds to the literature base with an increased understanding of what young children know about the structure of oral language before they enter kindergarten.
Chapter 4
ANALYSES

The purpose of this study is to identify levels of phonological awareness skill development leading to phonemic awareness in 4- to 5-year-old children before they enter kindergarten. The first goal was to identify the influence that age has in the development of the component skills of rhyming, alliteration, blending, and segmenting. A second goal was to determine the relationship of phonological awareness skill and subskill development in a hierarchical range of linguistic complexity. To address these research questions, data were gathered from a collection of measures developed to assess phonological awareness skill and subskill development in young children.

In addressing the first goal of this study, the data were analyzed using raw scores looking at the influence of age in the development of the four component phonological awareness skills and a total composite score. For the second goal, a comparison of the data was made looking at the relationship of linguistic levels of complexity within the four phonological awareness components using percent correct data. The levels within the skill of rhyming included detection and production. Alliteration included detection and categorization. The skills of blending and segmenting each included levels of syllables, onset and rime units, and individual phonemes. This chapter presents the results from the statistical analyses of the data for each of the hypotheses.
Descriptive data include the number of cases, age, means, standard deviations, median, range of scores, skewness, and kurtosis. Results of the multiple analysis of variance (MANOVA), evaluating whether mean differences among groups on the dependent variables taken together are larger than expected by chance (Tabachnick & Fidell, 1989), are reported describing the influences of age. The MANOVA results are followed by a reporting of univariate analyses of variance (ANOVA) for each of the dependent variables. In analyzing the linguistic levels of complexity for each phonological awareness component skill, the results of one-way ANOVAs using percent correct scores are compared to identify consistent differences between levels within component skills. Additionally, a Guttman scale was used to identify the order of difficulty of the 10 phonological awareness subskills.

Research Question and Hypothesis

The primary research question considered the levels of phonological awareness skill and subskill development within a general hierarchy of linguistic levels that lead to phonemic awareness in the areas of rhyming, alliteration, blending, and segmenting in children 4 and 5 years of age prior to entering kindergarten. The following description addresses the hypotheses.

Hypothesis 1 Comparison of Age Groups

The alternative hypothesis stated that there would be an important and statistically consistent difference between the average scores of the phonological awareness skills in children who were 4 years of age and children who were 5 years of age.
Data screening and statistical analysis. Prior to analysis of the data, the dependent variables measuring the phonological awareness component skills and the independent variable levels of age were examined using the Frequencies and Explore programs of the Statistical Package for the Social Sciences (SPSS) 12.0.1 software. To insure that standard assumptions for univariate and multivariate analyses were met, thorough attention was given to these descriptive statistics.

A total of 80 cases were entered into this analysis. Each cell contained a minimum of 39 cases, exceeding the 20 cases per variable recommended to insure robustness of statistical analysis (Tabachnick & Fidell, 1989). The numbers within cells were generally equal.

Data were inspected for accuracy of entry and for missing values. Additionally, each of the distributions was examined regarding univariate and multivariate assumptions for plausible central tendencies, normalcy, outliers, linearity, homogeneity of variance, and multicollinarity and singularity.

In univariate analyses, examination of the normal Q-Q plots and detrended normal Q-Q plots confirmed approximately normal distribution of each of the variables. There were no missing values, and no outliers were identified. All standardized skewness and kurtosis values appeared to be well within the acceptable range of +/- 2.58. Given this, and the fact that the univariate and multivariate tests for homogeneity of variance were not significant, the cases and the variables were entered into the statistical analysis unchanged; transformed variables were not used.

The intercorrelation for the dependent variables was analyzed using a Pearson correlation matrix. Table 10 shows the intercorrelation among the dependent variables of
rhyming, alliteration, blending, and segmenting. Moderate correlations exist between the variables; however, none of the correlations exceed the criterion value of .70, which would be indicative of singularity or multicollinearity.

Table 10

Pearson Correlation Matrix of Dependent Variables of Rhyming, Alliteration, Blending, and Segmenting

<table>
<thead>
<tr>
<th></th>
<th>Rhyming</th>
<th>Alliteration</th>
<th>Blending</th>
<th>Segmenting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rhyming</td>
<td>1.000</td>
<td>.564**</td>
<td>.494**</td>
<td>.493**</td>
</tr>
<tr>
<td>Alliteration</td>
<td>.564**</td>
<td>1.000</td>
<td>.486**</td>
<td>.510**</td>
</tr>
<tr>
<td>Blend</td>
<td>.494**</td>
<td>.486**</td>
<td>1.000</td>
<td>.471**</td>
</tr>
<tr>
<td>Segment</td>
<td>.493**</td>
<td>.510**</td>
<td>.471**</td>
<td>1.000</td>
</tr>
</tbody>
</table>

**Correlation is significant at the .01 level (2-tailed).

Additionally, examination of within-cells correlations, principal components analysis, and collinearity diagnostics for multicollinearity, singularity, and redundancy were performed and found to be satisfactory. Therefore, all assumptions for univariate and multivariate analysis of variance appear to have been sufficiently met.

Reliability. The internal consistency for this sample’s performance on the sub measures making up the four phonological awareness skills and a total composite score was analyzed using the Cronbach’s alpha. The internal consistency measure for the total composite score was .805. Rhyming was .839, alliteration was .792, blending was .784, and segmenting was .727.
Results. A one-way multivariate analysis of variance (MANOVA) was used to analyze the raw scores obtained on each of the five dependent variables (rhyming, alliteration, blending, segmenting, and a total composite score) and the influences of age as the independent variable with levels of 4 and 5 years. Tables 11 and 12 display the means, standard deviations, median, range of scores, skewness, and kurtosis of the raw scores for each age group for the four component phonological awareness skills and a total composite score. Figure 1 illustrates the mean scores for 4- and 5-year-old children. The scores represent the number of correct responses for each component skill. The areas of rhyming and alliteration each had a total of 20 possible points. The areas of blending and segmenting each had a total of 30 possible points. The composite total had a maximum of 100 possible points.

Table 11

Descriptive Statistics for 4-Year-Old Children for Phonological Awareness

Component Skills (n = 39)

<table>
<thead>
<tr>
<th>Skill</th>
<th>Mean</th>
<th>SD</th>
<th>Median</th>
<th>Range</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rhyming</td>
<td>8.97</td>
<td>7.08</td>
<td>5</td>
<td>1 - 20</td>
<td>.523</td>
<td>-1.496</td>
</tr>
<tr>
<td>Alliteration</td>
<td>8.46</td>
<td>4.42</td>
<td>8</td>
<td>1 - 20</td>
<td>.457</td>
<td>.126</td>
</tr>
<tr>
<td>Blending</td>
<td>13.85</td>
<td>5.64</td>
<td>15</td>
<td>2 - 28</td>
<td>-.017</td>
<td>-.027</td>
</tr>
<tr>
<td>Segmenting</td>
<td>7.31</td>
<td>3.10</td>
<td>7</td>
<td>2 - 16</td>
<td>.870</td>
<td>1.063</td>
</tr>
<tr>
<td>Total</td>
<td>38.33</td>
<td>15.34</td>
<td>35</td>
<td>19 - 81</td>
<td>.705</td>
<td>-.088</td>
</tr>
</tbody>
</table>
Table 12

Descriptive Statistics for 5-Year-Old Children for Phonological Awareness

Component Skills \( (n = 41) \)

<table>
<thead>
<tr>
<th>Skill</th>
<th>Mean</th>
<th>SD</th>
<th>Median</th>
<th>Range</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rhyming</td>
<td>14.29</td>
<td>6.53</td>
<td>18</td>
<td>1 - 20</td>
<td>-.882</td>
<td>-.865</td>
</tr>
<tr>
<td>Alliteration</td>
<td>12.76</td>
<td>4.75</td>
<td>13</td>
<td>4 - 20</td>
<td>-.058</td>
<td>-1.317</td>
</tr>
<tr>
<td>Blending</td>
<td>17.78</td>
<td>5.21</td>
<td>17</td>
<td>4 - 30</td>
<td>.132</td>
<td>.288</td>
</tr>
<tr>
<td>Segmenting</td>
<td>9.93</td>
<td>4.52</td>
<td>10</td>
<td>0 - 22</td>
<td>.357</td>
<td>.485</td>
</tr>
<tr>
<td>Total</td>
<td>54.95</td>
<td>16.52</td>
<td>55</td>
<td>12 - 84</td>
<td>-.335</td>
<td>-.270</td>
</tr>
</tbody>
</table>

The results indicated that the 4-year-old children received an average score of 8.97 \( (SD = 7.08) \) in the area of rhyming, which included detection and production and an average of 8.46 \( (SD = 4.42) \) on alliteration skills of detection and classification. For the areas of blending and segmenting, the 4-year-olds received an average score of 13.85 \( (SD = 5.64) \) and 7.31 \( (SD = 3.10) \) respectively. The mean for the total composite was 38.33 \( (SD = 15.34) \) out of a possible 100. The skewness measure ranged from -.017 to .870, and the kurtosis score ranged from -1.496 to 1.063.

