A Comparison Of Three Phonological Awareness Tools Used To Identify Phonemic Awareness Deficits In Kindergarten-age Children.

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A COMPARISON OF THREE PHONOLOGICAL AWARENESS TOOLS USED FOR IDENTIFYING PHONEMIC AWARENESS DEFICITS IN KINDERGARTEN-AGE CHILDREN

by

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ABSTRACT

The purpose of this study was to determine if three different tests of phonological awareness: the Comprehensive Test of Phonological Processes (CTOPP) (Wagner, Torgesen, & Rashotte, 1999), The Phonological Awareness Test (PAT) (Robertson & Salter, 1997), and the Pre-Literacy Skills Screening (PLSS) (Crumrine & Lonegan, 1999) measure the same phonological awareness skills (content) in the same manner (procedures) and, whether typically-developing kindergarten-age students perform similarly on each of the tests. Twenty-five kindergarten students consisting of 14 males and 11 females (mean CA of 72.24 months) participated in this study. All participants were attending the second half of kindergarten in a public school in Orlando, Florida. Prior to the administration of the three tools, all participants were administered the Fluharty Preschool Speech and Language Screening Test - Second Edition (Fluharty-2) (Fluharty, 2001) to ensure that no formal speech and/or language assessment was needed. A comparison of the CTOPP, PAT, and PLSS revealed that the PAT and CTOPP produced similar outcomes. That is, participants who performed well on one tool also did well on the other. Results of this study have shown that tasks on these two tools are comparable measures of phonological awareness known to strongly predict future reading ability. However, when the PLSS was compared to either the CTOPP or PAT, similar outcomes were not obtained. Three participants were identified "at risk" for reading disability on the PLSS. No participants were identified "at risk" on either the CTOPP or PAT. Using a standardized battery to identify children "at-risk" for reading failure and planning intervention may be more advantageous than using a screening measure like the PLSS. Even though it will take more time to complete, a comprehensive assessment

battery may be of more value to the clinician. A summary, possible limitations of study, and suggestions for future research are discussed.

Dedicated to my parents

Eunice and Edgar Robelo Sr.

for being my greatest inspiration.

Thank you for being who you are.

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CHAPTER 1
INTRODUCTION

Literacy development starts early in the preschool years when the majority of children learn some knowledge about the nature and purposes of reading (Snow, Scarborough, & Burns, 1999). Reading is not only a child's most important academic challenge but also a necessary skill for success in life. Unfortunately, for about 20% to 30% of children, reading can be a stressful process (Crumrine & Lonegan, 1999).

Investigators interested in the cognitive determinants of early reading acquisition have increasingly focused on phonological awareness as an important component in learning to read. Correlations between phonological awareness and initial reading are strong, much replicated, and have been clearly affirmed (Stahl & Murray, 1994; van Kleeck, Gillam, & McFadden, 1998). It has been suggested that a child's level of phonological awareness may be the single most powerful determinant of success in learning to read. In fact, investigators have found that kindergartners proficient at letter/sound correspondence attentiveness are more likely to be better readers than their peers who may be experiencing difficulty in phonological awareness (Adams, 1990; Bryant, MacLean, & Bradley, 1990; Mann, 1993; van Kleeck, et al., 1998). Children who demonstrate difficulty with letter/sound correspondence have a labored approach to decoding unknown words, misidentify known words, demonstrate choppy reading characterized by many errors and guessing, and experience poor comprehension of what is being read (Crumrine & Lonegan, 1999).

Because of the correlation that exists between reading and phonological awareness and the need to identify children at risk for reading failure, numerous tasks have been developed to assess a child's knowledge of phonological awareness. Such

tasks include word, syllable, rhyme, and phoneme tasks (e.g. word-to-word matching; recognition of rhyme; phonemic segmentation) (See Lewkowicz, 1980, for full review).

Based on the multitude of tasks that have been described in the literature over the past 30 years, an array of commercial tests that purport to assess phonological awareness skills have been developed. Although the stated purpose of the tests may be to assess phonological awareness, each may differ in the manner in which phonological awareness skills are measured. Thus, the tests may differentially identify children as having adequate phonological awareness skills.

Statement of the Problem

The purpose of this study was to determine if three commercially available tests of phonological awareness, the Comprehensive Test of Phonological Processes (CTOPP) (Wagner, Torgesen, & Rashotte, 1999), The Phonological Awareness Test (PAT) (Robertson & Salter, 1997), and the Pre-Literacy Skills Screening (PLSS) (Crumrine & Lonegan, 1999): 1) measure the same phonological awareness skills (content) in the same manner (procedures) and, 2) whether typically-developing kindergarten-age students perform similarly on each of the tests.

Delimitations

The following were delimitations of the study:

1. This study was limited to 25 participants, 14 males and 11 females, ages 5.5 to 6.5 years.

2. All participants were attending the second half of kindergarten at Waterford Elementary School located in Orlando, Florida. Inclusion in the study was based on the following criteria:

    a. Participants had been born and resided in the United States up until the time of testing.

    b. English was the primary language spoken both at home and at school.

    c. Participants were typically developing first-time kindergartners, as per parent report.

    d. Participants had no evidence of a neurological, visual or physical impairment, as per parent report.

    e. Participants had no prior history of speech and/or language therapy (please refer to Communication Questionnaire, Appendix D).

    f. Participants achieved passing scores on the Fluharty Preschool Speech and Language Screening Test - Second Edition (Fluharty2) (Fluharty, 2001).

3. The phonological awareness battery was confined to the following three tests: (a) Comprehensive Test of Phonological Processes (CTOPP) (Wagner, Torgesen, & Rashotte, 1999); (b) The Phonological Awareness Test (PAT) (Robertson & Salter, 1997); and (c) Pre-Literacy Skills Screening (PLSS) (Crumrine & Lonegan, 1999).

4. Participants were assessed on an individual basis and testing took place in a quiet area over a period of three 10 to 45-minute sessions, depending on which test was administered.

Limitations

The following were limitations of the study:

1. To the extent that the subjects selected are not representative of the language-normal population at large, caution should be used in generalizing results beyond the sample investigated.
2. Individual subtests of the PLSS were not converted to Standard Scores. Individual results are presented using Raw Scores.
3. For the purposes of comparison, participants' total/composite scores on the PLSS were converted to Standard Scores using the Statistical Package for the Social Sciences (SPSS) (2003) software.

Assumptions

The following assumptions were made in the study:

1. That the exposure to intervening variables in the school environment, such as pre-reading instruction, exposure to letters of the alphabet, phonics, was equivalent for all participants.

2. That the experienced test examiners who aided in the research through administration of the various phonological awareness tests to participants followed the standardization procedures described in test manuals.

3. That the researcher having completed coursework and clinical practica in Speech-Language Pathology and working as a Speech-Language Pathologist in the public

schools, was qualified to administer, score, and interpret all testing procedures used in this study.

4. That tasks utilized to assess phonological awareness, in fact, measured these abilities.

Hypotheses

The following hypotheses were developed and tested at the .05 level of significance. They are stated in the null form:

1a. There is no significant difference between overall performance on the CTOPP and the PAT.

1b. There is no significant difference between overall performance on the CTOPP and the PLSS.

1c. There is no significant difference between overall performance on the PAT and the PLSS.

2a. There is no significant difference between males/females in overall performance on the CTOPP and the PAT.

2b. There is no significant difference between males/females in overall performance on the CTOPP and the PLSS.

2c. There is no significant difference between males/females in overall performance on the PAT and the PLSS.

CHAPTER 2
REVIEW OF LITERATURE

Over the past 20 years, there has been increased interest in viewing reading as a language-based process (Bradley & Bryant, 1983; Wagner & Torgesen, 1987). Particular interest has been focused on the phonological aspect of learning to read. Numerous studies have focused on the child's ability to demonstrate awareness of the phonological segments that make up words, and how the awareness of the sound structure of words relates to reading success (Calfee & Lindamood, 1973; Bryant, MacLean, Bradley, & Crossland, 1990; Byrne & Fielding-Barnsley, 1993; Liberman, Shankweiler, Fischer, & Carter, 1974; Lenel & Cantor, 1979; Mann, 1993; Torgesen & Mathes, 2002; van Kleeck, Gillam, & McFadden, 1998). As a result of this research, there has been a growth in the publication of tests to measure phonological awareness to identify children who may be at risk for reading failure. Thus, it seems important to determine whether all phonological awareness tests measure the same skills with the same accuracy. This study compares three different tests of phonological awareness (two comprehensive batteries and one screening test) to determine if they measure the same phonological awareness skills (content) in the same manner (procedures) and whether typically-developing kindergarten-age students perform similarly on each of the tests.

