



The Effect Of A Phonological Awareness Intervention Program On Phonological Memory ,Phonological Sensitivity , and Metaphonological Abilities Of Preschool Children At-Risk For Reading Disabilities

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Abstract

The Purpose of this study was to explore the effect of a phonological awareness intervention program on phonological memory ,phonological sensitivity, and metaphonological abilities of preschool children at-risk for reading disabilities.. The participants in this study were 40 preschool children selected from three preschools located within three elementary schools in Baltim Educational Edara . A pre- post design was used to examine the effectiveness of the phonological awareness intervention program on phonological memory ,phonological sensitivity, and metaphonological abilities of the target children . Findings from this study indicated the effectiveness of the phonological awareness intervention program on phonological memory ,phonological sensitivity, and metaphonological abilities of the target children. On the basis of the findings, the study advocated for the effectiveness of the phonological awareness intervention program employed on phonological memory ,phonological sensitivity, and metaphonological abilities of the target children.

Keywords: phonological awareness, phonological memory ,phonological sensitivity, metaphonological abilities , preschool children at-risk for reading disabilities .

Introduction

Understanding the instructional needs of children with specific reading disabilities is Still a major concern of educators and researchers. During the 1st years, significant progress has been made in our understanding of specific reading disabilities. Reading problems are often the major concern in educating students because reading is the prerequisite skill for success in all other academic areas. The failure of children to develop early reading skills that contribute to academic and social success has turned out to be a national concern. Poor reading skills result in lower overall academic achievement. Lerner (2003) further emphasized the importance of reading by saying “children must learn to read so that later they can read to learn (p.396)”. Adams (1990) indicated that reading is a reliable predictor for children to succeed in school and become productive members of society. For example, the ability to read the text is critical for daily life, such as reading medical information, work-related reading materials, newspaper, filling out various applications, understanding the written information to use high-technological instruments, etc. People without the ability to read quickly, effortlessly, and automatically are ill-equipped to function well in today’s society.

However, according to Putman (2005), reading is the most fundamental but difficult skill for children to learn. Nowadays, the number of students who have reading difficulties is alarming. Study indicated that more than 70% poor readers have difficulties in phonological awareness when they are in kindergarten (Catts, Fey, Zhang, & Tomblin, 2001). There is widespread agreement in the literature that phonological awareness, the ability to analyze the sound structure of language, lays the foundation for successful literacy development (Al Otaiba, Puranic, Ziolkowski, & Montgomery, 2009).

McDonald and Cornwell (1995) reported that the phonological awareness scores in kindergarten were highly related to the performance in word identification and spelling 11 years later. 88% of children with reading deficits in the first grade will continue to experience reading problems at the end of the fourth grade (Juel, 1988). The majority of fourth graders with poor reading performance continued to experience difficulty in decoding monosyllabic nonsense words. Also, lack of appropriate reading instruction and early reading interventions may deteriorate the gap between low-achieving children and typically developing children, and this concern may deteriorate the minority overrepresentation in special education (Reschly, 2002).

Literature Review

Definition of Phonological Awareness

Phonological processing refers to various linguistic operations that make use of information about the sound (Le., phonological) structure of language. It is a set of mental activities or skills that are required in reading or learning to read. Phonological process involves accessing, storing, or manipulating phonological information (Mourad Ali, 2007). Phonological awareness can be defined as the ability to define and manipulate the sound structure of oral language (Layton & Deeny, 2002). Phonological awareness acquisition involves the learning of two things. First, it involves learning that words can be divided into segments of sound smaller than a syllable. Second, it involves learning about individual phonemes themselves (Torgesen, 2000). The awareness of phonological structure of a word helps children to draw connections between the spoken form of a word and its written representation (Gillon, 2004).

Rationale for Teaching Phonological Awareness

Researchers have called for earlier identification and effective programming for children who may be at risk for reading difficulties (Snow et al., 1998). It has been argued that early identification of those at risk for reading difficulties would enable professionals to limit the development of these problems and put at risk children back on the path toward normal reading development (Hurford & Schauf, 1994; Justice, Invernizzi & Meier, 2002; Lyon et al., 2001; Torgesen, Wagner & Rashotte, 1994). Over the past decade there has been a great deal of research focused on establishing kindergarten predictors of reading disabilities. For instance, Vervaeke, McNamara, and Scissons (2007) conducted a four-year longitudinal study following 650 children from Kindergarten to Grade 3 and found that letter identification and phonological awareness in Kindergarten were significant predictors of reading in Grade 3. However, Snow et al. (1998) suggest that children who are at risk for reading difficulties can be identified in the preschool years, prior to their entry into formal schooling.