The 5-year-old children received an average score of 14.29 \( (SD = 6.53) \) on rhyming and 12.76 \( (SD = 4.75) \) on alliteration. They received an average score of 17.78 \( (SD = 5.21) \) on blending and 9.93 \( (SD = 4.52) \) on segmenting. The total composite score mean was 54.95 \( (SD = 16.52) \). The skewness measure ranged from -.882 to .357, and the kurtosis score ranged from -1.317 to .485.
Each of the component skills showed a wide range of skill performance for both age groups. The mean raw scores of the phonological awareness skills and the total composite score for both age groups are illustrated in Figure 1.

**Figure 1.**
Mean Raw Scores of Phonological Awareness Skills and Total Composite for 4- and 5-Year-Old Children
A one-way multivariate analysis of variance (MANOVA) was performed on the five dependent variables describing phonological awareness: rhyming, alliteration, blending, and segmenting and the total composite score. The independent variable, age, had two levels: 4 years of age and 5 years of age. The combined dependent variables were significantly affected by age as indicated by the analysis results of a multivariate $F(5,74) = 165.22$, Wilks' Lambda $= .082$, $p < 0.001$. The Box's M test for equality of the group covariance matrix resulted in a score of $10.664$, $p < .05 (.824)$, indicating that there are no departures from multivariate normality.

Individual univariate analyses of variance (ANOVA) procedures were conducted on each of the dependent variables to determine the significance based on age. The results for the dependent variable of rhyming revealed a value of $F(1, 78) = 12.210$, ($p = .001$). The alliteration analysis resulted in a value of $F(1, 78) = 17.477$, ($p < .0005$). The result for blending was a value of $F(1, 78) = 10.519$, ($p < .0005$). The analysis for segmenting resulted in a value of $F(1,78) = 9.024$, ($p = .004$). Finally, the results of the univariate ANOVA for the total composite score of each phonological awareness component indicated a value of $F(1, 78) = 21.678$, ($p < .0005$).

The results of the univariate ANOVAs, as listed in Table 13, for each of the dependent variables of rhyming, alliteration, blending, segmenting, and a total composite indicated significant $F$ values and probability values that consistently exceeded the a priori value set at $\alpha = .05$. The MANOVA and ANOVA analyses led to the rejection of the null hypothesis and acceptance of the alternative hypothesis.
Table 13

Univariate ANOVA Results for Dependent Variables Comparing 4-and 5-Year-Olds

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>F Value</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rhyming</td>
<td>12.21</td>
<td>1, 78</td>
<td>.001</td>
</tr>
<tr>
<td>Alliteration</td>
<td>17.48</td>
<td>1, 78</td>
<td>.000</td>
</tr>
<tr>
<td>Blending</td>
<td>10.52</td>
<td>1, 78</td>
<td>.002</td>
</tr>
<tr>
<td>Segmenting</td>
<td>9.02</td>
<td>1, 78</td>
<td>.004</td>
</tr>
<tr>
<td>Total Composite</td>
<td>21.68</td>
<td>1, 78</td>
<td>.000</td>
</tr>
</tbody>
</table>

In taking the analysis one step further, the age groups were divided into half-year increments. Table 14 describes the age range, mean age, and sample size of these four groups.

Table 14

Description of Age Groups in Half Year Increments

<table>
<thead>
<tr>
<th>Age</th>
<th>Age Range</th>
<th>Mean</th>
<th>Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 years</td>
<td>4 years, 0 months to 4 years, 5 months</td>
<td>4 years, 2 months</td>
<td>17</td>
</tr>
<tr>
<td>4.5 years</td>
<td>4 years, 6 months to 4 years, 11 months</td>
<td>4 years, 9 months</td>
<td>22</td>
</tr>
<tr>
<td>5 years</td>
<td>5 years, 0 months to 5 years, 5 months</td>
<td>5 years, 2 months</td>
<td>20</td>
</tr>
<tr>
<td>5.5 years</td>
<td>5 years, 5 months to 5 years, 11 months</td>
<td>5 years, 9 months</td>
<td>21</td>
</tr>
</tbody>
</table>
The results further delineate the influence of age (in six month increments) on the development of phonological awareness skills. For all of the half year age groups, the skewness measure ranged from -1.450 to 1.230, and the kurtosis score ranged from -1.688 to 1.236. The descriptive statistics are displayed in Table 15. The raw score means are illustrated in Figure 2.

**Table 15**

Descriptive Statistics for Half Year Age Groups

<table>
<thead>
<tr>
<th>Variable</th>
<th>4 years (n = 17)</th>
<th>4.5 years (n = 22)</th>
<th>5 years (n = 20)</th>
<th>5.5 years (n = 21)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skill</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td></td>
<td>Median Range</td>
<td>Median Range</td>
<td>Median Range</td>
<td>Median Range</td>
</tr>
<tr>
<td>Rhyming</td>
<td>8.76 (6.81)</td>
<td>9.14 (7.44)</td>
<td>12.55 (7.27)</td>
<td>15.95 (5.40)</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>6</td>
<td>16.5</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>2-20</td>
<td>1-20</td>
<td>1-20</td>
<td>3-20</td>
</tr>
<tr>
<td></td>
<td>7.53 (4.19)</td>
<td>9.18 (4.56)</td>
<td>10.00 (3.92)</td>
<td>15.38 (3.96)</td>
</tr>
<tr>
<td>Alliteration</td>
<td>7</td>
<td>8.5</td>
<td>9.5</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>1-15</td>
<td>1-20</td>
<td>4-17</td>
<td>7-20</td>
</tr>
<tr>
<td>Blending</td>
<td>12.94 (5.78)</td>
<td>14.55 (5.55)</td>
<td>16.60 (6.08)</td>
<td>18.90 (4.06)</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>15</td>
<td>15.5</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>2-20</td>
<td>5-28</td>
<td>4-30</td>
<td>13-27</td>
</tr>
<tr>
<td></td>
<td>6.88 (2.76)</td>
<td>7.64 (3.37)</td>
<td>8.50 (3.62)</td>
<td>11.29 (4.95)</td>
</tr>
<tr>
<td>Segmenting</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>2-11</td>
<td>3-16</td>
<td>0-16</td>
<td>1-22</td>
</tr>
<tr>
<td>Total</td>
<td>35.53 (15.52)</td>
<td>40.50 (15.20)</td>
<td>47.55 (16.47)</td>
<td>62.00 (13.47)</td>
</tr>
<tr>
<td></td>
<td>31</td>
<td>38</td>
<td>45</td>
<td>63</td>
</tr>
<tr>
<td></td>
<td>20-62</td>
<td>19-81</td>
<td>12-75</td>
<td>40-84</td>
</tr>
</tbody>
</table>

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Mean Raw Scores of Phonological Awareness Skills and Total Composite by Half Year Increments
A second one-way multivariate analysis of variance (MANOVA) was performed on the five dependent variables describing phonological awareness: rhyming, alliteration, blending, and segmenting and the total composite score. The independent variable, age, was expanded to include four levels: 4, 4.5, 5, and 5.5 years of age. The combined dependent variables also were significantly affected by age in half year increments as indicated by the analysis results of a multivariate $F(5, 74) = 177.61$, Wilks' $\Lambda = .075$, $p < 0.005$.