The following review of the literature is organized into three major sections. The first section focuses on phonological awareness: its definition, its developmental progression (i.e., awareness of syllables, awareness of onset and rimes, awareness of phonemes), and the role of phonological awareness and learning to read. The second section, types of phonological awareness tasks, includes a discussion of numerous types of tasks used to assess phonological awareness skills. The chapter concludes with a

review of the three standardized measurements used in this investigation: The Comprehensive Test of Phonological Processes (CTOPP) (Wagner, Torgesen, & Rashotte, 1999), The Phonological Awareness Test (PAT) (Robertson & Salter, 1995), and the Pre-Literacy Skills Screening (PLSS) (Crumrine & Lonegan, 1999), and a discussion of the purpose of this study.

Role of Phonological Awareness and Learning to Read

Phonological processing refers to the mental operations that an individual uses to make use of the phonological or sound structure of oral language when learning how to decode written language (Wagner & Rashotte, 1987). The most frequently studied kinds of phonological processing skills and knowledge are phonological awareness, phonological memory, and rate of access of phonological information. Of the three, phonological awareness is the aspect of phonological processing that has been studied most extensively (Torgesen, Morgan & Davis, 1992; Torgesen, Wagner, & Rashotte, 1994).

Phonological awareness involves the specific awareness of the speech-sound structure of language. It has been defined as the ability to recognize that a spoken word is comprised of smaller components such as syllables and phonemes and that these units can be manipulated within words to form new words (Lombardino, Bedford, Fortier, Carter, & Brandi, 1997; Torgesen & Mathes, 2000; Stackhouse and Wells, 1997). This awareness of the speech-sound structure of language can be viewed as a hierarchical developmental progression where the child first becomes aware that the speech stream can be broken down into individual words (i.e., word awareness) and then refined to an

awareness of the syllable structure of words. Syllable awareness simply refers to the ability to separate words into syllables. Due to its greater perceptual salience, the syllable is an easily recognizable unit of speech, therefore, making it a very elementary skill for many young children. Onset-rime awareness follows syllable awareness, and refers to the division of each syllable of a word or monosyllabic word into intrasyllabic units (i.e., onset and rime). This hierarchical developmental progression culminates in an explicit awareness of the individual speech-sound units in words known as phonemic awareness; the smallest and most difficult unit to detect and manipulate (Bruck & Genesee, 1995; Cisero & Royer, 1995; Fox & Routh, 1975; Liberman et al., 1974).

In the early- and mid-1970s several studies were conducted investigating syllable awareness in young children. Liberman et al. (1974) tested 135 preschoolers, kindergartners, and first graders' ability to segment words into syllables by means of tapping out the number of syllables in spoken words presented. Investigators found that the number of children who were able to reach criterion was markedly greater in a syllable segmentation group than in a phoneme segmentation group. That is nearly 50% of both the preschoolers and kindergartners, and 90% of the first graders, were able to segment by syllables. However, for the phoneme segmentation group, none of the preschoolers, 17% of the kindergartners and 70% of first graders were able to segment by phonemes. Similar results were found in a study conducted by Fox and Routh (1975) regarding segmentation of words into syllables. In this study, 3-year-olds were able to correctly segment words into syllables in 3.42 of the eight words, where as 4.4-year-olds were able to segment into syllables in 4.63 of the eight words. Since these early studies, numerous other studies have found similar results which suggest that many young

children have a rudimentary awareness of the sound system of language before formal reading instruction begins (Blachman, 1994; van Kleeck et al., 1998; Wagner & Torgesen, 1987).

Additional studies of phonological awareness have investigated the age at which onset and rime awareness skills develop and the relationship between these skills and reading. To understand the concept of onset and rime, children must be able to detect what it is that words share in common and how they are distinct. An onset consists of any consonant that may precede a vowel, and a rime is the obligatory part of the syllable that consists of a vowel and the consonant(s) that follows it (Durgunoglu, Nagy, & Hancin-Bhatt, 1993). In the word rag, for example, /r/ is the onset and /ag/ the corresponding rime.

Lenel and Cantor (1981) investigated the development of rhyme knowledge, the factors that affect children's ability to recognize rhymes, and the age at which recognition of rhyming develops. One hundred and forty-four children participated in this experiment that consisted of 48 preschoolers (mean CA of 57.4 months), 48 kindergartners (mean CA of 69.5 months), and 48 first-graders (mean CA of 80.6 months). Rhyming tasks were administered to determine developmental changes in performance over the three age ranges. Results showed that the effects of manner of presentation, rhyming word list, and presentation order were all non-significant. Additionally, follow-up testing regarding age differentiation revealed that, although first graders performance was significantly better than that of preschoolers, F (1, 96) = 7.71, p = 0.007, the difference between preschoolers and kindergartners was only marginally significant, F (1,96) = 3.46, p = 0.066. There was no significant difference between

kindergartners and first graders. According to the investigators, findings of the study provide clear evidence that the ability to recognize rhymes has typically begun in children as young as 4 years of age; and, that awareness of rime improved with age.

Bradley and Bryant (1983) investigated 403 four and five year old children's sound categorization abilities (i.e., rhyme and alliteration) before formal reading instruction began. After a three-year period, investigators found high correlations between the initial sound categorization scores and the children's literacy development. Results of their study provide strong causal support for the hypothesis that the awareness of rhyme and alliteration, which children attain before going to school and perhaps as a result of their experiences at home, has a strong influence on their consequent accomplishment in learning to read and to spell.

In a longitudinal study, Stanovich, Cunningham, and Cramer (1984) administered ten phonological awareness tasks (i.e., rhyme identification and rhyme production tasks) to 49 kindergartners with a mean age of 6.1 years. Investigators found that individual children's performance on the rhyming tasks correlated significantly with reading ability, measured one year later using a standardized reading tool (i.e., Reading Survey Test-Form JS, Primary Level 1- of the Metropolitan Achievement Test). Similar findings were seen in a later longitudinal study conducted by Ellis and Large (1987) in which a battery of 44 cognitive tasks, which included memory, language, vocabulary, and visual skills, was administered to 40 preschoolers ranging in ages from 4 to 5 years. The reading ability of these preschoolers was assessed and compared to their performance on the 44 cognitive tasks over a subsequent three-year period. Stanovich et al. (1984) found that of the 44 tasks administered, rhyme oddity and rhyme generation tasks were the best and

second best measures, respectively, for discriminating good and poor readers. However, other studies point to phonemic awareness as a better predictor of future reading ability due to the fact that phonemic awareness requires an explicit awareness of the individual sounds in words (Adams, 1990; Cisero & Royer, 1995; Jimenez Gonzalez, J.E., & Haro Garcia, C.R., 1995; Share et al., 1984; Stanovich et al., 1984; Tunmer & Nesdale, 1985).

Torgesen (1999) described phonemic awareness as having both conceptual and skill components and stated that phonemic awareness "involves a more or less explicit understanding that words are composed of segments of sound smaller than a syllable, as well as knowledge, or awareness, of the distinctive features of individual phonemes themselves" (p. 129). Phonemic awareness has been viewed as a hallmark of good readers while its absence or insufficiency as one of the more undeviating characteristics of poor readers (Mann, 1993). Support comes from studies that show that children who have good phonemic awareness in kindergarten become better readers later on.

At the 1-Year follow-up of a longitudinal study evaluating a 12-week phonemic awareness program, Byrne and Fielding-Barnsley (1993) administered four tests of phonological awareness concepts (phoneme identity, phoneme elision, alphabet knowledge, and word identification) to 119 children. The participants were divided into two groups: an experimental group (63 participants; mean age: 72.4 months) and a control group (56 participants; mean age: 72.0 months). Investigators found that not only did the experimental group perform better than the control group, but also that phonemic awareness and alphabet knowledge work in conjunction to support early stages of reading and spelling acquisition (Byrne & Fielding-Barnsley, 1993).

Ball and Blachman (1991) carried out a project designed to evaluate the effects of training in phonemic segmentation and of instruction in letter names and letter sounds on kindergarten children's reading and spelling skills. Eighty-nine children (mean age 5.71 years) participated in this experiment which consisted of three groups: a phoneme awareness group, a language activities group, and a controlled group. Children in the phoneme awareness group met in groups of five, four times a week for 20 minutes, over a period of 7 weeks. This group participated in phoneme awareness type training activities. The language activity group also met in groups of five, four times a week for 20 minutes, over a period of 7 weeks. This group, however, focused on a variety of language activities, such as vocabulary development, story listening, and semantic categorization. Children assigned to the controlled group received no intervention at all. Investigators found that kindergartners not only can be taught to segment words into syllables, but also that the group receiving training in phonemic awareness significantly outperformed both the language activities group and the controlled group.

In summary, studies have demonstrated that many young children acquire some aspects of phonological awareness such as awareness of syllables, onset and rhyme, and phonemes before formal reading instruction begins. But whether phonological awareness is gained prior to, or subsequent to learning to read, a relationship has been shown to exist between reading attainment and the awareness of the sound structure of spoken words (Adams, 1990; Bradley & Bryant, 1983; Bryant, MacLean, Bradley, & Crossland, 1990; Lundberg, Frost, & Petersen, 1988; Tunmer & Nesdale, 1985; Wagner & Torgesen, 1987).