Since the 1980s, researchers have identified problems in phonological processing are a major factor for reading difficulties. In addition, numerous studies have demonstrated that understanding of phonological awareness is a strong predictor of later reading success (Catts, et al., 2001). In the longitudinal study Catts and his colleagues tracked reading achievement of 604 young children and reported more than 70% of poor readers had a history of deficits in phonological awareness or oral language in kindergarten.

Many researchers studied the effects and role of phonological awareness training on pre –reading skills of preschool children at- risk for reading failure (Rehab Al Sayed Al Sawi, 2013), Word recognition ability of children with autism spectrum disorder (Adel Abdulla & Amal Mostafa, 2012) , pre reading skills of children with mental retardation (Mourad Ali, 2013) ,and some reading skills in students with learning disabilities (Mourad Ali, 2007), and indicated the effectiveness of phonological awareness training.

Phonological Memory

Phonological memory has been of interest to investigators of word learning because of its key role in the temporary storage and manipulation of information for complex cognitive tasks, including speech and language. The functioning of the working memory system has been implicated in groups of children with marked learning difficulties, such as learning disabilities (e.g., Alloway et al., 2005; Swanson & Saez, 2003), reading impairments (Gathercole, Alloway, Willis & Adams, 2006), and specific language impairment (SLI; e.g., Archibald & Gathercole, 2006).

The term working memory has evolved from its ancestor term, short-term memory, which refers to the passive storage of information such as storing a list of names or digits. This store, as the name implies, has been conceptualized as a temporary register of incoming information. The more modern concept of working memory expands the early idea of short term memory beyond a passive register of information. The label “working” has been applied to highlight the current belief that active processing of information takes place in this temporary store. Working memory performs the function of temporary storage of incoming information, holding it long enough so that it can be processed in long term memory can come into play. This capability is required for language comprehension and production, problem solving, executive functioning, reasoning, and other complex cognitive functions (Andrade, 2001).

Nonword repetition tasks have been used to test the phonological memory capacity. Baddeley and colleagues (e.g., Gathercole and Baddeley 1989, 1990) have construed that nonword repetition involves the activation of pure phonological processes such as encoding, storage, and retrieval, independently from lexical knowledge (although others have challenged this assertion—see Snowling et al. 1991; Metsala 1999; Bowey 1996, 2001).

Studies have shown that phonological awareness and working memory are inter-related and associated with cognitive activities (Gindri et al., 2007; Santos & Siqueira, 2002). As phonological awareness develops, the performance level of working memory also increases and vice versa. The higher the levels of phonological awareness and working memory, the more advanced the literacy phase of a child will be. This means that these are directly proportional measures. (Andreia Martins de Souza Cardoso et al., 2013).

Phonological Sensitivity

Research with elementary school children has identified three interrelated phonological processing abilities: phonological sensitivity, phonological working memory, and phonological access to lexical storage (for review see Wagner & Torgesen, 1987). These three phonological processing abilities are strongly related to subsequent word decoding abilities, and, in the absence of intervention, they are highly stable individual differences from the late preschool period forward (Lonigan, Burgess, & Anthony, 2000; Torgesen & Burgess, 1998; Wagner et al., 1997).

Stanovich (1992) first used the term phonological sensitivity to describe the array of skills addressed within the research literature when he suggested to the reading research community a need to more accurately define the phonological processing ability related to the manipulation of speech sounds. He stated that the term “phonological sensitivity should be viewed as a continuum ranging from ‘deep’ sensitivity to ‘shallow’ sensitivity. Tasks indicating deeper levels of sensitivity require more explicit reports of smaller sized units”(p.317)(e.g., phonemes vs. syllables).

Therefore phonological sensitivity was proposed as the broad term encompassing both phonological and phonemic awareness. Scarborough and Brady (2002) supported Stanovich’s appeal for more consistent use of the “phon” words, suggesting that inaccurate use of terminology and misapplication in assessment and instructional materials may cause confusion for early intervention practitioners. The term phonological awareness has typically been used to refer to the ability to detect and manipulate the sound segments of spoken words. Other terms (e.g., phonologic awareness, phonemic awareness, phoneme awareness) have historically been used interchangeably (Ball, 1993; Lewkowicz, 1980).

