A Study of Classroom-Based Phonological Awareness Training for Preschoolers With Speech and/or Language Disorders

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Sixteen preschool children with speech and/or language disorders received phonological awareness training for a period of 9 months. Eight children attended a preschool classroom, and 8 children attended a pre-kindergarten classroom. The classrooms were located in a private school for children with speech and language disorders. A group of older children with speech and/or language disorders served as a nontreatment comparison group. Children in the treatment groups received 15 minutes of small-group lessons twice each week for two semesters. Classroom-based treatment focused on rhyming the first semester and on phoneme awareness the second semester. Rhyming and phoneme awareness activities were adapted from the literature on the development of phonological awareness in typically-achieving children. Results revealed that preschool children with speech and/or language disorders made significant improvement in rhyming and phoneme awareness. Comparisons with the non-treatment group indicated that gains in phoneme awareness were likely a result of the treatment rather than maturation or other aspects of the curriculum. We recommend the inclusion of some form of phonological awareness training, particularly phoneme awareness training, in intervention programs for preschoolers.

The relationship between phonological awareness and early reading achievement has been clearly established. Research has shown that the two skills are highly correlated in beginning readers, that the phonological awareness skills of prereaders predict early reading abilities, that training in phonological awareness results in improved reading achievement, and that children who are poor readers and illiterate adults have less well developed phonological awareness abilities than good readers (see, for example, reviews by Adams, 1990; Blachman, 1994; and Wagner & Torgesen, 1987). These results hold in spite of the numerous ways in which both phonological awareness and reading abilities have been measured and in spite of variation in how phonological awareness has been trained. In short, these findings have been compelling and robust. Clearly, phonological awareness in prereaders is a powerful predictor of subsequent early reading achievement. Explicit training in phonological awareness has a positive impact on reading and spelling skills, and phonological awareness can be effectively trained in prereaders with a subsequent positive impact on reading ability (Blachman, 1994; Lundberg, Frost, & Petersen, 1988).

The purpose of this study was to determine whether phonological awareness (including rhyming and phoneme awareness) could be effectively trained in preschool children with speech and/or language disorders in a classroom setting. The critical aspects of this treatment study that depart from previous research include (a) that the children had speech and/or language disorders, (b) that they were preschool-aged, (c) that the training took place in a classroom context, and (d) that the training included a rhyming phase and a phoneme awareness phase. One important question in many phonological awareness training studies has been whether such training affects reading achievement. We did not choose to answer this question in the current study because the relationship between phonological awareness and early reading (decoding) has been well established in previous research

(see, for example, reviews by Adams 1990; and Wagner & Torgesen, 1987).

Why Focus on Children With Speech and/or Language Disorders?

We chose to focus our training on children with speech and/or language disorders for several reasons. Longitudinal and retrospective research has indicated that many children with language disorders are at risk for reading difficulties (e.g., Aram, Ekelman, & Nation, 1984; Aram & Nation, 1980; Bishop & Adams, 1990; Gillam & Carlile, 1997; Korngold, Menyuk, Liebergott, & Chesnick, 1988; Menyuk & Chesnick, 1997). For children with speech impairments, the picture is less consistent, with several studies showing no relationship between speech impairments and reading disabilities (Bishop & Adams, 1990; Catts, 1993; Hall & Tomblin, 1978; King, Jones, & Lasky, 1982; Levi, Capozzi, Fabrizi, & Sechi, 1982; Lewis & Freebairn, 1992) and others finding a relationship between specific types of speech impairments and reading disabilities (Catts, 1986, 1989; Magnusson & Naucler, 1990). Bird, Bishop, and Freeman (1995) found that children with *persistent* speech impairments (from ages 5;10 to 7;7) scored significantly below controls on literacy measures.

Regarding phonological awareness abilities more specifically, studies have shown that these skills are deficient in children with both speech (Bird et al., 1995; Marion, Sussman, & Marquardt, 1993; Stackhouse & Snowling, 1992; Webster & Plante, 1992) and language disorders (Catts, 1993; Kamhi & Catts, 1986; Kamhi, Lee, & Nelson, 1985; Magnusson & Naucler, 1993; Menyuk & Chesnick, 1997), and that these deficiencies are related to reading difficulties (Bird et al., 1995; Catts, 1993; Menyuk & Chesnick, 1997). Once again, however, the findings for children with speech impairments are inconclusive. Magnusson and Naucler (1993) found no correlation between phonological deviance and phonological awareness, although children who were classified as phonologically aware had less severe phonological impairments than children who were classified as phonologically unaware.

In sum, there is some evidence that children with speech and language disorders are at risk for delayed phonological awareness skills. We are currently unable to predict which preschool children with speech or language disorders will have future problems and which will not. Thus, we chose to include children with speech disorders and children with speech and language disorders in the current study. Our results should be representative of the kinds of children that speech-language pathologists typically treat in preschool, school, and private practice settings. As such, the broader range of children in our study increases the generalizability of any findings of treatment effects and enhances the general clinical utility of the study.

Why Train Phonological Awareness in Preschool-Aged Children?