Types of Phonological Awareness Tasks

Numerous types of tasks have been used to measure phonological awareness in young children. Lewkowicz (1980) categorized various phonological awareness tasks according to their probable usefulness in the early stages of reading readiness training. The different phonological awareness tasks discussed in her article included sound-to-word-matching, word-to-word-matching, recognition of rhyme, phoneme isolation, phonemic segmentation, counting phonemes, phoneme blending, phoneme deletion, specification of which phoneme has been deleted, and phoneme substitution (see Lewkowicz (1980) for full review). However, use of such a wide variety of phonological awareness tasks has made interpretation, consolidation, and comparison of research findings difficult (Ball, 1993; Stanovich et al., 1984; Yopp, 1988). Without careful task analysis and comparison, it remains unclear to what magnitude the predictive power of these tasks has for phonological ability or other extraneous cognitive processes (Stanovich et al., 1984).

Seeking to determine the reliability and validity of tasks that have been used to operationalize the concept of phonological awareness, Yopp (1988) carried out a comparison study consisting of the administration of 10 phonological awareness tests with 96 kindergarten children. The tasks used in the study included sound-to-word matching, word-to-word matching, recognition and production of rhyme, isolation of a sound, phoneme segmentation, phoneme counting, phoneme deletion, specifying deleted phoneme, phoneme reversal, and invented spelling. Results of the study revealed that the majority of the tasks of phonological awareness used in the study (i.e., phoneme blending (Roswell-Chall, 1959); phoneme counting, (Liberman, et al., 1974); recognition of rhyme

(Yopp); and word-to-word matching (Yopp modification)) were significantly and positively correlated to each other suggesting that they indeed are measuring the same construct.

Although phonological awareness tasks may be assessing the same construct, there are other variables that may impact performance; therefore, it is important to note that two tests can, in title, assess the same global skill area, yet generate considerably different scores. Differences in test scores between similar tests may be an effect of variables such as examinee's motivation or health, examiner differences such as levels of competence, examinee-examiner differences like rapport or racial differences, or environmental variables such as change in physical comfort or other environmental distracters. Differences in test scores may also be attributed to psychometric factors such as item gradients, differences in norm table layout, reliability differences, skill differences assessed across tests, content differences across tests, and representativeness of the norming sample (Bracken, 1988).

Phonological Awareness Tests

There are numerous, published diagnostic instruments that speech-language pathologists may choose from to assess an individual's phonological awareness skills. These instruments range from screeners to complete test batteries. Although the instruments purport to measure the same construct, they may do so using different types of tasks. Consequently, speech-language pathologists are confronted with a difficult decision as to which instrument to select. As mentioned previously, three tests were selected for review as each is published commercially and readily available for use. Two

are frequently used tests, the Comprehensive Test of Phonological Processes (CTOPP) (Wagner, Torgesen, & Rashotte, 1999) and The Phonological Awareness Test (PAT) (Robertson & Salter, 1997). One is a screening test, the Pre-Literacy Skills Screening (PLSS) (Crumrine & Lonegan, 1999).

The Comprehensive Test of Phonological Processes (CTOPP) (Wagner, Torgesen, & Rashotte, 1999) was designed to aid in identifying individuals ranging in age from 5 years to 24 years, 11 months who may benefit from instructional activities to enhance their phonological proficiency. The normative sample for the CTOPP consisted of 1,656 participants from states representing each of the four major U.S. regions, including Alabama, California, Connecticut, Florida, Iowa, New Hampshire, North Carolina, Tennessee, Texas, and Wisconsin. The reliability of the CTOPP centers on estimating the amount of error associated with its scores and was calculated using content sampling (degree of homogeneity among items), time sampling (test-retest method), and interscorer differences (examiner variability in scoring) (Wagner, Torgesen, & Rashotte, 1999). According to the authors, "…the CTOPP evidences a high degree of reliability. This reliability is consistently high across all three types of reliability" (p. 73). Regarding the CTOPP's validity, which was calculated using content validity, criterion-related validity, and construct validity measures, Wagner, Torgesen, and Rashotte (1999) stated that it is a valid phonological processes measure that can be used with confidence (see manual for further review).

The second instrument, The Phonological Awareness Test (PAT) (Robertson & Salter, 1997) is also a comprehensive test. It includes an array of phonological awareness tasks. The normative sample for the PAT consisted of 620 males and 615 females, who

were randomly selected from 175 elementary schools in California, Connecticut, Florida, Texas, and Wisconsin. The reliability of the PAT was established by using test-retest reliability and internal consistency methods (i.e., Kuder-Richardson Formula 20, or KR20 reliability coefficients). According to the authors, the test comprises highly satisfactory levels of reliability for all subtests. With regard to its validity, Robertson and Salter (1995) stated that the PAT "…was developed following extensive review of available tests and the literature which indicated the particular items and skills selected were those reflective of necessary phonological awareness skills of elementary age students" (p. 52) (see manual for further review).

The third instrument, the Pre-Literacy Skills Screening (PLSS) (Crumrine & Lonegan, 1999) is a quick screener that can be used to identify kindergartners who may be at risk for literacy failure. The normative sample consisted of 67 males and 74 females, which were drawn from various classrooms in a small school district in Maine. Data is not provided in the manual for reliability or validity measures.

Summary

Literature has shown that phonological awareness develops in a hierarchical manner and that it is strongly correlated to future reading ability. This correlation between phonological awareness and reading is strong and indicates that children with deficits in phonological awareness are at-risk of reading failure. With the advent of numerous commercially available phonological awareness tests, the speech-language pathologist is confronted with the sometimes daunting task of selecting the most appropriate test for identifying children with potential reading difficulties.

The purpose of this study was to determine if three different tests of phonological awareness 1) measure the same phonological awareness skills (content) in the same manner (procedures) and, 2) whether typically-developing kindergarten-age students perform similarly on each of the tests.

CHAPTER 3
METHODOLOGY

The purpose of this study was to determine if three different tests of phonological awareness: the Comprehensive Test of Phonological Processes (CTOPP) (Wagner, Torgesen, & Rashotte, 1999), The Phonological Awareness Test (PAT) (Robertson & Salter, 1997), and the Pre-Literacy Skills Screening (PLSS) (Crumrine & Lonegan, 1999) 1) measure the same phonological awareness skills (content) in the same manner (procedures) and, 2) whether typically-developing kindergarten-age students perform similarly on each of the tests.

Twenty-five kindergarten students consisting of 14 males (56%) and 11 females (44%) ranging in age from 5 years, 6 months to 6 years, 6 months (overall mean age of 72.24 months) participated in this study. All participants were attending the second half of kindergarten at Waterford Elementary School located in Orlando, Florida. Criteria for initial participant selection were as follows: a) Participants had been born and resided in the United States up until the time of testing; b) English was the primary language spoken both at home and at school; c) participants were typically developing first-time kindergartners, as per parent report; d) participants had no evidence of a neurological, visual or physical impairment, per parent report; and, e) participants had no prior history of speech and/or language therapy (please refer to Communication Questionnaire, Appendix D).

Communication Questionnaires (Appendix D) and Parental Consent Forms (Appendix A) were distributed by seven teachers to 105 students in their classrooms. Approximately one week was given for signed consent forms to be returned to the classroom teachers. Of the seven classroom teachers, only six teachers returned signed

parental consent forms to the principal investigator (PI). A pool of 44 possible participants that fit the above-mentioned criteria was formed. The 44 potential participants were then administered the Fluharty Preschool Speech and Language Screening Test - Second Edition (Fluharty-2) (Fluharty, 2001) to ensure that no formal speech and/or language assessment was needed. The Fluharty-2 is appropriate for children between the ages of 3.0 to 6.11 and is composed of five subtests: Articulation, Repeating Sentences, Responding to Directives and Answering Questions, Describing Actions, and Sequencing Events. The Fluharty-2, which is normed on 705 children from 21 states, provides a quick identification of those children for whom a complete speech and language evaluation might be recommended. Twenty-five students of the potential 44 participants who satisfactorily met the above-mentioned criteria, returned the completed Communication Questionnaire (Appendix D) and Parental Consent Form (Appendix A), and passed the screening, were included in the study. The remaining 24 participants did not pass the screening criteria on the Fluharty-2 and therefore were not include in the study.

The principal investigator (PI) and two assistants: a trained graduate student from the University of Central Florida's Communication Disorders program, and, an experienced teacher and test administrator assisted in administering the standardized assessments (CTOPP, PAT, and PLSS). The principal investigator and the other two assistants held training sessions prior to the administration of the tests to ensure that tests were being administered and scored consistently and according to test manual specifications. The training sessions consisted of a thorough review of individual test administration procedures and practice administration of the tests (principal investigator

administering to assistants and vice-versa) under the supervision of an American Speech-Language-Hearing Association (ASHA) certified speech-language pathologist familiar with the tests and test administration procedures. After training, the principal investigator and assistants each administered each test to three children, not included in the study, to establish administration and scoring reliability. The 25 study participants were assessed on an individual basis. Testing took place in a quiet area over a period of three 10 to 45-minute sessions, depending on which test was administered. A counter-balanced random order of administration across subjects was utilized (see Table 1).