Metaphonological Abilities

Metaphonological ability refers to the ability to segment speech into increasingly smaller units—phrases, words, syllables, and finally phonemes as well as recognize rhyme (Adrian, et al., 1995). Another similar term which is common found in studies of phonemic awareness is metalinguistic ability. This comprises all aspects of linguistic analytical competence: segmenting sentences into words, words into syllables, syllables into phonemes, phoneme manipulation, and judgment of rhyme (Kurvers, et al., 2006). *Phonemic awareness* is an awareness of the smallest unit of sound in a language that can affect meaning, and the ability to isolate it from other sounds. This is at times referred to as *phonological awareness* which also describes awareness of sound patterns (Adrian, et al. 1995; Durgunoğlu & Öney, 2002). *Phonetic discrimination* or *detection*, or *phonological sensitivity* is the ability to simply identify distinct sounds. In this study this is referred to as *phonemic identification*.

The Purpose of this study is to explore the effect of a phonological awareness intervention program on phonological memory ,phonological sensitivity, and metaphonological abilities of preschool children at-risk for reading disabilities. It seeks to give answers to the following questions.

- 1- Are there differences in post – test scores mean between control and experimental groups on Phonological Memory Test ?
- 2- Are there differences in post – test scores mean between control and experimental groups on Phonological Sensitivity Test ?
- 3- Are there differences in post – test scores mean between control and experimental groups on Metaphonological Abilities Test ?

Method

Participants

The participants in this study were 40 preschool children selected from three preschools located within three elementary schools in Baltim Educational Edara . Three participants were selected based on the results of teacher(female) nominations,

screening for reading achievement, school attendance, and parental consent. Screening procedures of the participants included these steps:

Teacher nominations. The teacher was asked to nominate students who exhibited poor pre-reading skills and might benefit from additional instruction.

Screening for reading achievement. All children were assessed using The Dynamic Indicators of Basic Early Literacy Skills. Based on the results of these assessments, children exhibiting poor pre-reading skills were identified as at-risk for reading disabilities and possible participants for this study.

School attendance. Regular attendance was one of the eligibility requirements to participate in this study. Previous school attendance records were reviewed, and children with potentially poor attendance were excluded from the study.

Parent consent. A letter introducing the purpose of the study and a consent form were sent to parents of the potential participants. Written consent was obtained before beginning of the study. In addition, an oral solicitation using understandable sentences was read to the preschool children by the researcher. Children without written consent were also excluded from the study.

Children were randomly classified into two groups: experimental(n= 20 , 16 boys , 4 girls) and control (n= 20 , 18 boys and 2 girls). The two groups were matched by age, IQ, phonological memory ,phonological sensitivity, and metaphonological abilities . Table 1. shows means, standard deviations, t- value, and significance level for experimental and control groups on age (by month) ,IQ , phonological memory ,phonological sensitivity, and metaphonological abilities.

Table 1. *pre-test Means, standard deviations , t- value , and significance level for experimental and control groups on age (by month) , IQ, phonological memory ,phonological sensitivity, and metaphonological abilities .*

Variable	Group	N	M	SD	T	Sig.
Age	Experimental	20	61.35	2.25	-.735	-
	Control	20	61.95	2.76		
IQ	Experimental	20	114.15	4.68	-.816	-
	Control	20	115.25	3.79		
phonological memory	Experimental	20	8.75	2.00	-.980	-
	Control	20	9.35	1.87		
phonological sensitivity	Experimental	20	11.65	1.46	-.865	-
	Control	20	12.15	2.13		
metaphonological abilities	Experimental	20	15.50	2.48	-.656	-
	Control	20	16.15	3.67		

Table 1. shows that al t- values did not reach significance level .This indicated that the two groups did not differ in age, IQ ,phonological memory ,phonological sensitivity, and metaphonological abilities (pre-test) .

Measures

Nonword repetition test. Phonological working memory skills were measured using the children's test of nonword repetition test . The test consists of 22 nonwords, with items each containing 2–4 syllables. The 22 nonwords were recorded on a portable cassette recorder by a female speaker and separated by a 4 second interval. All participants were presented with a common random sequence of the 22 stimulus items. Interjudge reliability was calculated for the total number of correct responses using an “agreement reliability” formula (i.e. (number of agreements/number of agreements + disagreements)×100). Mean interjudge agreement reliability for *Nonword repetition test* scoring was 88.3% (range = 78.3–96.7%).