The vast majority of training studies of phonological awareness have been conducted with kindergarten and first grade children who are developing typically (e.g., Ball & Blachman, 1991; Blachman, Ball, Black, & Tangel, 1994; Bradley & Bryant, 1985; Brady, Fowler, Stone, & Winbury, 1994; Cunningham, 1990; Lundberg et al., 1988; Sawyer, 1988; Torgesen, Morgan, & Davis, 1992; Torneus, 1984; Treiman & Baron, 1993). Warrick, Rubin, and Rowe-Walsh (1993) successfully trained phonological awareness abilities in kindergartners with specific language impairment (SLI). Before training, children with SLI were significantly poorer on phonological awareness skills than age-matched typically developing children. One year after training, however, the children with SLI did not differ significantly from the age-matched controls on measures of phonological awareness, reading, and spelling. Another group of children with SLI who did not receive phonological awareness training remained significantly poorer on all three of these measures in comparison with both the SLI group that received training and the typically developing control group that did not.

As noted by Fey, Catts, and Larrivee (1995), it may be important to train phonological awareness skills in children with speech and language disorders as early as possible. Because children with speech and/or language disorders often present difficulties with literacy development, assistance that could lessen later literacy problems might be a crucial basic component of preschool language intervention. Phonological awareness training is one type of early intervention that these authors recommend (see also Catts, 1993).

Two longitudinal studies found that children with language impairments do not "catch up" on a variety of metalinguistic skills, including phonological awareness skills (Magnusson & Naucler, 1993; Menyuk & Chesnick, 1997). Regarding reading in general, Stanovich (1986) suggests that not only do children not "catch up," but they actually fall farther and farther behind. He discusses the "Matthew effect" in reading, wherein children who start out with strong skills make larger gains in reading than those who start out with weaker skills. It is a matter of the "rich-get-richer and the poor-get-poorer" (p. 360).

Stanovich (1992) applies this same logic in discussing the impact of early phonological awareness training. Critics have noted that the significantly higher phonological awareness skills of the trained groups are often nonetheless quite small. Stanovich notes that "small achievement differences that appear early can cause large differences later on" (p. 330). A study by Juel (1988) offers empirical verification of Stanovich's stance. Juel found that children entering first grade with poor phonemic awareness experienced difficulty in learning spelling-sound correspondences. By the fourth grade, these children had still not achieved decoding skills equivalent to those demonstrated by the average to good readers by the beginning of the second grade. What was a "slow start" in the first grade had become more than a 2-year delay by the fourth grade.

These researchers directly or indirectly support the idea that intervention for phonological awareness should begin as early as possible. At least one study shows that it is possible to train phonological awareness skills in preschool-aged children who are typically developing (Layton &

Deeney, 1996). Another study has shown that very specific aspects of phonological awareness (sound-blending, rhyming, or word-segmentation) can be effectively trained in 4- to 6-year-olds with language impairments who are also somewhat cognitively delayed (O'Conner, Jenkins, Leicester, & Slocum, 1993). Given the importance of phonological awareness to later early reading achievement, additional studies with a variety of preschool populations with language impairments seems warranted. In the current study, we trained preschoolers with speech and/or language disorders who were within the normal range cognitively.

Why Train Phonological Awareness in a Classroom Setting?

Blachman and her colleagues discuss the need for conducting phonological awareness training in classrooms in spite of the limitations of applied research in naturalistic settings (Blachman et al., 1994). We chose to conduct the training in the current study in two existing classrooms for preschoolers with speech and/or language disorders for two reasons. First, we wished to enhance the ecological validity of our findings. Second, we believed it was important to model research in an existing educational/clinical context.

Why Rhyming and Phoneme Awareness Training?

Phonological awareness is conscious knowledge of the sound component of language, although the degree of consciousness is debated and, as such, some scholars prefer that it be referred to as phonological sensitivity (e.g., Bowey, 1994; Stanovich, 1992). Speakers can potentially become aware of three broad units of sound within words—syllables, subsyllabic units (called onsets and rimes), and phonemes, although there is some controversy regarding the psychological reality of the onset/rime level (e.g., Carlisle, 1991). Phoneme awareness is the most difficult (for an explanation, see Liberman & Shankweiler, 1991) and hence the latest to develop (e.g., Fox & Routh, 1975; Sawyer, 1987). It is also the level of phonological awareness most clearly related to reading achievement (see, for example, the review by Wagner & Torgesen, 1987).

Phoneme awareness is required for grasping the alphabetic principle—knowledge that words are composed of individual letters that in turn correspond to sounds within spoken words. Although the alphabetic principle can be by-passed when reading words by associating holistic print configurations to known words, this principle is necessary for decoding newly encountered printed words (see Adams, 1990). Children cannot become fluent readers without discerning the alphabetic principle—whether directly or indirectly, consciously or unconsciously, or via instruction or intuition.