Table 1. Order of testing for three phonological awareness tools.

Tests	1*	2*	3*
CTOPP	4 (16%)	9 (36%)	12 (48%)
PAT	13 (52%)	10 (40%)	2 (8%)
PLSS	8 (32%)	6 (24%)	11 (44%)

*Number of participants receiving each phonological awareness test as their 1st, 2nd, or 3rd test.

At no point did any of the participants express feelings of discomfort or fatigue during any test administration, and no participant was absent on any of his or her scheduled test dates. Prior to the beginning of each testing session participants were told that they would be playing word games and that they would not be graded on their performance. The word "test" was not used with the participants.

Confidentiality of participants was not compromised. An alphanumerical numbering system was used to ensure confidentiality of the participants and their scores. The alphanumeric number was determined as follows: First, a number between 1 and 6 was assigned to identify each participating teacher. Then, the first three letters of a participant's last name were used. Finally, the teacher's number was combined with the

participant's first three letters of his/her last name to arrive at this alphanumeric number. Participant data were described using such number. Although the principal investigator, test administrators, and faculty supervisor of the study knew each participant's name, the identities of the participants were kept confidential to the extent provided by law.

The following is a description of the phonological awareness tests used in this study:

The Comprehensive Test of Phonological Processes (CTOPP)

The Comprehensive Test of Phonological Processes (CTOPP) (Wagner, Torgesen, & Rashotte, 1999): This test was designed to aid in the identification of individuals from kindergarten through college who may profit from instructional activities to enhance their phonological skills. The (CTOPP) is comprised of thirteen subtests that are appropriate for participants ranging in age from 5 years to 24 years, 11 months. Only Elision, Rapid Color Naming, Blending Words, Sound Matching, Rapid Object Naming, Memory for Digits, and Nonword Repetition were selected to be administered for this study since these subtests are appropriate for individuals between the ages of 5 and 6. This test took approximately 45 minutes to administer.

Table 2. General characteristics of the CTOPP.

General Characteristics	CTOPP
Standardization Sample	1656
Females	833
Males	823
Residence	AL; AZ; CA; CO; CT; FL; GA; IL; IA; KS; KY; LA; ME; MD; MA; MI; MO; NH; NY; NC; OH; OK; OR; PA; TN; TX; UT; VT; WA; WI
Test-Retest Reliability	.74 - .97
Content Sampling	.77 - .90
Time Sampling	.70 - .92
Interscorer	.95 - .99

a. Elision

The Elision section of the CTOPP contains 20 items that measure the extent to which an individual can say a word, and then say what is left of a word after dropping out designated syllables or sounds. For example, "say cupcake. Now say cupcake without saying *cake.*" "Say *cup.*" "Now say *cup* without saying /k/." The correct response is "up" (See test protocol).

b. Rapid Color Naming

The Rapid Color Naming section of the CTOPP is comprised of Form A and Form B, both containing color boxes that measure the test-taker's capability to say the names of colors presented on each page, as quickly and precisely as possible (See test protocol).

c. Blending Words

This section of the CTOPP includes 20 items that measure an individual's ability to combine sounds or syllables to form words. For example, "What word do these sounds make: *can-dy*?" (See test protocol).

d. Sound Matching

Sound Matching consists of 20 items that measure the extent to which an individual can match sounds. For example, "Which of these words ends with the /n/ sound like *can*? *Pot* or *sun*?" (See test protocol).

e. Rapid Object Naming

The Rapid Object Naming section is similar to the Rapid Color Naming section of the test. It is comprised of Form A and Form B, both containing different objects that measure the test-taker's ability to say the names of objects presented on each page, as quickly and accurately as possible (See test protocol).

f. Memory for Digits

The Memory for Digits section of the CTOPP contains 21 items that measure the extent to which an individual can repeat a series of numbers, ranging in length from two to eight digits. After the participant has listened to a series of audiocassette-recorded numbers, presented at a rate of two per second, he or she is asked to repeat the numbers collectively in the same order in which they were heard (See test protocol).

g. Nonword Repetition

This section of the CTOPP includes 18 items that measure an individual's ability to repeat nonwords that range in length from three to fifteen sounds. The participant is told to listen to an audiocassette-recorded made-up word and repeat it exactly as he or she heard it. For example, the participant hears the tape-recorded nonword "nigong," and repeats "nigong" (See test protocol).

The Phonological Awareness Test (PAT)

The Phonological Awareness Test (PAT) (Robertson & Salter, 1997): The PAT is an individually administered test designed to diagnose deficits in phonological processing and phoneme-grapheme correspondence. According to the authors, the test is comprehensive in that it includes a wide variety of tasks to measure a range of phonological skills. The PAT is composed of eight subtests: Rhyming, Segmentation, Isolation, Deletion, Substitution, Blending, Graphemes, and Decoding. These subtests are appropriate for participants ranging in age from 5 to 9 years. All subtests (with the exception of the Decoding subtest, which is not recommended for 5 year olds) were administered for a total of approximately 30 minutes.

Table 3. General characteristics of the PAT.

General Characteristics	PAT
Standardization Sample	1235
Females	615
Males	620
Residence	CA; CT; FL; TX; WI
Test-Retest Reliability	.95 - .98

a. Rhyming

The Rhyming Subtest consists of two tasks: Discrimination and Production. Discrimination measures the participant's ability to identify rhyming words presented in pairs. For example: "I am going to say two words and ask you if they rhyme. Listen carefully. Do these words rhyme? *fan*/*man.*" Production measures the ability to provide a rhyming word when given a stimulus word. For example: "Tell me a word that rhymes with *bat*" (See test protocol).

b. Segmentation

There are three segmentation tasks on the PAT: Sentences, Syllables, and Phonemes. The Sentences tasks assess the participant's ability to divide sentences into their constituent words. For example: "I am going to say a sentence, and I want you to clap one time for each word I say. *My house is big.*" Secondly, the Syllable segmentation tasks assess the participant's ability to divide words into syllables. For example: "I am going to say a word, and I want you to clap one time for each word part or syllable I say. *Saturday*." Finally, the Phoneme segmentation tasks assess the participant's ability to segment words by phoneme. For example: "I am going to say a

word and then I'll say each sound in the word. Listen carefully, ready? *Cat.*" Examiner then gives no other prompts and proceeds to test items (See test protocol).

c. Isolation

The isolation tasks measure the ability to identify one phoneme by position in a word. These tasks include isolating initial, final, and medial phonemes. For Example: "I am going to say a word, and I want you to tell me the beginning or first sound in the word. What's the beginning sound in the word *cat*"? A similar procedure is used for medial and final isolation tasks (See test protocol).

d. Deletion

The two deletion tasks assess the participant's ability to manipulate root words, syllables, and phonemes in words. The participant is asked to say a word, and then say it again deleting one root word (in compound words), syllable, or phoneme. For example: Say *Snowman*. Now say it again but don't say *man*. A similar procedure is used for the phoneme deletion task (See test protocol).

e. Substitution

Substitution is a composite activity that requires the participant to employ segmentation and isolation skills. It assesses the participant's ability to isolate a phoneme in a word, and then change it to another phoneme forming a new word. The tasks that have been included on the PAT are Substitution with manipulatives and Substitution without manipulatives. However, only the substitution with manipulatives was

administered since substitution without manipulatives is not appropriate for 5 year-olds and 11 of the participants were between the ages of 5 years 7 months and 5 years 11 months (See test protocol for full review of procedures).

f. Blending

This subtest of the PAT assesses the participant's ability to blend units of sound together to form words. Blending of syllables and phonemes are included. For example: "I'll say the parts of a word. What word is this: "*ta-ble?*" A similar procedure is used for the phoneme blending task (See test protocol).

g. Graphemes

The Graphemes subtest assesses the participant's knowledge of sound/symbol correspondence. For example: "I am going to show you some letters. I want you to tell me what sound each letter makes. Examiner uses stimulus phrase "Tell me what sound this makes" (See test protocol).

The Pre-Literacy Skills Screening (PLSS)

The Pre-Literacy Skills Screening (PLSS) (Crumrine & Lonegan, 1999) was the third tool utilized to assess all participants in this study. The PLSS is a quick screening tool that can be used to identify kindergartners who may be at risk for literacy failure. The normative sample consisted of 67 males and 74 females drawn from various classrooms in a small school district in Maine. Data is not provided in the manual for reliability or validity measures. The PLSS consists of nine subtests: rhyming, naming,

sentence segmentation, syllable segmentation, multisyllabic word repetition, sentence repetition, blending, letter naming, and deletion. All nine subtests were administered for a total testing time of approximately 10 minutes.