Phonological sensitivity measures. Six measures were used to assess children's phonological sensitivity: Rhyme Recognition , Rhyme Application, Blending Body-Coda, Blending Onset-Rimes, Blending Phonemes, and Phoneme Deletion. Each of the measures included one practice item that was followed by correction, explanation, and readministration if the child gave an incorrect answer or confirmation and explanation if the child gave the correct answer. All 5 test trials within each measure were administered to all children . The rationale behind this test design was to guarantee that the full spectrum of children's phonological sensitivity was assessed, as some measures tapped more than one level of linguistic complexity. Indiscriminant positive feedback was offered on test trials. All correct responses were real words.

Metaphonological Abilities Measures. Eight measures were used to assess children's metaphonological abilities: Oddity Tasks—Beginning Sounds, Oddity Tasks—Ending Sounds, Oddity Tasks—Middle Sounds, Blending Onset-Rimes, Blending Phonemes, Segmenting Onset-Rimes, Segmenting Phonemes, Phoneme substitution—Beginning Sounds, Phoneme Substitution—Ending Sounds, and Phoneme Substitution—Middle Sounds. Each of the measures included one practice item that was followed by correction, explanation, and readministration if the child gave an incorrect answer or confirmation and explanation if the child gave the correct answer. All 5 test trials within each measure were administered to all children . The rationale behind this test design was to guarantee that the full spectrum of children's metaphonological abilities was assessed, as some measures tapped more than one level of linguistic complexity. Indiscriminant positive feedback was offered on test trials. All correct responses were real words.

Procedure

Participants were selected, then pretest data were collected using phonological memory ,phonological sensitivity, and metaphonological abilities(pre-test). The classroom PA training program was conducted by the author with the experimental class in one large group for 10 weeks with 20 minute sessions conducted three times a week. A variety of fun, play-based phonological activities were used with the class that incorporated the spectrum of PA skills (e.g. rhyming, sound/syllable matching, sound/syllable isolation, sound/syllable blending, sound/syllable addition or substitution, and sound/syllable segmentation).

The children participated by singing, listening, answering questions, and following directions. The following is a list of the PA activities addressed during training:

1. Sound Matching/Sound Identification
2. Rhyming Activities

3. Sound Addition or Substitution Activities
4. Sound/Syllable Blending Activities
5. Sound/Syllable Segmentation Activities.

The author started with the earlier developing PA skills, such as matching and rhyming, and moved throughout the continuum of PA skills. These activities were rotated from easiest to hardest throughout the 5 week training period. At the end of the study, the posttest data were collected again using the same measures to determine the effectiveness of the PA training.

Results

Table 2. shows data on ANCOVA analysis for the differences in post- test mean scores between experimental and control groups in phonological memory test scores. The table shows that the (F) value was (96.743) and it was significant value at the level (0.01).

Table 2. ANCOVA analysis for the differences in post- test mean scores between experimental and control groups in phonological memory test scores

Source	Type III sum of squares	df	Mean square	F	Sig.
Pre	4.322	1	4.322		
Group	374.363	1	374.363	96.743	0.01
Error	143.178	37	3.870		
Total	544.400	39			

Table 3. shows T. test results for the differences in post- test mean scores between experimental and control groups in phonological memory test. The table shows that (t) vale was (10.112). This value is significant at the level (0.01) in the favor of experimental group . The table also shows that there are differences in post- test mean scores between experimental and control groups in phonological memory test in the favor of experimental group .

Table 3. T- test results for the differences in post- test mean scores between experimental and control groups in phonological memory test

Group	N	Mean	Std. deviation	T	Sig.
Experimental	20	15.95	1.79	10.112	0.01
Control	20	9.65	2.13		

Table 4. shows data on ANCOVA analysis for the differences in post- test mean scores between experimental and control groups in phonological sensitivity test scores. The table shows that the (F) value was (60.174) and it was significant value at the level (0.01).