Although phoneme awareness is the ultimate goal of phonological awareness training, we chose to focus on rhyming for one semester and phoneme awareness skills for a second semester. We had several reasons for doing so, including research indicating that rhyming (a) is an activity that sensitizes children to the sound structure of words, (b) is a naturally occurring activity among many preschoolers, (c) is often quite difficult for children with language and speech impairments, (d) is an ability that predicts later reading and spelling ability, (e) seems to contribute to later reading and spelling independent of its relationship to phoneme awareness, and (f) has been effectively used in previous studies that trained phonological awareness skills in children. As will be discussed below, these various points are neither universally accepted nor universally supported empirically. However, taken together, we believe they provide a solid rationale for using rhyming as a component of training in the current study.

Rhyming Focuses Children on the Sound Structure of Words

There is some controversy in the literature about the whether there is a direct connection between rhyming and phoneme awareness (e.g., Carlisle, 1991; Goswami & Bryant, 1990; Morais, 1991). However, even those who suggest that rhyming may not exist on a continuum with phoneme awareness still believe it is a valuable activity in sensitizing children to the sound structure of words.

Rhyming Can Be Spontaneous

Many preschool children spontaneously demonstrate the ability to engage in rhyming (e.g., Chukovsky, 1963; Dowker, 1989), and rhyming books are found among the books that mothers share with their preschoolers increasingly as these children develop through the preschool years (De Temple & Snow, 1996; van Kleeck, Alexander, Vigil, & Templeton, 1996). We believed that activities using skills that are a natural part of the repertoire of many preschoolers who are typically developing would create an aspect of our training that was fun and natural for children in this age range and would be a good starting point to introduce them to focusing on the sound component of speech.

Rhyming is Difficult for Many Children With Speech and Language Disorders

Bird et al. (1995) demonstrated that children with phonological impairments and those with phonological impairments plus language disorders performed significantly lower than control subjects on three rhyming tasks, including onset matching, rime matching, and onset segmentation and matching. It was noted in this study that "the impression of the experimenter was that many of these children had no idea of what was meant by the concept of rhyme, and they were unable to work out what was required, despite being given examples with practice and feedback" (p. 453). Magnusson and Naucler (1993) included rhyming tasks in their study of the linguistic awareness skills of preschool children with language disorders and also found that these children scored significantly lower than the control children on their rhyming measures.

Rhyming Predicts Reading and Spelling Ability

Preschool rhyming ability has been shown to predict subsequent early reading and spelling achievement in a number of studies (e.g., Bradley & Bryant, 1983; Ellis & Large, 1987; Lundberg, Olofosson, & Wall, 1980). The results of studies that have not found a relationship between rhyming and reading might be questioned because they were conducted with older children, and often ceiling effects have occurred on the rhyming tasks (e.g., Lundberg et al., 1988; Stanovich, Cunningham, & Cramer, 1984; Yopp, 1988).

Rhyming Contributes to Reading and Spelling Independently

Some studies (e.g., Bowey & Francis, 1991; Bryant, MacLean, & Bradley, 1990) have shown that rhyming ability makes a contribution to early reading and spelling ability independent of being an important foundation step in becoming aware of individual phonemes in words (see van Kleeck, 1994; and Goswami & Bryant, 1990, for further discussion of this point).

Rhyming Has Been Effectively Used in Previous Training Studies

Other studies involving phonological awareness training have included a rhyme or onset/rime component. For example, Lundberg et al. (1988) began their training sequence with rhyming and progressed to segmenting sentences into words, followed by segmenting words into syllables. Fox and Routh (1984) had children work on onset and rime segmentation and blending. Bradley and Bryant (1985) started with rhyming and then moved to phoneme segmentation coupled with letter training.

Others have suggested that it is easier for children to learn separately about sounds in orally presented words and about letters before those skills are combined (e.g., Adams, 1990; Blachman, 1994; van Kleeck, 1995). For this reason, we did not combine phonological awareness training with letter sound and letter identification training. As will be shown in the methods section, the children with speech and/or language disorders in the current study had pre-training scores on the Test of Early Reading Ability, 2nd Edition (Reid, Hresko, & Hammill, 1989) that were within normal limits. One of the three main goals of this test is to assess knowledge of the alphabet and its functions. Furthermore, several studies have indicated that, as a group, children with speech and language disorders have adequate home experience with literacy (Bird et al., 1995; Catts, 1993; Gillam & Johnston, 1985; Marvin & Wright, 1997). From studies of preschoolers who are developing typically, we know that alphabet knowledge is often established in such homes (e.g., Mason, 1980).

The main purpose of this study was to determine whether phonological awareness training conducted twice weekly for short sessions in a classroom setting would be equally effective with younger (4-year-old) and older (5-year-old) preschoolers with speech and/or language disorders. Intervention was conducted with groups of 3 or 4 students who rotated through a "sound center" offered as one of three classroom activity centers twice each week. Treatment focused on rhyming for the first semester and on phoneme awareness for the second semester.

Method

Participants

Twenty-four children between the ages of 45 and 93 months participated in the study. All participants attended a private school for children with communication disorders. These children had been diagnosed as presenting speech and/or language disorders by licensed speech-language pathologists. To qualify for placement in the school, the children also were required to have normal nonverbal cognitive abilities. Two groups of 8 children with speech and/or language disorders received phonological awareness training. The youngest group (ages 45–52 months) attended a preschool-aged class (PS group). The second group (ages 57–66 months) attended a pre-kindergarten class (Pre-K group).