Table 4. General characteristics of the PLSS.

General Characteristics	PLSS
Standardization Sample	141
Females	74
Males	67
Residence	ME

a. Rhyming

The Rhyming section of the PLSS contains two sections (Section 1A, Recognizing Rhyme and Section 1B, Producing Rhyme) that measure an individual's ability to hear and match, as well as produce, similar word patterns (See test protocol).

b. Sentence Repetition

This section consists of the participant repeating three sentences, one at a time. The participant must repeat sentences exactly as stated by examiner (i.e., "My dad went to the store") in order to receive the maximum score of 2 points per sentence, for a total of 6 points for this subtest (See test protocol).

c. Naming

The Naming subtest of the PLSS, which consists of two sections, requires a participant to quickly retrieve what he or she sees. Directions are given in the following manner: "Look at this page. It has colored circles. Listen to me as I name the colors in

the top row." (Examiner names the colors in the first row). "Now you name these" (Examiner points to the second row). Similar directions are given for the two subsequent tasks (naming of shapes, and naming of colors and shapes); (See test protocol).

d. Blending

The Blending section of the PLSS requires the participant to process and recall a sequence of individual sounds or syllables in the correct order and blend them into a word. For example examiner says "*pen-cil.*" The correct response would be "*pencil*" (See test protocol).

e. Sentence Segmentation

In this section of the PLSS, the participant is asked to listen to a short sentence and state how many words are in that sentence. For example, the examiner may say, "*Birds fly*. This sentence has two words: *Birds fly*". The participant sequentially holds up two fingers or verbally states "two words" while segmenting the sentence (See test protocol).

f. Letter Naming

The participant is required to name eight capital letters: B, D, O, A, T, F, P, M). Directions are as follows: "I am going to show you some letters. Name the ones that you know" (See test protocol).

g. Syllable Segmentation

In the Syllable Segmentation section of the PLSS the participant is asked to listen to some words. After the examiner has said the word, the participant is asked to clap one time for each part of the word he/she heard. For example, "I am going to say some words. I want you to clap one time for each part of the word" (See test protocol).

h. Deletion

In this section of the PLSS, the participant is required to omit/delete an initial or final sound of a word and to retain the sequence of sounds that remain. For example: "I am going to say a word. Listen carefully and then do what I ask you to do". "Say *raincoat*" (wait for response). "Now say *raincoat* again, but don't say *coat*" (See test protocol).

i. Multisyllabic Word Repetition

In the Multisyllabic Word Repetition section, the participant is asked to repeat a three-syllable word five times in succession. Directions for this subtest are as follows: "I am going to say a word and I want you to say the word over and over again until I tell you to stop" (See test protocol).

A wide variety of phonological awareness tasks were included in all three assessment tools. However, differences exist in terms of the level of awareness each one taps. The CTOPP for example, offers tasks ranging from manipulation of syllables to phonemes (blending and deletion). These tasks, especially at the phonemic level, are higher-level tasks that require a more explicit level of awareness. The CTOPP also offers retrieval and memory tasks that are part of one's phonological processing skills. The CTOPP does not offer rhyming or segmentation tasks. On the other hand, the PAT offers tasks which tap into an easier, amore advanced, and the most difficult levels of awareness. Some tasks included in the PAT are: rhyming tasks, deletion, blending, and segmenting tasks. The PAT does not offer sound matching, retrieval, or memory tasks. Finally, the PLSS offers a more limited array of tasks that tap into an earlier phonological awareness level. For example, the PLSS includes rhyming tasks (a rudimentary skill). Segmenting and deletion tasks are included, however, only at a syllabic level and not at a phonemic level. No retrieval or memory tasks are included (see Table 5).

Table 5. Subtest tasks for each of three phonological awareness tools.

Content			
	CTOPP	**PAT**	**PLSS**
nonwords	**X**		
syllables	**X**	**X**	**X**
phonemes	**X**	**X**	
compound words	**X**	**X**	**X**
letter naming			**X**
consonant sounds		**X**	
long & short vowel sounds		**X**	
rhyme discrimination		**X**	**X**
rhyme production		**X**	**X**
sentences		**X**	**X**
initial sound matching	**X**		
final sound matching	**X**		
multisyllabic word repetition			
nonword repetition			**X**
sentence repetition	**X**		
rapid color naming	**X**		
rapid object naming	**X**		
memory for digits	**X**		
Procedures			
	CTOPP	**PAT**	**PLSS**
Blending	**X**	**X**	**X**
Deletion	**X**	**X**	**X**
Graphemes		**X**	**X**
Isolation		**X**	
Rhyming		**X**	**X**
Segmentation		**X**	**X**
Sound Matching	**X**		
Repetition	**X**		**X**
Retrieval	**X**		

The following chapter presents the results for the three phonological awareness tests.

CHAPTER 4
RESULTS

The purpose of this study was to determine if three similar but different measures of phonological awareness reliably assess the same skills in kindergarten-age students, and if they do so in the same manner. This chapter will provide a descriptive comparison of the subtests included in each of the three tests to answer the question of whether the tests measure phonological awareness in the same manner, a summary of the data, and the appropriate analyses for the three standardized measures used in this investigation: The Comprehensive Test of Phonological Processes (CTOPP) (Wagner, Torgesen, & Rashotte, 1999), The Phonological Awareness Test (PAT) (Robertson & Salter, 1995), and the Pre-Literacy Skills Screening (PLSS) (Crumrine & Lonegan, 1999). Data analyses were conducted using the Statistical Package for the Social Sciences (SPSS) (2003).

Data analyses are organized and presented as follow:

1. Descriptive analysis of subtest and composite scores of the CTOPP, PAT, and PLSS;
2. Inferential analysis of subtest and composite scores of CTOPP, PAT, and PLSS;
3. Correlational analyses of CTOPP, PAT, and PLSS.

The CTOPP and PAT include phonological awareness tasks of blending, deletion, and repetition of words, non-words, syllables, and phonemes. However, only the CTOPP provides a measure of rapid naming and memory for digits, significant skills necessary when assessing retrieval skills and memory. The CTOPP does not assess isolation, segmentation, or rhyming skills. On the other hand, the PAT offered other tasks not assessed by the CTOPP, including letter-sound correspondence tasks (Consonants and Long & Short Vowels sections), decoding diphthongs, segmentation, rhyming, and substitution; tasks indicative of good phonological awareness skills.

Descriptive Data for Subtest and Composite Scores

Comprehensive Test of Phonological Processing (CTOPP)

A summary of the subtest and composite CTOPP performance for all participants is presented in Table 6. Performance on both the individual subtests and the resulting composite scores indicate a consistent level of responding slightly less than 1 standard deviation above the mean on all measures. These data suggest that overall, the participants level of phonological processing ability is within the range of normal when compared to the test standardization norm. Further the range of scores for each measure indicates a relatively normal distribution ranging from low average (PA composite score of 88) to above average (PA, PM, RN composite scores of 133).

Table 6. Group means, standard deviations, and ranges for individual subtests and composite score for PA.

Phoneme Awareness	n	Mean	Std. Deviation	Lower Bounds	Upper Bounds
*Elision	25	11.24	1.422	8	14
*Blnd. Wds.	25	11.40	1.528	6	14
*Sd. Match	25	9.76	2.146	5	14
****PA Composite**	25	108.68	10.339	89	133
Phonological Memory					
*Mem. Digit	25	10.44	1.938	7	14
*NWd. Rep.	25	11.68	3.145	8	19
****PM Composite**	25	106.36	13.257	88	133
Rapid Naming					
*Rco. Nam.	25	12.16	1.772	10	16
*Rob. Nam.	25	11.36	1.890	8	16
****RN Composite**	25	110.56	9.412	94	133

*Mean= 10; SD= 3 **Mean= 100; SD= 15

Phonological Awareness Test (PAT)

The second measure administered to the participants of this study was the PAT which measures seven specific phonological skills: Rhyming, Segmentation, Isolation, Deletion, Blending, Graphemes, and Substitution. The performance of the participants is summarized in table 7.

Table 7. Group means, standard deviations, and ranges for individual subtests and overall performance on the PAT.