Individual univariate analyses of variance (ANOVAs) procedures were conducted on each of the dependent variables to determine the significance based on age in half year increments. The $F$ values, degrees of freedom, and probability values for each of the variables are listed in Table 16. The results of the univariate ANOVAs for each of the dependent variables of rhyming, alliteration, blending, segmenting, and a total composite indicated significant $F$ values and probability values that consistently exceeded the a priori value set at $\alpha = .05$. These analyses confirmed that age, in half year increments, was a significance influence, as well, on phonological awareness development and that the null hypothesis is rejected.
Table 16

Univariate ANOVA Results for Dependent Variables Comparing Half Year Increments

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>$F$ Value</th>
<th>$df$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rhyming</td>
<td>4.97</td>
<td>3, 76</td>
<td>.003</td>
</tr>
<tr>
<td>Alliteration</td>
<td>13.25</td>
<td>3, 76</td>
<td>.000</td>
</tr>
<tr>
<td>Blending</td>
<td>4.44</td>
<td>3, 76</td>
<td>.006</td>
</tr>
<tr>
<td>Segmenting</td>
<td>5.11</td>
<td>3, 76</td>
<td>.003</td>
</tr>
<tr>
<td>Total Composite</td>
<td>11.44</td>
<td>3, 76</td>
<td>.000</td>
</tr>
</tbody>
</table>

To investigate the influence that gender may have on the development of phonological awareness skills, a two-way ANOVA was performed as a test of between subjects effect. The results for the variable of rhyming revealed a value of $F(1, 78) = 1.882$, ($p = .212$). The alliteration analysis resulted in a value of $F(1, 78) = 0.329$, ($p = .568$). The result for blending was a value of $F(1, 78) = 1.313$, ($p = .255$). The analysis for segmenting resulted in a value of $F(1, 78) = 0.604$, ($p = .439$). Finally, the results of the total composite score of each phonological awareness component indicated a value of $F(1, 78) = 1.668$, ($p = 0.200$). As listed in Table 17, these results indicated that there was not a consistent difference between the groups based on gender with probability values exceeding the .05 level. Age was the primary group difference.
Table 17

Two-Way ANOVA Results Investigating the Influence of Age and Gender

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>F Value</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rhyming</td>
<td>1.882</td>
<td>1, 78</td>
<td>.212</td>
</tr>
<tr>
<td>Alliteration</td>
<td>.329</td>
<td>1, 78</td>
<td>.568</td>
</tr>
<tr>
<td>Blending</td>
<td>1.313</td>
<td>1, 78</td>
<td>.255</td>
</tr>
<tr>
<td>Segmenting</td>
<td>.604</td>
<td>1, 78</td>
<td>.439</td>
</tr>
<tr>
<td>Total Composite</td>
<td>1.668</td>
<td>1, 78</td>
<td>.200</td>
</tr>
</tbody>
</table>

Hypotheses 2 and 3 Comparison of Linguistic Levels of Complexity

Descriptive data. The following is a description by age level of the means, standard deviations, and ranges for the points correct for each of the phonological awareness subskills assessed. Rhyming included levels of detection and production, while alliteration included detection and categorization. Blending and segmenting included levels of syllables, onset and rime units, and phonemes. Table 18 lists this descriptive data for the phonological awareness subskills.
Table 18

Descriptive Data for Phonological Awareness Subskills by Age

<table>
<thead>
<tr>
<th>Phonological Skill</th>
<th>4 Years (n = 39)</th>
<th>5 Years (n = 41)</th>
<th>Total (N = 80)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>Range</td>
<td>Range</td>
</tr>
<tr>
<td>Rhyme Detection</td>
<td>58.46 (32.16)</td>
<td>81.46 (26.70)</td>
<td>70.25 (31.50)</td>
</tr>
<tr>
<td></td>
<td>10-100</td>
<td>10-100</td>
<td>10-100</td>
</tr>
<tr>
<td>Rhyme Production</td>
<td>31.28 (42.13)</td>
<td>61.46 (41.99)</td>
<td>46.75 (44.46)</td>
</tr>
<tr>
<td></td>
<td>0-100</td>
<td>0-100</td>
<td>0-100</td>
</tr>
<tr>
<td>Alliteration Detection</td>
<td>32.05 (21.54)</td>
<td>53.90 (28.71)</td>
<td>43.25 (27.59)</td>
</tr>
<tr>
<td></td>
<td>0-100</td>
<td>10-100</td>
<td>0-100</td>
</tr>
<tr>
<td>Alliteration Categorization</td>
<td>52.56 (28.07)</td>
<td>73.66 (25.47)</td>
<td>63.38 (28.64)</td>
</tr>
<tr>
<td></td>
<td>0-100</td>
<td>20-100</td>
<td>0-100</td>
</tr>
<tr>
<td>Blending of Syllables</td>
<td>83.85 (23.13)</td>
<td>92.20 (11.07)</td>
<td>88.13 (18.36)</td>
</tr>
<tr>
<td></td>
<td>20-100</td>
<td>40-100</td>
<td>0-100</td>
</tr>
<tr>
<td>Blending of Onsets/Rimes</td>
<td>41.79 (29.90)</td>
<td>56.59 (26.04)</td>
<td>49.38 (28.79)</td>
</tr>
<tr>
<td></td>
<td>0-100</td>
<td>0-100</td>
<td>0-100</td>
</tr>
<tr>
<td>Blending of Phonemes</td>
<td>12.82 (17.16)</td>
<td>28.78 (24.61)</td>
<td>21.00 (22.64)</td>
</tr>
<tr>
<td></td>
<td>0-80</td>
<td>0-100</td>
<td>0-100</td>
</tr>
<tr>
<td>Segmenting of Syllables</td>
<td>61.79 (20.11)</td>
<td>70.98 (24.06)</td>
<td>66.50 (22.56)</td>
</tr>
<tr>
<td></td>
<td>20-100</td>
<td>0-100</td>
<td>0-100</td>
</tr>
<tr>
<td>Segmenting of Onset/Rimes</td>
<td>8.21 (15.87)</td>
<td>21.22 (26.66)</td>
<td>14.88 (22.89)</td>
</tr>
<tr>
<td></td>
<td>0-60</td>
<td>0-80</td>
<td>0-80</td>
</tr>
<tr>
<td>Segmenting of Phonemes</td>
<td>3.08 (8.93)</td>
<td>7.07 (12.09)</td>
<td>5.13 (10.79)</td>
</tr>
<tr>
<td></td>
<td>0-40</td>
<td>0-60</td>
<td>0-60</td>
</tr>
</tbody>
</table>

Children who were four years of age detected rhyming words an average of 58% of the time in 10 trials and produced a word that rhymed an average of 31% of the time in 10 trials. The 5-year-olds detected rhymes an average of 81% of the time and produced words that rhymed an average of 61%. As a group, the children in the study detected
rhyme 70% of the time and produced rhyming words 47% of the time. Figure 3 illustrates the mean percent correct scores for rhyming by year and half year increments.

(Figure 3 continues)
Figure 3.

Mean Percent Correct Scores for Rhyming Detection and Production by Year and Half Year.
The alliteration subskills required children to detect words that began with the same sound and then identify a picture that began with a target sound. The 4-year-olds detected alliterative words 32% in 10 trials and categorized a word based on the beginning sound 53% of the time in 10 opportunities. The 5-year-olds completed alliteration detection 54% and chose a picture beginning with a target sound 74% of the time. The results for the whole group followed the same pattern with detection receiving a score of 43% and a categorization score of 63% of the words in 10 trials. Figure 4 illustrates the mean percent correct scores for the alliteration subskills by year and half year.

(Figure 4 continues)
Figure 4.

Mean Percent Correct Scores for Alliteration Detection and Categorization by Year and Half Year
The linguistic levels of syllables, onset and rime units, and phonemes were assessed for the phonological awareness skills for blending and segmenting. As illustrated in Figure 5, children who were 4 years old were able to blend an average of 84% of words from syllables, 44% of words from onsets and rimes, and 13% of words from phonemes each with 10 trials. Five-year-old children were able to blend an average of 92% of words from syllables, 57% of words from onsets and rimes, and 29% of words from phonemes. As a whole, the children were able to blend 88% of words from syllables, 49% of words from onsets and rimes, and 21% of words from phonemes.
Figure 5.