An ideal comparison group for testing the effectiveness of the training would have been same-age children with speech and/or language disorders who attended these classrooms and who did not receive treatment. Unfortunately, these two classrooms consisted of only eight children each. Placing some of these children in a control group would have substantially diminished the already small size of the groups receiving training. Therefore, we selected a comparison group of eight children with speech and/or language disorders (ages ranging from 60–93 months and averaging 71.5 months) who had previously attended the pre-kindergarten classroom in the study and who were still attending the same school. Historical data were available concerning the comparison children's language abilities at the time they attended the pre-kindergarten classroom. The pre-kindergarten teacher had not changed, and she informed us that, with the exception of our in-class treatment, her curriculum during the period of this study was very similar to the curriculum that the children in the comparison group had been exposed to. Therefore, our comparison group consisted of older children with speech and language disorders who had educational experiences that were very similar to those of the children in the treatment groups.

The 16 children in the two treatment groups received the following battery of tests during the first 4 weeks of the fall semester: 30-minute language samples during play with an examiner from which mean length of utterance in morphemes (MLU) and percent of grammatically unacceptable utterances were calculated, the Test of Auditory Comprehension of Language–Revised (TACL-R; Carrow-Woolfolk, 1985), the Goldman-Fristoe Test of Articulation (Goldman & Fristoe, 1969), the Test of Early Reading Ability–2 (TERA-2; Reid et al., 1989), and a battery of rhyming and phoneme awareness tasks that will be described in detail later in the method section. We did not administer global language tests because these students had all been tested within the past year by licensed speech-language pathologists and/or psychologists, using tests

TABLE 1. Pretraining performance of children in the two experimental groups on specific measures of language development.

	Experimental Groups	
	PS	Pre-K
Chronological age (months)	48.87 (45 to 52)	60 (57 to 66)
MLU (raw scores)	3.78 (3.04 to 4.54)	3.84 (2.78 to 4.71)
MLU (*z* scores)	–.19 (–.58 to .64)	–1.28 (–3.34 to .56)
% grammatically unacceptable utterances	22% (6.2% to 56.7%)	16.3% (5.7% to 47.4%)
TACL-R: Total (deviation quotient)	97.37 (77 to 117)	90.874 (72 to 117)
Test of Articulation (sounds in error)	8.25 (6 to 19)	7.78 (4 to 19)
TERA-2	103.62 (85 to 121)	87.5 (67 to 111)

Note. Ranges in parentheses. PS = Preschool class; Pre-K = pre-kindergarten class; MLU = mean length of utterance in morphemes; TACL-R = Test of Auditory Comprehension of Language–Revised; TERA-2 = Test of Early Reading Ability–2nd Edition.

such as The Test of Early Language Development (Hresko, Reid, & Hammill, 1991), the Clinical Evaluation of Language Fundamentals–Preschool (Wiig, Secord, & Semel, 1992), and the Preschool Language Scale–3 (Zimmerman, Steiner, & Pond, 1992).

Table 1 presents the means and standard deviations on pretraining measures that we administered to the children in the two training groups. Note that the children in the PS group were approximately one year younger than the children in the Pre-K group. The MLU values for the two groups were quite similar, but the MLU *z* scores (based on Leadholm & Miller, 1992) were lower for the Pre-K group because these children were older. The groups were also similar with respect to percent of grammatically unacceptable utterances, receptive language ability, and number of sounds in error on the Goldman-Fristoe Test of Articulation. All of the children in the PS group and 5 of the 8 children in the Pre-K group performed within normal limits on the TERA-2. As we noted earlier, these children had parents who valued literacy development, and they were read to frequently. Their performance on the TERA-2 may reflect their rich early literacy experiences. Note that the TERA-2 does not assess phonological awareness. Of the first 20 items, only one ("What is the first letter in GIRL") relates to phonological awareness, and it could be answered correctly by simply recognizing the letters in the printed word.

We also wanted to contrast the language performance of children in the training groups with that of children in the comparison group when they attended the pre-kindergarten classroom. Recall that licensed speech-language pathologists and psychologists had administered global language tests to the children in the two training groups. We searched records for similar kinds of receptive and expressive tests that had been administered to children in the comparison group during the period that they attended the pre-kindergarten classroom. Because the tests that were administered varied, deviation quotients were converted to z-scores to contrast the comparison group's past performance on formal language tests with performance of the children in the treatment groups. Table 2 indicates that when the children in the comparison group attended the pre-kindergarten classroom, they performed somewhat better on expressive language subtests and somewhat worse on receptive language subtests than the children in the two training groups. It is interesting that the children in the treatment groups performed somewhat more poorly on global language tests than they performed on the specific formal and informal measures that were part of our pretreatment battery.