***PAT**	n	Mean	Std. Deviation	Lower Bounds	Upper Bounds
Rhy. Disc.	25	106.32	6.485	93	113
Rhy. Prod.	25	110.80	5.485	94	116
Rhy. Total	25	110.40	5.515	94	117
Seg. Sent.	25	110.28	7.295	95	120
Seg. Syll.	25	100.48	13.614	77	123
Seg. Pho.	25	116.36	16.271	94	156
Seg. Total	25	110.68	10.578	91	131
Isol. Init.	25	110.76	3.562	104	115
Isol. Med.	25	121.88	13.470	105	153
Isol. Final	25	117.12	8.580	97	132
Isol. Total	25	118.32	7.570	107	133
Del. C & P	25	115.80	8.573	92	123
Del. Pho.	25	115.80	10.747	98	135
Del. Total	25	117.92	10.054	97	136
Blnd. Syll.	25	107.32	4.120	97	110
Blnd. Pho.	25	114.32	9.397	87	128
Blnd. Total	25	113.76	7.928	89	125
Gph. Cons.	25	113.40	5.416	105	122
Gph. L/S V	25	117.36	12.470	85	137
Sb. Mnp.	25	102.08	34.877	0	153
TOTAL Composite	25	107.28	9.542	93	124

*Mean= 100; SD= 15

These data indicate that the average measured performance on the individual subtests tended to aggregate around the 1 sd mark with scaled scores ranging from 102 to 122. These performances are generally consistent across all subtests and produced a

composite score that is half a standard deviation above the mean (107.28) for the standardization sample performance.

Pre- Literacy Skills Screening (PLSS)

The mean total score for the PLSS was 100.16 with a standard deviation of 14.008 (Table 8).

Table 8. Group means, standard deviations, and ranges for individual subtests and for overall performance on the PLSS.

***PLSS**	n	Mean	Std. Deviation	Lower Bounds	Upper Bounds
Rhyme	25	4.80	1.224	2	6
Sent. Rep.	25	4.32	1.600	2	6
Nam. Acc.	25	6.00	0.000	6	6
Nam. Time	25	4.48	1.004	1	5
Blending	25	7.84	0.553	8	8
Sent. Seg.	25	5.76	1.414	4	8
Let. Nam.	25	8.00	0.000	8	8
Syll. Seg.	25	3.64	1.414	0	5
Deletion	25	3.28	0.890	1	4
MSW Rep.	25	2.48	0.770	1	3
****Composite TOTAL**	25	100.16	14.008	77	123

*PLSS subtests' scores are presented in Raw Scores. **Mean= 100; SD= 15

Of the 25 participants assessed with the PLSS, no one received a perfect raw score of a possible 59. On the Naming Accuracy, Blending, and Letter Naming subtests, however, all participants received the maximum number of possible points. On the Syllable Segmentation subtest one of the participants was unable to perform the task required thus earning 0 points for that particular section of the PLSS.

Inferential analysis of subtest and composite scores of CTOPP, PAT, and PLSS

An analysis of variance (ANOVA) was conducted to investigate differences in performance across the three tests. The first level of analysis assessed differences due to gender. Comparisons of mean composite scores for each measure are presented in Table 9 for both males and females. There was no statistically significant ($p < .05$) difference between the performance of the males and females for any test comparison. These findings taken together suggest that the remaining analyses can adequately treat all participants as a single group without undue bias due to gender differences.

Table 9. ANOVA table for composite standard scores on the CTOPP, PAT, and PLSS for males and females.

	n	Mean	Std. Deviation	Lower Bounds	Upper Bounds	F	Significance
PA CS							
Males	14	107.07	10.344	101.10	113.04	.763	.392
Females	11	110.73	10.451	103.71	117.75		
TOTAL	25	108.68	10.339	104.41	112.95		
PM CS							
Males	14	104.93	12.652	97.62	112.23	.361	.554
Females	11	108.18	14.393	98.51	117.85		
TOTAL	25	106.36	13.257	100.89	111.83		
RN CS							
Males	14	110.07	10.232	104.16	115.98	.082	.777
Females	11	111.18	8.704	105.33	117.03		
TOTAL	25	110.56	9.412	106.67	114.45		
PAT							
Males	14	106.79	9.784	101.14	112.43	.082	.777
Females	11	107.91	9.659	101.42	114.40		
TOTAL	25	107.28	9.542	103.34	111.22		
PLSS							
Males	14	102.07	14.210	93.87	110.28	.582	.453
Females	11	97.73	14.029	88.30	107.15		
TOTAL	25	100.16	14.008	94.38	105.94		

Comparison of mean difference performance on the composite scores

The next level of analysis was designed to answer the primary question regarding whether or not the three tests reflect a similar level of participant performance. Paired samples test of all participants showed no significant difference between the PAT and any of the three CTOPP composites (PA CS, PM CS, and RN CS); however, a significant difference ($p = .05$) was observed between the PLSS and the PAT ($p = .05$), as well as between the PLSS and all three CTOPP composite measures, PA ($p = .009$), PM ($p = .048$), and RN ($p = .003$).

Table 10 presents the appropriate t values and associated levels of significance for each test comparison as well as the combined mean levels of performance for the CTOPP, PAT, and PLSS. These results suggest further analysis is warranted in order to determine if in fact the tests are measuring similar constructs or content despite the performance differences observed in the composite scores.

Table 10. Means, standard deviations, 95% confidence interval for the combined composite scaled scores on CTOPP, PAT, and PLSS.

	n	Mean	Std. Deviation	t	p
PA	25	108.68	10.339	.733	.470
PM		106.36	13.257		
PA	25	108.68	10.339	-.671	.509
RN		110.56	9.412		
PM	25	106.36	13.257	-1.589	.125
RN		110.56	9.412		
PAT	25	107.28	9.542	-.510	.614
PA		108.68	10.339		
PAT	25	107.28	9.542	.295	.771
PM		106.36	13.257		
PAT	25	107.28	9.542	-1.346	.191
RN		110.56	9.412		
PAT	25	107.28	9.542	2.062	.050
PLSS		100.16	14.008		
PLSS	25	100.16	14.008	-2.863	.009
PA		108.68	10.339		
PLSS	25	100.16	14.008	-2.086	.048
PM		106.36	13.257		
PLSS	25	100.16	14.008	-3.353	.003
RN		110.56	9.412		

Correlational analyses of CTOPP, PAT, and PLSS

The final step in the analysis of the data was to assess the degree of relationship between the observed composite scores of the three tests. A Pearson Product Moment Correlation was conducted comparing each composite score in a pair-wise manner. These data are presented in Table 11.

Table 11. Correlation between composite scores for all tests.

	n	Correlation	Significance
PA -PM	25	.119	.573
PA -RN	25	-.004	.986
PM -RN	25	.359	.078
PAT-PA	25	.050	.813
PAT-PM	25	.092	.662
PAT-RN	25	.173	.408
PAT-PLSS	25	-.040	.849
PLSS-PA	25	.282	.172
PLSS-PM	25	.407	.044
PLSS- RN	25	.168	.423

As illustrated in Table 11, comparisons of all participants yielded no statistically significant correlations between any of the three CTOPP composites (PA, PM, and RN) and the PAT. Additionally, no statistically significant correlations between the PAT and the PLSS were observed. The comparison between the PLSS and the PM were the only performances to produce a statistically significant correlation (r=. 407; p = .044). It should be noted that all other performance comparisons produced weak correlations suggesting little predictability of performance from one measure to another.

In summary, these data suggest that gender does not result in differential performance bias on any of the three tests. These data also suggest that the CTOPP and PAT yielded similar levels of performance on both tests and resulted in significantly higher

composite scores than the PLSS. The correlational analyses suggest that even though the performance differences are significantly different for several composite scores, overall there appears to be relatively little predictability or relationship of performance across the three tests. In order to address the issue of construct validity it would be necessary to conduct a factor analysis in order to determine construct loading values for each item or score. However, due to the small sample size of this study, an accurate factor analysis is not possible.

CHAPTER 5
DISCUSSION

A child's increasing awareness of and sensitivity to the sound structure of language appears to be a developmental progression from awareness of words to explicit awareness of individual sounds. Over the past 30 years, a variety of tasks have been designed to measure phonological awareness skills in young children (e.g., sound matching tasks, rhyming tasks, sound segmentation tasks, sound blending tasks, etc.). These types of tasks have been incorporated into numerous commercially available diagnostic instruments used to assess the phonological awareness skills of children. These tools range from quick screeners to comprehensive test batteries. Therefore, speech-language pathologists are faced with the decision as to which instrument to select when conducting an assessment of phonological awareness abilities for a child suspected of being "at risk" for or having a reading disability.

The purpose of this study was to investigate whether children, in the second half of kindergarten, perform similarly on three readily available tests that measure phonological awareness. Two of the tests were frequently used comprehensive measures of phonological awareness, the Comprehensive Test of Phonological Processes (CTOPP) (Wagner, Torgesen, & Rashotte, 1999) and The Phonological Awareness Test (PAT) (Robertson & Salter, 1997); the third was a screening test, the Pre-Literacy Skills Screening (PLSS) (Crumrine & Lonegan, 1999).

A comparison of the CTOPP, PAT, and PLSS revealed that there was no significant difference in performance on the PAT and CTOPP but there was a significant difference in performance between the PLSS and the CTOPP and PAT. On the CTOPP and PAT participants who performed well on one tool also did well on the other. This

was not surprising since both tools measure a wide range of phonological awareness tasks (e.g., syllable and phoneme blending; syllable and phoneme deletion) and each of the tools has good validity and reliability. In addition no participant was identified as "at-risk" for a reading disability either by the CTOPP or PAT.