Mean Percent Correct Scores for Blending Syllables, Onsets and Rimes, and Phonemes by Year and Half Year
For the skill of segmenting, 4-year-old children segmented words into syllables 62%, words into onset and rime units 8%, and words into phonemes 3% of the time, whereas the 5-year-olds segmented 71% of words into syllables, 21% of words into onset and rime units, and 7% of words into phonemes. The whole group segmented an average of 67% of words into syllables, 15% of words into onset and rime units, and 5% of words into phonemes. Figure 6 describes the mean percent correct scores for segmenting.
(Figure 6 cont.)

Figure 6.
Mean Percent Correct Scores for Segmenting Syllables, Onsets and Rimes, and Phonemes by Year and Half Year
Hypothesis 2a. The alternative hypothesis stated that there would be an important and statistically consistent difference between the average scores of the rhyming subskills of detection and production by 4- to 5-year-old children. The results of a one-way ANOVA indicated a significant $F$ values $F(1,78) = 12.162$, ($p = .001$) and $10.295$, ($p = .002$). The data supported the rejection of the null hypothesis which indicated that there would not be a difference.

An analysis comparing each subject's performance on rhyming revealed that 37 of the 4-year-old children and 37 of the 5-year-old children received an equal or higher score on the detection task than the production task. Only 2 of the 4-year-olds and 4 of the 5-year-olds scored higher on the production task over the detection task. Rhyme detection was as easy or easier for 93% of the sample.

Hypothesis 2b. The alternative hypothesis stated that there would be an important and statistically consistent difference between the average raw scores of the alliteration subskills of detection and categorization by 4- to 5-year-old children. The data supported the rejection the null hypothesis which indicated that there would not be a difference. The one-way ANOVA resulted in significant $F$ values that are $F(1,78) = 14.708$, ($p < .0005$) and $12.411$, ($p = .001$). However, the detection task was more difficult for the children to complete than the categorization task. A difference was found, but in the opposite direction.

An analysis comparing each subject's performance on the alliteration tasks revealed that 34 of the 4-year-old children and 36 of the 5-year-old children received an equal or higher score on the categorization task than the detection task. Five of the 4-year-olds and 4 of the 5-year-olds scored higher on the detection task over the
categorization task. Alliteration categorization was as easy or easier for 88% of the sample.

_Hypothesis 3a._ The alternative hypothesis stated that there would be an important and statistically consistent difference among the average scores of the blending subskills of syllables, onset and rime units, and phonemes by 4- to 5-year-old children. The data again supported the rejection of the null hypothesis which indicated that there would not be a difference. The $F$ values of the one-way ANOVA were significant for each level at $F(1, 78) = 4.308, (p = .041)$ for syllables, $5.582 (p = .021)$ for onsets and rimes, and $11.209 (p = .001)$.

An analysis comparing each subject’s performance on the three levels of blending revealed that 37 of the 4-year-old children and all of the 5-year-old children received a score equal to or higher than in the series of syllables, onsets and rimes, and phonemes. Only 2 of the 4-year-olds displayed a higher score on one of the smaller linguistic levels. For 98% of the sample, blending syllables was typically easier than onsets and rimes which was easier than phonemes.

_Hypothesis 3b._ The alternative hypothesis stated that there would be an important and statistically consistent difference among the average raw scores of the segmenting subskills of syllables, onset and rime units, and phonemes by 4- to 5-year-old children. The results of the one-way ANOVA indicated the following $F$ values: $F(1, 78) = 3.410, (p = .069)$ for syllables, $6.946, (p = .010)$ for onsets and rime units, and $2.804 (p = .098)$ for phonemes. The data supported the rejection of the null hypothesis for only the onset and rime level of linguistic complexity. There was not an important or consistent difference between the age groups and the linguistic levels of syllables and phonemes.
An analysis comparing each subject’s performance on the three levels of segmenting indicated that 37 of the 4-year-old children and 37 of the 5-year-old children received a score equal to or higher than in the series of syllables, onsets and rimes, and phonemes. Only 2 of the 4-year-olds and 4 of the 5-year-olds displayed a higher score on one of the smaller linguistic levels. For 93% of the sample, segmenting syllables was typically easier than onsets and rimes which was easier than phonemes. However, there were significant floor effects for the phoneme level.

*Comparison of the phonological awareness subskills.* The results of the one-way analyses comparing the levels of linguistic complexity identified important and consistent differences in 8 of the 10 subskills within the component skills of phonological awareness. To identify the different relationships between each subskill and use the raw scores converted to z-scores as listed in Table 19 and illustrated in Figure 7. The use of z-scores allows the direct comparison of the slopes (of the relationships between variable and age) for each subskill. For all of the subskills, a one-way between and within ANOVA, using the converted z-scores as dependent variables with subskill type as the within-subject factor and age group as the between factor, analyzed the overall subskill by age interaction of the subjects. The results provided a significant value of $F(9, 702) = 27.28$, ($p < .005$). This indicates that there are different age trends for different subskills. This is also evident from the visual inspection of Figure 7.
Table 19

Z-Scores for Phonological Awareness Subskills

<table>
<thead>
<tr>
<th>Phonological Awareness Subskill</th>
<th>4-Year-Olds z-score (SD)</th>
<th>5-Year-Olds z-score (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rhyme Detection</td>
<td>-.374 (.102)</td>
<td>.356 (.85)</td>
</tr>
<tr>
<td>Rhyme Production</td>
<td>-.348 (.95)</td>
<td>.331 (.94)</td>
</tr>
<tr>
<td>Alliteration Detection</td>
<td>-.406 (.78)</td>
<td>.386 (1.04)</td>
</tr>
<tr>
<td>Alliteration Categorization</td>
<td>-.378 (.98)</td>
<td>.539 (.89)</td>
</tr>
<tr>
<td>Blending of Syllables</td>
<td>-.233 (1.26)</td>
<td>.221 (.60)</td>
</tr>
<tr>
<td>Blending of Onsets and Rimes</td>
<td>-.263 (1.04)</td>
<td>.250 (.91)</td>
</tr>
<tr>
<td>Blending of Phonemes</td>
<td>-.361 (.77)</td>
<td>.344 (1.09)</td>
</tr>
<tr>
<td>Segmenting Syllables</td>
<td>-.209 (.89)</td>
<td>.198 (1.07)</td>
</tr>
<tr>
<td>Segmenting Onsets and Rimes</td>
<td>-.291 (.69)</td>
<td>.277 (1.16)</td>
</tr>
<tr>
<td>Segmenting Phonemes</td>
<td>-.190 (.83)</td>
<td>.181 (1.12)</td>
</tr>
</tbody>
</table>
Figure 7.

Mean Z-Scores for Phonological Awareness Subskills

The following figures separate the subskills within each phonological awareness skill component. Figure 8 illustrates the slopes for the rhyme detection and production subskills. These tasks changed significantly from 4 to 5 years of age. Rhyming skills were developing in the 4-year-olds and were more stable in the group of 5-year-olds.
Like rhyming, alliteration subskills also changed significantly from 4 to 5 years of age as illustrated in Figure 9. As described earlier, the categorization task was easier than the detection task for both groups. When comparing the age groups, the 4-year-olds were developing a sense of alliteration and these skills were more stable within the group of 5-year-old children.
The slopes for the blending subskills display a variety of steepness as seen in Figure 10. The phoneme blending task has a similar slope to the rhyming and segmenting subskills, whereas the syllable and onset and rime unit tasks have less of a slope. The phoneme task had lower levels of skill attainment for both groups of children and yet showed considerable change from 4 to 5 years of age. The syllable task had the highest level of skill attainment in both age groups as illustrated by the less steep slope.
Mean Z-Scores for Blending Syllables, Onset and Rime Units, and Phonemes

The slopes of the segmenting subskills displayed the least amount of slope in the 10 subskills as illustrated in Figure 11. The syllable segmenting task had fairly high attainment levels and the phoneme segmenting task had low skill attainment levels for both age groups resulting in less steep slopes. As with the task of blending onset and rime units, the segmenting task at this linguistic level shows a moderate slope in relationship to the other subskills.
Finally, to investigate the relative order of difficulty and the presumed order of acquisition or attainment of the phonological awareness subskills, a Guttman Scale was used (Gilpin & Hays, no date; Guttman, 1944). A Guttman scale is a one-dimensional structure used to study items. The data were transformed into a pass–fail accounting, in which scores of 0 to 5 were considered to be failing, and scores of 6 to 10 were considered to be passing. The results provided a Guttman Reliability score of $R = 0.834$ and a Coefficient of Reproducibility of $0.865$. Table 20 describes the order, number
passing, and level of difficulty for each phonological awareness subskill. This indicates, roughly, the order in which it is expected that children will attain a “passing” level of each subskill.