The children in the three groups presented different kinds of speech and/or language disorders. Six children in the PS room, 3 children in the PK room, and 2 children in the comparison group presented both speech and language disorders (defined as more than six different sounds in error on the Goldman-Fristoe Test of Articulation combined with more than 20% ungrammatical utterances on a language sample or *z* scores of –1.25 or below on receptive and/or expressive language tests). Four children in the PK room and 4 children in the comparison group presented language disorders only (fewer than six different sounds in error in the Goldman-Fristoe Test of Articulation combined with more than 20% ungrammatical utterances on a language sample or *z* scores of –1.25 or below on receptive and/or expressive language tests). One child in the PK room and one child in the comparison group presented speech disorders only (greater than six sounds in error in the Goldman-Fristoe Test of Articulation combined with fewer than 20% ungrammatical utterances on a language sample and *z* scores above –1.25 on receptive and/or expressive language tests). Finally, there were 3 children

TABLE 2. Performance on global language measures (converted to *z* scores for comparison purposes) for children in the preschool (PS), pre-kindergarten (PK), and comparison groups.

	Expressive Language *z*-score	Receptive Language *z*-score
PS	–1.78 (–1.03 to –.316)	–.175 (–1.53 to 1.33)
PK	–1.75 (–2.69 to –.86)	–.6 (–1.86 to 1.33)
Comparison	–1.24 (–1.75 to –.4)	–.976 (–1.5 to –.2)

Note. Ranges in parentheses.

(one from each group) who performed within normal limits on the formal language tests, had fewer than 20% ungrammatical utterances on a language sample, and had fewer than six sounds in error on the Goldman-Fristoe Test of Articulation. All 3 children had difficulties with pragmatic aspects of language (2 had been diagnosed with Pervasive Developmental Disorder by one or more professionals). As we noted in the introduction, the participants are rather heterogeneous with respect to type and degree of communication disorders. However, they represent the kinds of children that speech-language pathologists routinely see in their daily practice.

Phonological Awareness Training

Graduate student clinicians in speech-language pathology and classroom teachers who were certified speech-language pathologists conducted phonological awareness activities in two classrooms (one preschool and one pre-kindergarten) for 12 weeks during the fall semester and 12 weeks during the spring semester. Training focused on rhyming during the fall semester and phoneme awareness during the spring semester. Our lessons were designed in collaboration with the two classroom teachers and the director of the school to fit the intervention into the extant classroom curriculum and structure. The activities were structured as one of three "centers" that children rotated through during their classroom center time.

The graduate student clinicians conducted the phonological awareness activity centers with groups of 3 or 4 children at a time. The activity center mini-lessons lasted for approximately 10 to 15 minutes per group. During the fall semester, the centers focused on rhyming, and classroom teachers read the selected rhyming books during book reading activities with the entire class. The teachers were not asked to do anything special during the second semester when the "sound center" activities focused on phoneme awareness. In fact, teachers were asked not to provide any special instruction on phonological awareness (rhyming or phoneme awareness) outside of the planned training session.

Rhyming Activities

During the fall semester, classroom teachers read the same rhyming book (e.g., *Itchy, Itchy Chicken Pox*, Maccarone & Lewin, 1992) or poem aloud at the beginning of each day for a 2-week period. The criteria for selecting the books and poems were that they contained a minimum of 10 rhyme pairs and that they matched a topic that was consistent with many of the classroom lessons and activities during that 2-week period. We did not attempt to control the syllable structure of the rhymes or the difficulty of the vocabulary. None of the rhyming vocabulary matched the rhyming words that appeared on the pre- and posttests, however. After 2 weeks, a new book or poem was selected. Five rhyme pairs were chosen from the books and poems and were targeted in rhyming activities each week, making a total of ten rhyme pairs for each book or poem. Picture cards (3 × 5 inch index cards containing line drawings) depicting the words in each rhyme pair plus 5 non-rhyming foils, and game boards with pockets for the picture cards were used to create game-like contexts for intervention.

Each week, children were led through a series of increasingly difficult rhyming activities, beginning with rhyme recognition and progressing to rhyme generation. During rhyme recognition activities, children were shown pictures representing each target word as it was said. The cards were placed in a line, and the children were asked to point to the pictures as the examiner named them. Next, children were told which words rhymed, and they were taken through a choral imitation task in which they repeated the rhyme pairs after the clinician. These introductory activities were followed by rhyme identification, rhyme judgment, and rhyme generation activities.

In the rhyme identification activities, the clinicians said a word and asked the children to find its rhyming mate. Clinicians placed cards in the game board pockets, and children took turns naming the cards, selecting cards that pictured their rhyme mates, and placing their mates in the correct pockets. During the rhyme judgment activities, clinicians selected two cards, said the words, and asked whether they rhymed or not. Children also participated in rhyme creation activities in which they thought of new words that rhymed with the target words. A typical rhyming sequence is presented in Table 3.

Phoneme Awareness Activities

Children in both groups completed phoneme awareness activities during the spring semester. The activities were designed to help them acquire an awareness of sounds at the beginning and end of words. The sequence of activities (Table 4) was based on the literature that was available on the development of phoneme awareness in typically achieving children. The target sounds were /b, d, g, m, n, s, f/. Contrary to the assumption that stops might be difficult to segment and blend because they don't exist outside of a

TABLE 3. An example of rhyming activities conducted over a 2-week period in the twice-weekly activity center mini-lessons.