However, similar outcomes were not found when the PLSS was compared with the CTOPP and PAT. That is, participants who did well on the CTOPP and PAT did not necessarily do well on the PLSS. In fact three subjects were identified as being "at risk" (i.e., scoring below the 20th percentile) for a reading disability on the PLSS. The following examples of participants 2VAN, 6DAV, and 6DAW illustrate the contradictory findings between scores on the CTOPP and PAT, and PLSS.

The first participant, 2VAN, obtained an overall score of 43 on the PLSS, which translated into a standard score of 79 (8th percentile). This student's scores were lowest on the Syllable Segmentation, Multisyllabic Word Repetition, and Deletion sections of the PLSS. However, on the CTOPP, 2VAN scored within normal limits: PA CS= 102; PM CS= 106; and RN CS= 124. She also scored within normal limits on the PAT (SS = 112. Scores obtained from the CTOPP and PAT are contradictory to those obtained with the PLSS and do not indicate a deficit in 2VAN's phonological awareness abilities.

The second participant, 6DAV, also identified by the PLSS to be "at risk," scored an overall score of 46, which converted into a standard score of 79 (8th percentile). This student's lowest score on the PLSS was on the Sentence Repetition section. Nonetheless, 6DAV's scores on the CTOPP fell within or above normal limits (PA CS= 127; PM CS= 94; RN CS= 103). And she obtained a score within normal limits on the PAT (SS =114).

Once again scores obtained from the CTOPP and PAT are contradictory to those obtained on the PLSS and do not indicate a deficit in 6DAV's phonological awareness skills.

The third participant, 6DAW, was identified on the PLSS as being "at risk," obtained an overall score of 42, which converted to a composite standard score of 77, (6th percentile). This student's scores on the PLSS were lowest on the Rhyme, Sentence Repetition, and Multisyllabic Word Repetition subtests. On the CTOPP, however, 6DAW scored within normal limits: PA CS= 104; PM CS= 88; and RN CS= 118. The score on the PAT for 6DAW, although the lowest of the sampled population, was also within normal limits (SS = 93). Again, scores obtained from the CTOPP and PAT are contradictory to those obtained with the PLSS and do not indicate a deficit in 6DAW's phonological awareness abilities.

Interestingly, each of these three participants had difficulty on the Sentence Repetition and/or the Multi-syllable Word Repetition subtest. Both of these subtests provide for a measure of phonological memory. Two of the three participants, 6DAV and 6DAW, also had their lowest composite scores on the CTOPP Phonological Memory (PM CS). This finding is consistent with the significant correlation found between the PLSS and phonological memory. However, this finding was not consistent for 2VAN. For this subject the lowest composite score was phonological awareness (PA CS).

A converse scenario was revealed when examining participants' highest scores on the PLSS. As with the comparison of the lowest scores, the participants scoring the highest on the PLSS were not the same ones who scored the highest on the CTOPP and/or the PAT. Due to the inconsistent results when comparing the PLSS to either the CTOPP or PAT it is recommended that caution be used when interpreting results of the

PLSS. Findings suggest that children may be over-identified as being "at risk" for a reading disability using this screening instrument.

An analysis of variance (ANOVA) was conducted to investigate differences due to gender. Comparisons of mean composite scores for each phonological awareness measure were performed. No statistically significant difference ($p < .05$) between males and females achievement was found. As a result, participants were treated as a homogeneous group without unjustifiable bias due to gender.

The results obtained on each of the three assessment tools correlated with results from past literature. Research has shown that typically developing children should be able to demonstrate awareness of onset and rhyme and syllables in Pre-K/Kindergarten, as well as phonemic awareness in Kindergarten/1st grade (Ball & Blachman, 1991; Bradley & Bryant, 1983; Byrne & Fielding-Barnsley, 1993; Fox & Routh, 1975; Lenel & Cantor, 1981; Liberman et al., 1974). In general the children assessed in this study did demonstrate these reading readiness skills.

Possible Limitations of Study

One limitation of the study was the possibility of a "learning effect" since the tests were administered during a two week period and each test measured phonological awareness in a more or less comprehensive manner. To account in part for a "learning effect," the order of testing of the three phonological awareness tools was initially counter-balanced. However, due to time constraints and absenteeism, testing was conducted in a partially counter-balanced order of administration across subjects. That is, the CTOPP was administered as the first test to four participants. It was nine participant's second test, and 12 participant's last test taken. The PAT was the test that was administered the most as the initial test (a total of 13 participants). It was also the test that was administered the most as the second test (10 participants). Only two participants received the PAT as the last assessment tool. The PLSS was administered to eight participants as their first test, to six participants as the second test; and to 11 participants as their third and last test.

However, a "learning effect" still may be present regardless of counter-balancing the order of test administration since each test is a measure of phonological awareness to some degree. For example, the PLSS was administered to 17 of the 25 participants as their second or third test. This gave these subjects an opportunity to "practice" phonological awareness tasks on either the CTOPP or PAT, both comprehensive tests of phonological awareness. Although no participant was identified to be "at-risk" for future reading failure either by the CTOPP or PAT, the PLSS did identify three of these 17 participants as "at-risk" for reading failure. This finding suggests that for these three children the benefit of having past practice was not a factor in their score. The fact that

their performance was below expectations may have nothing to do with their phonological awareness abilities. Many other factors exist that may have influenced these participants' performance (e.g., illness, room temperature, nervousness, time of day, etc…). However, this does not mean that there was not a "learning effect" for some of the participants.

Another possible limitation of the study is the small sample size. The sample was comprised of 25 students, all attending the same school. With a sample of this size, the statistics are underpowered. Thus, it is difficult to draw definitive conclusions regarding the outcomes of the study to the general population.

A third possible limitation was the use of local norms rather than national norms, for comparing the PLSS with the CTOPP and the PAT. Because normative data were not provided for the PLSS, local norms were generated using the Statistical Package for the Social Sciences (SPSS) (2003) software. The local standardization presents a problem not only because of the limited number of participants but also because the PLSS lacks properties of a standardized tool including reliability and validity.

Clinical Implications

Overall this study found that the CTOPP and PAT assess a wide range of phonological awareness skills (i.e., from word level awareness to individual sound awareness) and participants who did well on one of the tests did well on the other. The CTOPP and PAT include phonological awareness tasks of blending, deletion, and repetition of words, non-words, syllables, and phonemes. However, only the CTOPP provides a measure of rapid naming and memory for digits, significant skills necessary when assessing retrieval skills and memory. The CTOPP does not assess isolation, segmentation, or rhyming skills. On the other hand, the PAT offered other tasks not assessed by the CTOPP, including letter-sound correspondence tasks (Consonants and Long & Short Vowels sections), decoding diphthongs, segmentation, rhyming, and substitution; tasks indicative of good phonological awareness skills. Based on results obtained from each test, a subtest analysis can be done by the examiner in order to identify areas in need of remediation, and thus a specific phonological awareness program can be developed and implemented.

Results of this study have shown that performance on the CTOPP and PAT are comparable measures of phonological awareness tasks known to strongly predict future reading ability. When the PLSS was compared to either the CTOPP or PAT, similar outcomes were not obtained. The PLSS assesses rhyming, sentence repetition, naming, blending, segmentation, and deletion, but does not give the child an opportunity to demonstrate his/her awareness of phonemes. Previous research has shown that a child's awareness of phonemes is highly correlated with later reading skills (Adams, 1990;

Bradley & Bryant, 1983; Bryant, MacLean, Bradley, & Crossland, 1990; Lundberg, Frost, & Petersen, 1988; Tunmer & Nesdale, 1985; Wagner & Torgesen, 1987).

From an efficient clinical perspective, using a comprehensive standardized battery to identify children at-risk for reading failure may be more advantageous than a screening instrument. Even though more time will be taken to complete a comprehensive test, the results will be more valuable to the clinician. Standardized assessment batteries such as the CTOPP and PAT are reliable and valid, offer multiple opportunities to test for specific skills, and are standardized on a large population. Since the PLSS does not offer the opportunity to test for phoneme awareness (the best predictor of later literacy development), does not offer standardized norms, and has no established reliability or validity, it is recommended that practicing clinicians not limit their initial screenings to the sole use of this tool.

When choosing an assessment tool, it is important to consider the tool's value from a clinical perspective. Though a comprehensive assessment tool may have a longer administration time, it is recommended in order to gain a better understanding of a child's abilities and needs. Consequently, a clinician can develop a more detailed and appropriate intervention plan to target the child's specific needs.

Suggestions for Future Research

Over the years the amount of research on phonological awareness has provided conclusive evidence that phonological awareness is a necessary skill for literacy development. Reliable and valid tests (e.g., CTOPP and PAT) are available to assess a child's phonological awareness ability. Appropriate interventions are needed to prevent or abate reading disabilities. There are a number of areas for possible future research including:

1. Longitudinal studies of the children identified as "at-risk" in kindergarten to investigate the role of phonological awareness, phonological memory, and phonological retrieval interventions and their impact on reading, comprehension, and writing.
2. Inclusion of a teacher rating scale in research projects to compare teacher's perception of the participants' reading ability against his/her performance and match teacher's perception and child's "true" ability.
3. Investigation of the underlying components of literacy with tasks to assess the orthographic knowledge and comprehension of children as they acquire literacy skills.