Table 20

**Guttman Ranking and Level of Difficulty of Phonological Awareness Subskills**

<table>
<thead>
<tr>
<th>Rank</th>
<th>Phonological Awareness Subskill</th>
<th>Number Passing</th>
<th>Difficulty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Blending Syllables</td>
<td>74</td>
<td>0.93</td>
</tr>
<tr>
<td>2</td>
<td>Segmenting Syllables</td>
<td>60</td>
<td>0.75</td>
</tr>
<tr>
<td>3</td>
<td>Rhyme Detection</td>
<td>53</td>
<td>0.66</td>
</tr>
<tr>
<td>4</td>
<td>Alliteration Categorization</td>
<td>47</td>
<td>0.59</td>
</tr>
<tr>
<td>5</td>
<td>Rhyme Production</td>
<td>42</td>
<td>0.52</td>
</tr>
<tr>
<td>6</td>
<td>Blending Onsets and Rimes</td>
<td>35</td>
<td>0.44</td>
</tr>
<tr>
<td>7</td>
<td>Alliteration Detection</td>
<td>22</td>
<td>0.28</td>
</tr>
<tr>
<td>8</td>
<td>Segmenting Onsets and Rimes</td>
<td>7</td>
<td>0.09</td>
</tr>
<tr>
<td>9</td>
<td>Blending Phonemes</td>
<td>7</td>
<td>0.09</td>
</tr>
<tr>
<td>10</td>
<td>Segmenting Phonemes</td>
<td>1</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Note: A high level of “Difficulty” rating indicates an easier subskill.

**Summary**

A total of 80 children participated in the study in which 39 children were 4 years of age and 41 children were 5 years of age. None of the children had started kindergarten. These two groups represented the levels of the independent variable. Each child in the study was assessed using a collection of measures gathered from the literature designed
to assess phonological awareness skills in the area of rhyming, alliteration, blending, and segmenting. A total composite score was calculated as well.

A one-way MANOVA was performed for the dependent variables of rhyming, alliteration, blending, and segmenting, as well as a composite score for the independent variable of age with levels comparing 4- and 5-year-olds and an additional analysis of levels based on half year increments to identify the influences of age on the skill development of phonological awareness. The analysis of the results indicated significant differences of phonological awareness skill development with respect to age.

Additionally, one-way ANOVAs were performed to identify the relationship that linguistic levels of complexity have on skill attainment of the individual phonological awareness skills. Significant difference was found between and among the various levels of linguistic complexity in the areas of rhyming, alliteration, and blending; however, only the onset and rime level segmenting was found to be significant.

Given these results, the null hypotheses were rejected in favor of the alternative hypotheses stating that important and consistent differences do exist between the development of phonological awareness skills of 4- and 5-year-old children with the exception of the segmenting skill. Children who were 5 years of age had higher levels of phonological awareness skill development. Both groups generally had higher scores for the receptive level of rhyming over the expressive level. Alliteration categorization was an easier task than the detection task. For the skill of blending, children received higher scores for larger linguistic units and lower scores for smaller units. This trend was also noted for the levels of segmenting; however, the difference among the subskills was not found to be significant. There were large floor effects for the onset and rime and
phoneme levels of linguistic complexity for segmenting and blending, which were difficult tasks for both age groups.
Chapter 5

DISCUSSION

Introduction

Phonological awareness plays a key role in literacy development (Anthony & Lonigan, 2004). Phonemic awareness of children entering kindergarten has been identified in research as one of the best predictors of their reading performance in second grade. The definition of phonemic awareness as a component skill developing out of phonological awareness has become more concise in the literature. A variety of tasks have been used to identify and measure skill development in young children.

The purpose of this study is first to further identify and define what phonological awareness skills lead to phonemic awareness in children who are 4 and 5 years of age prior to entering kindergarten and the influence of age. Secondly, this study looked at the relationship among the levels of linguistic complexity within the component skills of phonological awareness from syllables to phonemes. This chapter provides a discussion and summary of the population and sample; conclusions of the data analysis with respect to the research questions, hypotheses, and possible explanations; strengths and limitations; and implications for future research.

Population and Sample

Typically developing 4- and 5-year-old children participating in childcare services in the Missoula, Montana area were the population for this study. Children in childcare
programs, whose directors agreed to allow the study to be conducted at their site, were selected to participate. Two center-based and six home-based childcare facilities were the sites where the study was conducted.

Eighty children who were 4 and 5 years of age prior to entering kindergarten, who were considered to be typically developing by their parents and childcare providers, and whose parents signed a permission to participate form, comprised the sample for this study. Of this group, 39 children were 4 years old, of which 22 were girls and 17 were boys; and 41 children were 5 years old, including 22 girls and 19 boys.

Each child was assessed individually in a quiet location in the childcare facility. The assessment took an average of 30 minutes to administer. Only two of the 80 children required an additional session to complete the four components of the assessment. A different finger puppet was used for each of the four skill components. The children were anxious to meet each “friend,” who easily maintained their attention and engagement.

Conclusions

The following section contains a discussion of the study results pertaining to the research question and the three alternative hypotheses and sub-hypotheses. The research question and the hypotheses are restated followed by a discussion of the results.

Research Question

The primary research question regards the levels of phonological awareness skill and subskill development within a general hierarchy of linguistic complexity that lead to phonemic awareness in the areas of rhyming, alliteration, blending, and segmenting in children 4 and 5 years of age prior to entering kindergarten.
Hypothesis 1 Comparison of Age

The alternative hypothesis stated that there would be an important and statistically consistent difference between the average scores of the phonological awareness skills in children who are 4 years of age and children who are 5 years of age.

Discussion. The null hypothesis stated that there would not be a difference between the scores on the phonological awareness skill measures of 4- and 5-year-old children. The results determined that there was a statistically consistent and important difference between children of those ages (p > .004), thus rejecting the null hypothesis. There was a difference between 4- and 5-year-old children in their skill development of each of the four components of rhyming, alliteration, blending, and segmenting, as well as the total composite.

In taking the analysis a step further, a statistically consistent and important difference also was found when the two age groups were divided into half year increments. Indeed, for each of the phonological awareness component skills and the total composite, the 5-year-old children displayed higher levels of skill attainment than the 4-year-old children. As well, there was a general progression of skill attainment for each component skill for each group in six month increments.

Hypothesis 2a Comparison of Linguistic Levels of Rhyming

The alternative hypothesis stated that there would be an important and statistically consistent difference between the average raw scores of the rhyming subskills of detection and production by 4- to 5-year-old children.

Discussion. The linguistic levels of complexity for the skill of rhyming included a receptive level of rhyme detection and an expressive level of rhyme production. The
rhyme detection task required the children to identify a picture of a word that rhymed with a target word. The production task required children to produce a word that rhymed with a target word. The results of the analysis indicated an important and statistically consistent difference rejecting the null hypothesis, which stated that there would be no difference. Children had a higher level of skill attainment for the receptive level of rhyme detection than for the expressive level of rhyme production. This was true for the entire sample, as well as for each 4- and 5-year age group.

The frequency distribution for the skill of rhyming provided an interesting pattern. Typically, the children either had some concept about rhyming, as indicated by higher skill attainment scores, or they did not, as indicated by lower scores. There were not many scores falling in the middle range. This suggests that the skill of rhyming has distinct subskills. Children who focused on the structure of the words demonstrated an attainment of language development at the metaphonological level, which is indicative of a child’s ability to understand that words have a meaning, as well as a form or structure that can be played with and manipulated (Hodson, 1994).

Some of the children, especially those in the 4-year-old group, had not reached this level of language development. For example, during the rhyme detection task, a 4-year-old boy was shown a picture of a wooden bat as the target word with response choices of a sun, a mouse, or a cat. When asked which word rhymed with or sounded the same at the end as “bat,” he asked where the “ball” was, because a ball was the thing that went with a bat. Clearly, he was focusing on the semantic association of the object and not the structural aspect of the word.
Many children who produced words that rhymed displayed a simplified or constrictive pattern by providing words that rhymed with the target word that all began with the same phoneme. For example, a child might provide the word “bat” as a rhyme for cat, “bug” for rug, “bite” for kite, “bake” for cake and then not provide a rhyming word for “bee” because the target word began with the preference phoneme.