Week 1, Day 1
- Small Group Activities
  - Read the selected book
  - Show and model five rhyme pairs
  - Present the rhyme introductory activities
  - Play a rhyme identification game

Week 1, Day 2
- Small Group Activities
  - Reacquaint children with rhyme pairs
  - Present picture foils
  - Play a rhyme judgment game with foils
  - Play a rhyme generation game

Week 2
- Repeat the activities in Week 1 with a new set of five target rhyme pairs.

TABLE 4. Phoneme awareness activities

1. ***Clinician modeling of initial sounds.*** Clinician models the initial sounds of eight pictured words. Example: "Listen carefully to this word /b/ - /baɪk/; /baɪk/ starts with the sound /b/."
2. ***Judging and correcting initial sounds.*** Children indicate when words are said correctly or incorrectly. Children are also asked to correct the clinician's or a puppet's incorrect production. Example: "Here's how Billy Bear says this word [shows picture], /saɪk/. Is that the right way to say that word?
3. ***Matching initial sounds.*** Children select pictured words that begin with the phoneme spoken by the clinician. Example: Clinician shows children four pictures of training words and two pictures of foils and asks, "Which of these words starts with /b/?"
4. ***Identifying initial sounds.*** Children identify beginning sounds of pictured words selected by the clinician. In another activity, children choose pictures and classify them according to beginning sounds. Example: Pictures of training items and foils are spread out on the floor in front of the children. The clinician points to one of the words and asks, "What sound does this word start with?"
5. ***Selecting and generating new words with targeted initial sounds.***
   a. Children select pictures of untrained words that begin with target sounds. Example: Eight new pictures are spread out in front of the children, and the clinician asks, "Which of these words starts with the sound /b/?"
   b. Children generate words that begin with target sounds. Example: The clinician says, "Let's all think of as many words as we can that start with /b/. I'll time us for one minute and we'll see how many we can name. Last week we thought of 12 words. Let's beat that this week."
6. ***Repeating the preceding five steps with word-final sounds.***
7. ***Blending sounds.***
   a. Clinician displays five pictures of words used in previous training. She says the sequence of individual sounds that make up one of these words. Example: The clinician sets out six pictures and says, "Listen to these sounds, /b/-/aɪ/-/k/. Which picture is a /b/-/aɪ/-/k/."
   b. Procedure above is repeated with pictures of words not used in previous training.
8. ***Analyzing sounds.***
   a. Clinician presents a picture of a previously trained word and says the word. Children are asked to say the sequence of individual sounds that make up the word. Example: "Here's a word we've been talking about (shows a picture of a bike). Who can tell me the sounds in this word?"
   b. Procedure above is repeated with pictures of words not used in previous training.

syllable context, our piloting revealed that these were easy sounds for normally developing preschoolers to work with. The intervention activities focused on two sounds at a time. The targeted sounds were changed every 2 weeks.

Activities 1 through 5 in Table 4, which all focus on initial phonemes, were targeted during the first 7 weeks of the second semester. These activities were repeated for final sounds during weeks 8 through 10. The sound blending activities were conducted during the final 2 weeks of the second semester.

Phonological Awareness Measures

Rhyming Tasks

A series of four rhyming tasks were administered as a pretest before training and as a posttest after the two semesters of phonological awareness training. The examiners who administered the posttests were blind to the results of the pretesting. The tasks were:

Rhyme Identification Through Oddity. Following a procedure used by MacLean, Bryant, and Bradley (1987), the child was shown a series of three pictures and asked to point to the picture that did not rhyme with the two others. After one training series, ten additional series were presented.

Rhyming Identification. As in Smith and Tager-Flusberg (1982), the child was shown a puppet named Jed who liked words that rhymed with his name. After two training items, the child was then asked to identify whether seven words rhymed with "Jed" ("Jed" was repeated as each new word was presented). Next, Jed's kite was introduced and the child was told that Jed also likes words that rhyme with "kite." The process was repeated with seven more words that either rhymed or did not rhyme with kite (here again, "kite" was repeated as each new word was presented).

Rhyme Production. Following another procedure used by MacLean et al. (1987), the child was given a series of ten single-syllable words and asked to generate a word that rhymed with each. During training, the child was presented with a word (mouse), and the examiner then generated a real word (house) and a nonsense word (bouse) that rhymed with it.

Rhyme Fluency. In this task, the child was introduced to a puppet named Matt who also liked words that rhymed with his name. The examiner demonstrated two examples, one real word (cat) and one nonsense word (gat), and then asked the child to think of as many more words as she or he could that rhymed with Matt during a 30-second period.

Phoneme Awareness Tasks (in order of difficulty)

Phoneme Judgment and Correction. Using a procedure developed by Chaney (1992), the child was introduced to a puppet named Max who sometimes didn't say words right. The examiner showed a series of 14 pictures and said a correct or incorrect version of the single syllable word depicted in each. The examiner asked if Max said the word right or not (judgment), and then asked the child to show Max how to say the word (correction). One training item was presented.