APPENDIX A
PARENTAL CONSENT FORM

Parental Consent Form

I, (parent's name) _____, give my permission for my child (child's name) _____, who was born on (child's date of birth) _____, to participate in a study entitled: "A Comparison of Three Phonological Awareness Tools Used to Identify Phonemic Awareness Deficits in Kindergarten-age Children". The study will be conducted by Edgard A. Robelo, Master's student, and Dr. Jamie B. Schwartz, Assistant Professor, in the Department of Communicative Disorders at the University of Central Florida. The purpose of this study is to collect information that will be used to further understand phonological awareness (awareness of sounds in words) and to more accurately identify children at risk for reading problems. Results of the study may or may not directly help your child today, but may be beneficiary in the future.

Thirty children will be administered three different reading assessment tools which consist of a variety of formal tasks involving the awareness of sounds in words. For example, your child may be asked if two words like *man* and *can*, sound the same. Assessment will be on an individual basis and will take place in a quiet area, over a period of three 10 to 40-minute sessions depending on which test is administered. The sessions will take place at the end of March, throughout April, and beginning of May.

Individual data will be described using a randomly assigned alphanumeric code. The master list of names and corresponding code numbers will be kept in a locked cabinet in the faculty supervisor's office. Although the principal investigator, graduate assistant and faculty supervisor of the study will know each participant's name, the identities of the participants will be kept confidential to the extent provided by law. All results of this study that may be reported will be done so in the form of group data. I understand that participation or nonparticipation in this study will not affect my child's grades or placement in any programs.

I understand that verbal consent to participate in this study will be obtained from my child by the examiner. My child will be asked whether he/she would like to participate in the project. He/she will be told that they do not have to answer questions that they don't want to and that they may return to class early if they want.

I understand that both my child and I will have the opportunity to withdraw consent and to stop participating in the project at any time without consequence. I expect that all appropriate precautions be taken to protect my child's identity. I understand that my child's name will not be used in any of the results of the study. I understand that if my child is determined to be at risk for reading problems, he/she will be referred for further evaluation to the school psychologist. I am aware that my child will be given formal tests and the results of these tests will be available to me upon request in December 2003. There are no known risks during the administration of the standardized tests.

_____	_____	_____	_____
Parent's Signature	Date	2nd Parent (Optional)	Date

If you have any questions about this research project, please contact me at (407) 482-1022 or my faculty supervisor, Dr. Jamie B. Schwartz at (407) 823-4807. Questions or concerns about research participant's rights may be directed to the UCFIRB office, University of Central Florida Office of Research, Orlando Tech Center, 12443 Research Parkway, Suite 207, Orlando, FL 32826. The hours of operation are 8:00 am until 5:00 p.m., Monday through Friday except on University of Central Florida official holidays. The phone number is (407) 823-2901.

Sincerely,

Edgard A. Robelo

S
21/Jan

APPENDIX B
LETTER OF INQUIRY

Waterford Elementary School
12950 Lake Underhill Road
Orlando, FL 32828
*****A Five-Star School*****
Brenda Cunningham, Principal **Drew A. Hawkins, Assistant Principal**
Telephone: (407) 249-6410 **Fax: (407) 249-4425**

January 16, 2003

Dear Ms. Cunningham,

I am writing to inquire whether Waterford Elementary School would invite a proposal from my behalf requesting the conduction of a study during the present semester of the school year to support my master's thesis. The study will be conducted under the supervision of Dr. Jamie B. Schwartz, Assistant Professor in the Department of Communicative Disorders at the University of Central Florida. The purpose of this study is to determine if three different tests of phonological awareness Comprehensive Test of Phonological Processes (CTOPP), Phonological Awareness Test (PAT), and Pre-Literacy Skills Screening (PLSS): 1) measure the same phonological awareness skills (content) in the same manner (procedures) and, 2) whether typically-developing kindergarten-age students perform similarly on each of the tests.

The assessment tools consist of a variety of formal tasks involving the awareness of sounds in words. For example, a child may be asked if two words like *man* and *can*, sound the same. Assessment will be on an individual basis and will take place over a period of three 10 to 40-minute sessions depending on which test is administered. The sessions will begin around March 15th, 2003 and will continue through April of 2003.

Please know that there are no foreseen risks during the administration of the tests. In addition, rest assured that the identities of the participants will be kept confidential to the extent provided by law.

If you have any questions about this research project, please contact me at (407) 482-1022 or my faculty supervisor, Dr. Jamie B. Schwartz at (407) 823-4807. Questions or concerns about research participant's rights may be directed to the UCFIRB office, University of Central Florida Office of Research, Orlando Tech Center, 12443 Research Parkway, Suite 207, Orlando, FL 32826. The hours of operation are 8:00 am until 5:00 p.m., Monday through Friday except on University of Central Florida official holidays. The phone number is (407) 823-2901.

Sincerely,

Edgard A. Robelo

I have read the procedures described above. I give my consent for Edgard A. Robelo to carry out the study at Waterford Elementary School.

Brenda Cunningham, Principal — Date 1/17/03

Brenda Cunningham, Principal
Waterford Elementary School
12950 Lake Underhill Road
Orlando, FL 32828

OC PS

"The Orange County School Board is an equal opportunity agency."

APPENDIX C
PRINCIPAL'S SUPPORT LETTER

Waterford Elementary School
12950 Lake Underhill Road
Orlando, FL 32828
*****A Five-Star School*****
Brenda Cunningham, Principal **Drew A. Hawkins, Assistant Principal**
Telephone: (407) 249-6410 **Fax: (407) 249-4425**

March 28, 2003

Dear Parents:

I wanted to let parents of kindergarten students know that I am in support of the research being conducted by our speech and language teacher, Mr. Edgard Robelo. Mr. Robelo will be conducting a field research project as part of the requirements for his advanced degree.

The tests Mr. Robelo will be administering to your children will not be very time-consuming, so they should not miss much of their regular classroom activities. Thank you in advance for your cooperation. If you have any questions, please feel free to contact Mr. Robelo or myself at (407) 249-6410.

Sincerely,

Brenda Cunningham

Brenda Cunningham
Principal

APPENDIX D
COMMUNICATION QUESTIONNAIRE

Communication Questionnaire

Student's Name: _____ Gender: Male / Female
Birth date: _____ Age: _____ Place of Birth: _____
Parent(s) Name: _____ Telephone: _____
Teacher: _____

1. Please circle person(s) living at home with the student:

Mother Father Guardian(s) _____ Other _____

Brother(s) _____ Sister(s) _____ Grandmother(s) _____ Grandfather(s) _____

2. Countries where student has resided:
_____ Length of residence: _____
_____ Length of residence: _____
_____ Length of residence: _____
_____ Length of residence: _____

3. Language(s) spoken at home: _____
4. Student's primary language: _____
5. Other languages spoken by student: _____

6. Does your child currently receive speech and/or language services? No / Yes
If yes, please explain briefly: _____
_____
_____
_____
_____

7. Are there any present health concerns: No / Yes
If yes, please explain briefly: _____
_____
_____
_____
_____

8. Are you aware of any vision or hearing difficulties your child may have: No / Yes
If yes, please explain briefly: _____
_____
_____
_____

APPENDIX E
HUMAN SUBJECTS APPROVAL LETTER

University of Central Florida

Office of Research

January 22, 2003

Edgard A. Robelo
Department of Communicative Disorders
College of Health and Public Affairs
University of Central Florida
4000 Central Florida Boulevard
Orlando, Florida 32816

Dear Mr. Robelo:

With reference to your protocol entitled, "A Comparison of Three Phonological Awareness Tools Used to Identify Phonemic Awareness Deficits in Kindergarten-age Children," I am enclosing for your records the approved, executed document of the UCFIRB Form you had submitted to our office.

Please be advised that this approval is given for one year. Should there be any addendums or administrative changes to the already approved protocol, they must also be submitted to the Board. Changes should not be initiated until written IRB approval is received. Adverse events should be reported to the IRB as they occur. Further, should there be a need to extend this protocol, a renewal form must be submitted for approval at least one month prior to the anniversary date of the most recent approval and is the responsibility of the investigator (UCF).

Should you have any questions, please do not hesitate to call me at 823-2901.

Please accept our best wishes for the success of your endeavors.

Cordially,

Chris Grayson
Institutional Review Board (IRB)

Copies: Dr. Jamie B. Schwartz
IRB File

Office of Research
12443 Research Parkway Suite 207 • Orlando, FL 32826-3252
407-823-3778 • FAX 407-823-3299
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