Generally, children who were 4 years old could detect words that rhymed about 60% of the time. These results are consistent with previous studies that assessed rhyme matching in which 4-year-olds were able to match words that rhymed in a range from 50% to 70% of the time. The 5-year-olds in this study matched rhyming words about 80% of the time, as compared to 60% to 70% in previous studies. Four-year-olds produced words that rhymed about 30% of the time, as compared to 60% for the 5-year-olds. No previous studies identified levels of rhyme production, as an isolated skill, in 4- or 5-year-old groups. Upon entering kindergarten, these 5-year-old children displayed high levels of rhyme detection, and the majority could produce rhymes.

_Hypothesis 2b Comparison of Linguistic Levels of Alliteration_

The alternative hypothesis stated that there would be an important and statistically consistent difference between the average raw scores of the alliteration subskills of detection and categorization by 4- to 5-year-old children.

_Discussion._ The two tasks used to measure a child’s understanding of the beginning sounds of words included a forced-choice matching task finding a picture in which the word begins with the same phoneme as the target picture word and a task that required the child to choose a picture in which the word begins with a given phoneme. The matching task was a component of a measurement designed for 3- to 5-year-old
children, whereas the phoneme categorization task was a component of a measurement
designed for children in kindergarten. The results indicated an important and consistent
difference in the scores for the two linguistic levels, rejecting the null hypothesis which
stated that there would not be a difference. However, the results were the reverse of what
was expected. The phoneme categorization task (for kindergarteners) was overall easier
than the matching task (for preschoolers) for both groups of 4- and 5-year-old children.

The children who were not easily able to detect words beginning with the same
phoneme often chose a picture that had a semantic association with the target word rather
than a phonological similarity. For example, one of the target words was “teeth” with
response choices of tire, phone, and pear. Children often chose the “pear” because of the
connection of eating a pear with teeth. Even those who attended to the sound structure
some of the time reverted to a semantic association, at times. This may indicate that
children’s metaphonological skills were still developing. However, when the target
phoneme was already isolated, as in the categorization task, the children were more
successful at identifying the picture that began with that sound.

For this phonological awareness skill and the tasks that were required, children
generally detected words that began with the same phoneme about 30% of the time when
they were 4 years old and 50% of the time when they were 5 years old. This compares to
a percent correct of about 50% for both 3- and 4-year-old children as listed in previous
studies. Four-year-olds were able to select a picture that began with a target sound about
50% of the time, as compared to 70% for the 5-year-olds. These results could not be
directly compared to either the Individual Growth and Development Indicators (IGDIs)
results or the Dynamic Indicators of Basic Early Literacy Skills (DIBELS) scores which
both have a time element that was not used in this study. Children entering kindergarten in this study had a developing understanding of the beginning sounds in words.

*Hypothesis 3a Comparison of Linguistic Levels of Blending*

The alternative hypothesis stated that there would be an important and statistically consistent difference among the average raw scores of blending syllables, blending onset and rime units, and blending phonemes by 4- to 5-year-old children.

*Discussion.* The three levels of linguistic complexity measured in the blending skill are based on the size of the word unit. Larger units like syllables are generally easier for children to manipulate than smaller units such as phonemes. This was the case for the three subskills identified by the blending tasks. The children were asked to guess what a puppet, who spoke in a funny and slow way, might be saying. After each response, the child was shown a picture of the segmented word to confirm their answer. Children were highly engaged in this activity and, overall, enjoyed this aspect of the interaction.

Within the age groups and as a whole, the children were most successful blending words from syllables, then by onset and rime units, followed by phonemes. These results of the analysis were statistically consistent indicating that the null hypothesis, which stated that there would not be a difference, was rejected. Four-year-olds could blend words from syllables about 80% of the time, words from onset and rime units about 40% of the time, and from phonemes about 10% of the time. The 5-year-olds, respectively, blended about 90%, 60%, and 30% of the items for each of the linguistic levels.

Of the studies reviewed regarding blending, the results were reported either as combined linguistic levels by year (one blending score for syllables, onsets and rimes, and phonemes together for a particular age group by year) or as a combination of age
groups for each linguistic level (blending score of each linguistic level for 4- to 6-year-olds). Only one study reported linguistic levels for a single age level, which described 4-year-olds having a percent correct score of 65% for syllables, 22% for onset and rime units, and 10% for phonemes. In this study, the 4-year-olds demonstrated a sense of phonological awareness but not phonemic awareness, whereas the 5-year-olds were developing a sense of phonemic awareness, as exhibited by their ability to blend onsets to rimes. Their ability to deal with individual phonemes was still developing.

Hypothesis 3b Comparison of Linguistic Levels of Segmenting

The alternative hypothesis stated that there would be an important and statistically consistent difference among the average raw scores of segmenting words into syllables, segmenting words into onset and rime units, and segmenting words into phonemes by 4- to 5-year-old children.

Discussion. The segmentation task included the same levels of linguistic complexity as the blending task. The results followed a similar pattern, as well, with syllables being the easiest and phonemes being the hardest to segment. Children who were 4 years of age segmented words into syllables 60%, words into onset and rime units 8%, and phonemes 3% of the time. The 5-year-old children displayed a success rate of 70% for syllables, 20% for onset and rime units, and 7% for phonemes. However, the only linguistic level that resulted in a statistically consistent difference from the other levels was the onset and rime level. There was not a significant difference between the syllable level (p = .069) or the phoneme level (p = .098). The null hypothesis was not rejected. These results have a mixed comparison with previous studies which reported...
that 4-year-old children could segment words into syllables about 60% to 70%, onsets from rimes at about 20% and phonemes about 15%.

Syllable segmentation was a skill that both 4- and 5-year-old children were generally successful at completing. Words with two syllables, such as "pillow" or "candy," generally were easier than longer words, such as "television." Within this subskill, the number of syllables appeared to influence the children's competency in separating the syllables within words. The level that required isolation of the onset from the rime was a challenging task for almost all the children, although the 5-year-olds demonstrated a significant increase over the 4-year-olds. A significant difference was not found between the age groups on the segmentation at the phoneme level. The scores for both age groups were quite low with little skill attainment at this linguistic level indicating a large floor effect. Children entering kindergarten displayed phonological awareness skills with an ability to segment words into syllables. Phonemic awareness was still a developing skill.

An additional observation was made for children who segmented words into onset and rime units and phonemes. Several children, who were all 5 years old, had a lower score on the syllable segmentation task than on the onset and rime task. These children appeared to focus on the smaller linguistic unit. So, when the task required syllable segmentation, they responded with phoneme segmentation exceeding the number of syllables in a word, but displaying a more complex ability of isolating phonemes.