Initial Sound Identification. Again using a task devised by Chaney (1992), the child was told that puppet Max liked words that started with the same sound as his name. After a training item, 14 word pairs (Max plus a second word beginning or not beginning with an "m") were presented and the child judged whether the initial sounds were the same.

Generating Initial Sounds. A puppet named Tom was introduced. He also liked words that started with the first sound of his name. After presenting a real word that started

with "t" (tick) and a nonsense word that started with "t" (toup), the child was asked to generate as many words as he or she could think of in 30 seconds that started with the first sound of Tom's name.

Identifying Initial and Final Sounds. The examiner presented five words and asked the child to identify the first sound (one began with a vowel) and then presented five more words in which the child was asked to identify the last sound (all consonants). There were no training items on this task.

Results

Two-way mixed ANOVAs were used to test whether the children in the classrooms that received training improved on rhyming and phoneme awareness tasks after training (Table 5). The independent variables were the classroom groups (PS vs. PK) and the time of testing (pretest at the beginning of the school year before training and posttest at the end of the school year after training). The dependent variables were the total number of correct items on rhyming and phoneme awareness measures (composite scores). The same pattern of results was obtained for both dependent variables. The group main effects and the group × time interactions were not significant, suggesting that the performance of the children in the two classrooms did not differ to any reliable degree for either dependent variable. However, there was a significant time of testing main effect for rhyming [$F(1, 14) = 18.21$, $p < .001$; $\eta^2 = .54$] and for phoneme awareness [$F(1, 14) = 51.3$, $p < .001$; $\eta^2 = .77$], suggesting that children in both classrooms made significant gains in rhyming and phoneme awareness ability between the pretest and posttest dates. The η^2 values suggest that the change in time (corresponding to the implementation and completion of intervention) accounted for a moderate degree of the total variability in the rhyming measures and for a moderately high degree of the total variability in the phoneme awareness measures. Figure 1 depicts the upper and lower limits of the 95% confidence interval of the pretest performance on both rhyming and phoneme awareness measures. Each classroom's mean posttest performance is shown in relation to the pretest confidence interval. In each case, the posttest mean scores fall outside of the upper limit of the pretest confidence interval.

We also wanted to know whether the gains in rhyming and phoneme awareness abilities could be attributed to our training or whether they resulted from other general factors related to the school curriculum. To answer this question, we compared the performance of the children in our experimental groups with that of a group of children with speech and/or language disorders who had previously attended the pre-kindergarten classroom in this same school. Recall that the children in the comparison group were older than the children in the treatment groups and that they were tested at the beginning of their kindergarten/first grade year. Therefore, this is a very conservative comparison.

Figure 2 depicts the upper and lower limits of the 95% confidence interval of the comparison group. The PS and PK classrooms' posttest mean performance on the rhyming and phoneme awareness measures are plotted in relation to these confidence intervals. After completing the training, the means of the PS and PK groups were still below the lower 95% confidence level of the comparison group for the rhyming tasks. We know from the earlier analysis that there were undeniable gains on the rhyming measure.

TABLE 5. Mean number of correct responses on the rhyming and phoneme awareness tasks by children in the PS, PK, and Control Groups.

Measure and Group	Mean	*SD*	95% Confidence Interval
Rhyming			
Pretest			
PS Group	12.25	6.86	(7.49, 17.01)
PK Group	13.12	4.73	(9.84, 16.40)
Control Group	28.0	6.39	(23.56, 32.44)
Posttest			
PS Group	22.88	10.30	(15.72, 30.03)
PK Group	19.13	8.39	(13.30, 24.96)
Phoneme Awareness			
Pretest			
PS Group	16.75	6.27	(12.39, 21.11)
PK Group	13.75	5.12	(10.19, 17.31)
Control Group	19.0	4.9	(15.59, 22.41)
Posttest			
PS Group	28.38	6.80	(23.65, 33.10)
PK Group	28.5	5.86	(24.43, 32.57)

FIGURE 1. Training classroom (PS and PK) children's posttest mean performance on rhyming and phoneme awareness in relationship to their pretest performance 95% confidence intervals.

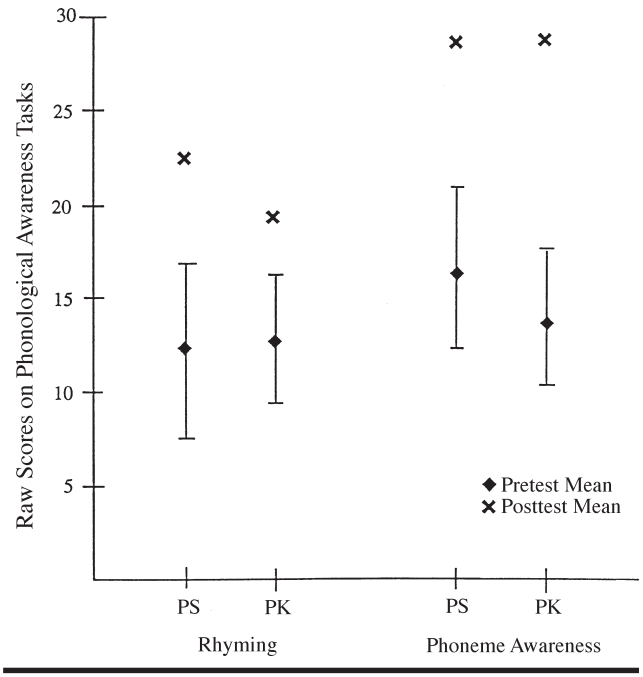

FIGURE 2. Training groups' (PS and PK) posttest mean performance on rhyming and phonological awareness in relationship to the control group's 95% confidence intervals on these measures.