Table 4. ANCOVA analysis for the differences in post- test mean scores between experimental and control groups in phonological sensitivity test scores

Source	Type III sum of squares	df	Mean square	F	Sig.
Pre	7.247	1	7.247		
Group	282.743	1	282.743	66.169	0.01
Error	158.103	37	4.273		
Total	440.975	39			

Table 5. shows T. test results for the differences in post- test mean scores between experimental and control groups in phonological sensitivity test. The table shows that (t) vale was (7.959). This value is significant at the level (0.01) in the favor of experimental group . The table also shows that there are differences in post- test mean scores between experimental and control groups in phonological memory test in the favor of experimental group .

Table 5. T- test results for the differences in post- test mean scores between experimental and control groups in phonological sensitivity test

Group	N	Mean	Std. deviation	T	Sig.
Experimental	20	19.65	1.81	7.959	0.01
Control	20	14.40	2.32		

Table 6. shows data on ANCOVA analysis for the differences in post- test mean scores between experimental and control groups in metaphonological abilities test scores. The table shows that the (F) value was (369.138) and it was significant value at the level (0.01).

Table 6. ANCOVA analysis for the differences in post- test mean scores between experimental and control groups in metaphonological abilities test scores

Source	Type III sum of squares	df	Mean square	F	Sig.
Pre	20.033	1	20.033		
Group	2311.771	1	2311.771	369.138	0.01
Error	231.717	37	6.263		
Total	2546.975	39			

Table 7. shows T. test results for the differences in post- test mean scores between experimental and control groups in metaphonological abilities test. The table shows that (t) vale was (18.613). This value is significant at the level (0.01) in the favor of experimental group . The table also shows that there are differences in post- test mean scores between experimental and control groups in metaphonological abilities test in the favor of experimental group .

Table 7. *T- test results for the differences in post- test mean scores between experimental and control groups in metaphonological abilities test*

Group	N	Mean	Std. deviation	T	Sig.
Experimental	20	31.35	2.25	18.613	0.01
Control	20	16.20	2.85		

Discussion

The Purpose of this study is to explore the effect of a phonological awareness intervention program on phonological memory ,phonological sensitivity, and metaphonological abilities of preschool children at-risk for reading disabilities. Participants were selected, then pretest data were collected using phonological memory ,phonological sensitivity, and metaphonological abilities(pre-test). The classroom PA training program was conducted by the author with the experimental class in one large group for 10 weeks with 20 minute sessions conducted three times a week.

The results of this study as revealed in tables 3 , 5, 7, show that the phonological awareness training program was effective in improving phonological memory ,phonological sensitivity, and metaphonological abilities of preschool children at-risk for reading disabilities in experimental group, compared to the control group whose individuals were left to be taught in a conventional way .

Participants of this study fall into IQ of 115 or more, nevertheless, they are at -risk for learning disability in reading . Thus IQ score cannot account for learning disabilities. The results of the present study support that conclusion with evidence that students who participated in the study do not fall into the low IQ range, however they are at -risk for learning disability in reading. When designing a program based on phonological awareness, they had statistical increase in phonological memory ,phonological sensitivity, and metaphonological abilities. This goes in line with what Mourad Ali et al (2006) notes that there is one problem " students who are identified as learning disabled often cover any special abilities and talents, so their weakness becomes the focus of their teachers and peers , ignoring their abilities. Mourad Ali (2007) , however , notes that " learning disabled , as well as gifted students can master the same contents and school subjects ", but they need to do that in a way that is different from that used in our schools .

Experimental group gained better scores in phonological memory ,phonological sensitivity, and metaphonological abilities tests than did control groups in post-tests though there were no statistical differences between the two groups in pre- test. This is due to the program which met the experimental group's needs and interests. On the contrary, the control group was left to be taught traditionally. This goes in line with our adopted perspective which indicates that traditional methods used in our schools do not direct students as individual toward tasks and materials , and do not challenge their abilities. This may lead students to hate all subjects and the school in general. On the contrary, when teachers adopt a strategy (such as phonological awareness intervention) that suits students interests and challenge their abilities with its various modalities .

This indicates that " as we learn more about the scope and complexity of individual differences and how they affect academic progress, we become increasingly convinced that many individuals who do not do well at school do not because the instructional methods used to teach them does not complement preferred styles to learn, thus ,we should seek strategies that help these students and match their strengths.

Future Research Recommendations

Further research is still required to explore the potential benefits of phonological awareness intervention for children at-risk for reading disabilities . Such research may include large scale studies, and a further exploration of the exact influence of student attendance, teacher training, classroom conditions and treatment duration and intensity.

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