Comparison of the Component Subskills

Within the four component skills of phonological awareness of rhyming, alliteration, blending, and segmenting, 10 subskills were measured. The results, using
percent correct scores, provide a direct comparison of the subskills in terms of which ones were easier and which ones were harder for the groups of 4- and 5-year-old children. For both age groups, blending syllables was the easiest skill, while blending phonemes and segmenting onset and rime units and phonemes were the most difficult. The 4-year-olds next segmented syllables, detected rhyme, and categorized words beginning with a target phoneme, while the 5-year-olds next detected rhyme, categorized words by beginning sound, and segmented syllables. The subskills which were moderately difficult for the 4-year-olds included blending onset and rime units, alliteration detection, and rhyme production. This level of difficulty for the 5-year-olds included rhyme production, blending of onset and rime units, and alliteration detection. These results are comparable to the results of the Guttman Scaling analysis. Table 21 illustrates the subskill percent correct score ranking from highest to lowest for both age groups. The shading indicates the three levels of difficulty from easier to more difficult. The “slope” of change from 4 to 5 years of age differs significantly for the subskills.
<table>
<thead>
<tr>
<th>Ranking</th>
<th>4-Year-Olds</th>
<th>Percent Correct</th>
<th>5-Year-Olds</th>
<th>Percent Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Blending Syllables</td>
<td>84</td>
<td>Blending Syllables</td>
<td>92</td>
</tr>
<tr>
<td>2</td>
<td>Segmenting Syllables</td>
<td>62</td>
<td>Rhyme Detection</td>
<td>81</td>
</tr>
<tr>
<td>3</td>
<td>Rhyme Detection</td>
<td>58</td>
<td>Alliteration Categorization</td>
<td>74</td>
</tr>
<tr>
<td>4</td>
<td>Alliteration Categorization</td>
<td>53</td>
<td>Segmenting Syllables</td>
<td>71</td>
</tr>
<tr>
<td>5</td>
<td>Blending Onsets and Rimes</td>
<td>42</td>
<td>Rhyme Production</td>
<td>61</td>
</tr>
<tr>
<td>6</td>
<td>Alliteration Detection</td>
<td>32</td>
<td>Blending Onsets and Rimes</td>
<td>57</td>
</tr>
<tr>
<td>7</td>
<td>Rhyme Production</td>
<td>31</td>
<td>Alliteration Detection</td>
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</tr>
<tr>
<td>8</td>
<td>Blending Phonemes</td>
<td>13</td>
<td>Blending Phonemes</td>
<td>29</td>
</tr>
<tr>
<td>9</td>
<td>Segmenting Onsets and Rimes</td>
<td>8</td>
<td>Segmenting Onsets and Rimes</td>
<td>21</td>
</tr>
<tr>
<td>10</td>
<td>Segmenting Phonemes</td>
<td>3</td>
<td>Segmenting Phonemes</td>
<td>7</td>
</tr>
</tbody>
</table>

From an observational standpoint, the researcher noted that frequently when the task was harder, the children’s attention turned to other things. They began talking about
other topics, asked about the other finger puppets, and became more restless. This observation corresponds well with the literature describing the relationship between behavior and literacy competency.

Within each of the phonological awareness skills, the 5-year-old children demonstrated higher levels of competency than the 4-year-olds. In terms of linguistic complexity, syllable units were easier to manipulate than phonemes for the children as a whole. All of the 5-year-old children in the study were age eligible to begin kindergarten within a month of the time the study data were collected.

Upon entering kindergarten, these children on average easily blended syllables and detected rhymes. They were fairly successful with alliteration categorization and syllable segmentation. They were developing an ability to produce rhymes, blend onsets to rimes, and detect alliteration. They were only beginning to blend phonemes and segment onsets from rimes and phonemes in words. Indeed, the children demonstrated skill development in phonological awareness and progressing to phonemic awareness, moving from syllables to phonemes.

*Strengths and Limitations*

*Strengths*

The purpose of this study is first to further identify the influence of age and define what phonological awareness skills lead to phonemic awareness in children who are 4 and 5 years of age prior to entering kindergarten. Secondly, this study investigates the relationship among the levels of linguistic complexity within the component skills of phonological awareness from syllables to phonemes. This study investigated skill and subskill attainment of phonological awareness components of rhyming, alliteration,
blending, and segmenting. The results are reported by specific age groups and detailed by specific linguistic subskills. An adequate number of 4- and 5-year-old children participated in the study in order to draw some conclusions.

Careful consideration was given to the familiarity and phonetic inventory of the words chosen to be included in the items of the phonological awareness skills in the setup of each subskill task to provide a pure measure of the skill. Items were chosen or adapted from the published measures that were representative of common objects within everyday environments of young children. Familiar words are less likely to tax children’s phonological memory and are more accessible for phonological naming. The phonetic inventory of the group of words included a representative sampling of phonemes within the English language but excluded sounds that are more typically difficult for young children to pronounce, such as /th, r, er/ sounds.

The data were collected by a researcher with experience in interacting with young children. Many of the children requested to participate a second time. They displayed a high level of interest and engagement. For the most part, the children enjoyed participating in all of the presented tasks.

Analyses of the results indicated a clear difference in the development of phonological awareness as an influence of age between children who were 4 and 5 years of age. Older children had higher levels of phonological awareness skill development than younger children in the areas of rhyming, alliteration, blending, and segmenting. Further, this trend continued when the age groups were divided again into half year increments. Clearly, the development of phonological awareness begins during the
preschool years. As children approach the age to enter kindergarten, their phonological awareness skills are developing into phonemic awareness skills.

The skill attainment by each age group further identified the progression of development when linguistic levels of complexity are considered from phonological awareness to phonemic awareness, moving from syllables to phonemes. The children demonstrated higher levels of skill development with larger linguistic units of syllables over smaller linguistic units such as phonemes. Consistent differences were identified between the linguistic levels of each component skill. By delineating the levels of linguistic complexity, the continuum of development is much clearer and further defined.

The results of the study add to the knowledge base on the development of phonological awareness and phonemic awareness skills and subskills of children who are 4 and 5 years of age and help to define what children typically know upon entering kindergarten. Children in their fourth year of age are developing phonological awareness with an ability to focus on larger linguistic levels in words. They demonstrated skill development in how words rhyme, beginning sounds in words, and how words can be pulled apart and put together at a syllable level. They were beginning to develop a sense of phonemic awareness, but the skills requiring attention at the phoneme level were still challenging. Children who most likely would be entering kindergarten were able to handle phonological awareness skills with higher levels of achievement. They also had higher levels of skill attainment with phonemic awareness tasks, although competency in these skills was still developing.
Limitations

Child development is a complex occurrence with many influential factors. Characteristics, such as socioeconomic level and ethnicity, were not controlled for in this study. Any 4- or 5-year-old child participating in a childcare program, who was considered to be developing in a typical manner, and whose parent provided consent was included in the study.

Reading is a complex process involving many interrelated skills, including phonological awareness; however, this study only looked at one specific aspect of early literacy development. Other skill sets were not considered in relation to the development of phonological awareness such as oral language, vocabulary development, or print knowledge.

Generalizability of the results is limited to children who have similar characteristics as the children included in the sample. The sample included 4- and 5-year-old children who participated in childcare in a rural community in the western part of the United States. Directors of a few childcare facilities decided that they did not want to be included in the study. As well, some parents declined to have their children participate.

The measures used in this study were a collection of tasks gathered from published assessments. The items for each subskill were chosen with semantic and phonetic considerations. The words were in the typical expressive vocabulary of young children, and the phonemes in the words were typically ones that children who are 4- and 5-years of age produce.
The measures used to identify levels of phonological awareness development came from several different sources. The rhyming and alliteration tasks were adapted from two sources. The measures for the blending and segmenting components were derived from the same source for syllable and phoneme levels; however, the words were adapted to control for the number of syllables and the level of linguistic complexity. An interesting finding of this study included the measures used to identify alliteration. The results of the children in this sample indicated that the alliteration detection measure designed for preschool children was more difficult than the alliteration categorization task designed for children in kindergarten.

*Implications for Future Research*

The preschool period is a critical time for literacy development. Children begin the process of learning about oral and written language well before they enter kindergarten. The results of this study contribute to the knowledge base of what children know about phonological awareness in the areas of rhyming, blending, and segmenting, and the hierarchy of linguistic development within each skill. A beginning understanding was gained regarding subskills of phonological awareness components in relation to other subskills. Aspects of the alliteration skill were partially identified. It was easier for children to identify words that began with an isolated target phoneme than words that began with the same phoneme. Possibly, alliteration is more closely related to segmenting, and a level of phonemic awareness is required before children are able to attend to beginning sounds.

As the tasks that represent phonological awareness are more clearly identified and defined, a larger sample of children should be included to see if those results are
replicated. The measures designed to identify these skills should be carefully developed to increase the certainty that the component skill is being assessed without other confounding factors, such as phonological memory or phonological naming. Such assessment procedures are vital to be able to identify children's developmental learning trajectory of phonological awareness. Knowing what skills children typically demonstrate and levels of competency are vital so that children's phonological skill attainment can be identified before formal reading instruction begins. Therefore, interventions can be introduced before they experience difficulty in learning to read.

The need for developing valid and reliable phonological awareness assessment measures for preschool children continues. The results of this study may provide a beginning for the development of such an assessment. Many aspects and factors must be considered.

Summary

Phonological awareness is an important aspect of early literacy that is related to reading success later in school. Skills include rhyming, alliteration, blending, and segmenting within a linguistic hierarchy of speech structures such as syllables, onset-rime units, and phonemes. Phonemic awareness, a component of phonological awareness, focuses on individual phonemes and includes phoneme blending, segmenting, and manipulation. Many of the studies looking at the development of phonological and phonemic awareness generally have included children already in kindergarten, with only a few studies including preschool aged children. Also, many of the studies focused on a specific skill or a set of skills often without considering a range of linguistic complexity.
separately. Preschool developmental levels must be more clearly determined to identify
typical development and to help predict future reading differences.

This study sought to gain a deeper understanding of young children’s
phonological awareness skill development within a hierarchy of linguistic complexity and
identifying the influence of age. Eighty children participated in the study in which 39
children were 4 years of age and 41 children were 5 years of age. None of the children
had started kindergarten.

Each child was assessed using a collection of measures gathered from the
literature designed to assess phonological awareness skills in the areas of rhyme detection
and production; alliteration detection and categorization; and levels of syllables, onset
and rime units, and phonemes for the skills of blending and segmenting. A total
composite score was calculated as well.

A variety of statistical analyses of the data resulted in important and statistically
consistent differences in the development phonological awareness skills. Children who
were 5 years of age consistently had higher levels of phonological awareness skill
development over the 4-year-olds. Trends for both groups emerged when considering the
linguistic levels of complexity within the component skills of phonological awareness.
All the children generally had higher scores for the receptive level of rhyming over the
expressive level. Alliteration categorization was an easier task than the detection task. For
the skill of blending, children received higher scores for larger linguistic units and lower
scores for smaller units. This trend was also noted for the levels of segmenting; however,
the difference among the subskills was not found to be significant. There were large
floor effects for the onset and rime and phoneme levels of linguistic complexity for segmenting and blending which were difficult tasks for both age groups.

The results of this study strongly suggest that phonological awareness skills are developing in young children beginning with larger linguistic units, such as syllables, and moving toward smaller units in phonemes. The easiest phonological awareness skills for both age groups included an ability to blend and segment syllables, detect rhyme, segment syllables, and categorize beginning sounds in words. The most challenging tasks for both groups included blending and segmenting onset and rime units and phonemes.

The children, who most likely would be entering kindergarten, easily blended syllables and detected rhymes. They fairly easily categorized beginning sounds and segmented syllables. They were developing an ability to produce rhymes, blend onsets to rimes, and detect alliteration. However, they were only beginning to blend phonemes and segment onsets from rimes and phonemes in words. Indeed, the children demonstrated skill development in phonological awareness and progressing to phonemic awareness, moving from syllables to phonemes.

These findings add to the literature base of what young children know about the structural aspects of oral language before they enter kindergarten. Phonological awareness tends to develop with age. Linguistic levels of complexity are important elements of development within the component skills of phonological awareness.
REFERENCES


knowledge among preschool-aged children. *Journal of Educational Psychology*, 95(3), 465-481.


APPENDICES
APPENDIX A

Permission Letter
SUBJECT INFORMATION AND CONSENT FORM

TITLE: The Development of Phonological Awareness Skills in Preschool Children: From Syllables to Phonemes

INVESTIGATOR and STUDY DIRECTOR:
Lucy Hart Paulson
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(406)251-8108

Rhea Ashmore, Ed. D.
Faculty Advisor
Curriculum and Instruction
32 Campus Dr.
Missoula, MT 59812
(406)243-5415

Special instructions to the parent or guardian of the potential subject: This consent form may contain words that are new to you. If you read any words that are not clear to you, please ask the person who gave you this form to explain them to you.

Purpose: We would like to ask permission for your child to help us learn more about how early literacy skills develop in young children. The purpose of this research project is to better help us identify what young children know about the skills that lead to learning to read when they enter school.

Procedures: Children in the study will participate individually with a trained and qualified researcher for a total of about 30 to 45 minutes in several game-like activities designed to identify their early literacy skill development in the phonological awareness areas of rhyming, alliteration, blending, and segmenting. The children will be asked to match and say words that rhyme and begin with the same sound (alliteration), identify words that have been stretched out (blending), and pull words apart (segmenting). The study will take place in your child’s daycare facility.

Risks/Discomforts: There are minimal risks or discomforts associated with completing the assessment measures. The researcher will establish a rapport and a level of familiarity and comfort with each child before starting the proposed study activities. When a child’s interest or attention diminishes, the session will be ended and the assessment will continue after a break or at a later time within a two-week period. The policies of the childcare or daycare facility will be followed.

Benefits: Your help with this study will help us identify an aspect of early literacy that is known to lead to later reading success. A potential benefit for you is the identification of your child’s phonological awareness skill development based on the results of this study in comparison with other children of similar age. Identification of these skills may in part help to predict how well your child will learn to read.
Confidentiality: Within the study itself, all children’s identities will remain confidential. A coded numbering system will be used so that no child or care provider names will be kept confidential. However, if you wish, a written summary and explanation of your child's results will be shared with you at your request.

Compensation for Injury: Although we do not foresee any risk in taking part in this study, the following liability statement is required in all University of Montana consent forms. In the event that you are injured as a result of this research you should individually seek appropriate medical treatment. If the injury is caused by the negligence of the University of any of its employees, you may be entitled to reimbursement or compensation pursuant to the Comprehensive State Insurance Plan established by the Department of Administration under the authority of M.C.A., Title 2, Chapter 9. In the event of a claim for such injury, further information may be obtained from the University’s Claims representative of University Legal Counsel. (Reviewed by University Legal Counsel, July 6, 1993)

Voluntary Participation/Withdrawal: Your child’s participation in this project is completely voluntary. He or she may withdraw at any time during the study and choose not to participate in any of the activities without loss of benefit to which you are normally entitled.

Your child may not be included in the study for any of the following reasons:
1. Failure to follow the study director/investigator's instructions;
2. The study director/investigator thinks it is in the best interest of your child’s health and welfare; or
3. The study is terminated.

Questions: You may wish to discuss this with others before you agree to take part in this study. If you have any questions about the research now or during the study, please feel free to contact Lucy Hart Paulson at (406) 251-8108 or my advisor Dr. Rhea Ashmore at (406) 243-5415. If you have any questions regarding your child’s rights as a research subject, you may contact the Sheila Hoffland, Chair of the Institutional Review Board, through the Research Office at The University of Montana at 243-6670.

Statement of Consent: I have read the above description of this research study. I have been informed of the risks and benefits involved, and all my questions have been answered to my satisfaction. Furthermore, I have been assured that any further questions I may have will also be answered by a member of the research team. I voluntarily agree to have my child take part in this study. I understand I will receive a copy of this consent form.

Printed (Typed) Name of Child: ________________________________________________

Child’s Birthdate: _____________________________________________________________

Signature of Parent or legally Authorized Representative: ____________________________

Date: ____________________________ Approval Expires On 6/23/05

Date Approved by UM IRB 7/13/04

[Signature] IRB Chair

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APPENDIX B

Timeline
TIMELINE

Fall 2003

1. Finalize Comprehensive Examination Committee
2. Prepare for and take comprehensive examinations

Spring 2004

1. Finalize Dissertation Committee
2. Prepare Dissertation Proposal
3. Meet with advisor
4. Make revisions
5. Schedule date for Dissertation Proposal Defense

June 2004

1. Meet with advisor, make revisions
2. Prepare and submit checklist 11 Point Summary of proposed study for IRB
3. Submit Dissertation Proposal to Committee for review

July 2004

1. Meet with Committee to defend dissertation proposal
2. Revise Dissertation Proposal as necessary
3. Obtain approval to conduct study from IRB
4. Gain approval from childcare facilities to conduct study
5. Obtain approval for screening
July/August 2004

1. Collect data
2. Begin data analysis

September/October 2004

1. Continue data analyses
2. Compose chapters of findings, conclusions, and recommendations
3. Submit first draft to advisor

November 2004

1. Meet with advisor for feedback
2. Revise final chapters as needed

December 2004

1. Meet with Committee for oral dissertation defense
2. Revise dissertation with requested changes
3. Submit dissertation to Dean of the Graduate School
DOCTORAL DISSERTATION TIME LINE

1. Gathering of Data
   From July 2004 To August 2004

2. Analysis of Data
   From August 2004 To October 2004

3. Writing of Dissertation
   From October 2004 To November 2004

4. Expected Date of Defense
   December 2004

5. Expected Completion Date
   December 2004

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