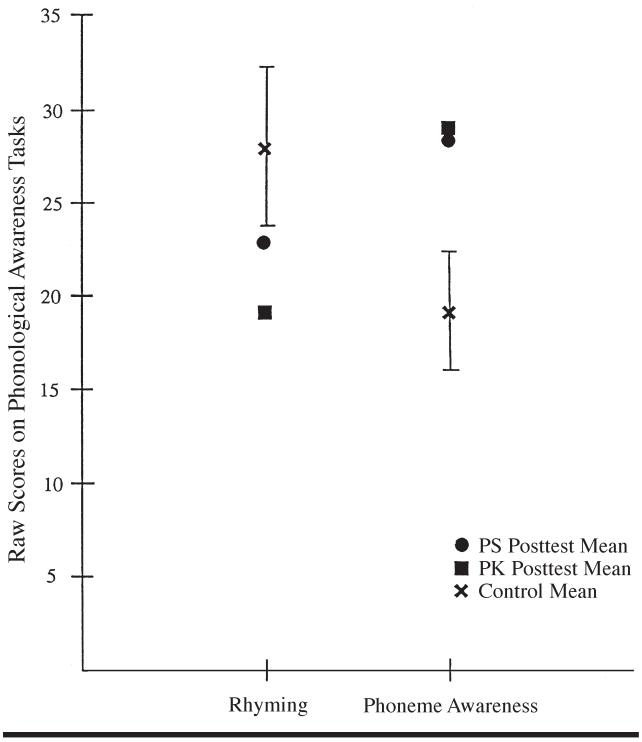

TABLE 6. Correlations between language measures and phonological awareness measures for the children in the training groups.

	Language Measures			
	MLU	% Gramm. Unacc.	TACL-R	G-F Artic
Rhyming - pre	.294	–.215	.165	–.140
PA - pre	–.184	.071	.266	–.121
Rhyming gains	.075	–.074	.680*	–.198
PA gains	.174	–.090	.208	.165

Note. MLU = Mean Length of Utterance; % Gramm. Unacc. = percentage of grammatically unacceptable utterances in a language sample; TACL-R = Test of Auditory Comprehension of Language–Revised; G-F Artic = number of sounds in error on the Goldman-Fristoe Test of Articulation; Rhyming - pre = total score on the rhyming tasks; PA - pre = total score on the phoneme awareness tasks; Rhyming gains = posttreatment scores on the rhyming tasks minus the pretreatment scores; PA gains = posttreatment scores on the phoneme awareness tasks minus the pretreatment scores.
*$p < .01$.

Although the changes in rhyming look fairly large, the effect was not large enough to render the treatment groups' scores higher than those of the comparison group.

The results for the phoneme awareness measures are very different. After training, the means for both the PS and the PK groups are higher than the upper 95% confidence level of the control group. Therefore, we can be reasonably confident that the increases in phoneme awareness in the two groups that received training resulted from that training, and not just from the experiences in the regular curriculum.

Finally, we wanted to know whether any of the initial speech and language measures predicted children's rhyming and phoneme awareness abilities before training or their gains in rhyming and phoneme awareness during training. Previous ANOVAs indicated no significant differences between the training groups, so we collapsed across the two training groups for this analysis. Table 6 presents Pearson's *r* correlations among the four speech and language pretreatment measures and scores on the rhyming and phoneme awareness tasks. Only one correlation is reliable. Children who earned higher scores on the TACL-R tended to be the ones who made the greatest amount of change on the rhyming task between pre- and posttreatment administrations.

We also wondered whether children who had better rhyming and phoneme awareness before treatment would be the ones who made the greatest gains during the treatment period. The correlation between performance on the rhyming pretest and the extent of gain on the rhyming tasks during treatment was not reliable ($r = .377$, $p > .05$), but there was a reliable negative correlation between performance on the phoneme awareness tasks before treatment and the extent of gain on these tasks during the treatment period ($r = –.580$, $p < .05$).

Discussion

Outcomes of this intervention study support the usefulness of phonological awareness training with 4- and 5-year-old children with speech and/or language disorders. Intervention that focused on rhyming for one semester and on phoneme awareness for a second semester resulted in improved phonological awareness abilities in both groups of children. To determine whether these changes were directly attributable to our training, we compared the end-of-the-year performance on rhyming and phoneme awareness to that of a comparison group composed of kindergarten and first grade children who had earlier attended the PK classroom in the same school. When the comparison group was tested (at the beginning of their kindergarten or first grade year), they were, on average, 13.7 months older than the PS children and 2.5 months older than the PK children when they were posttested.

We found that, despite their significant gains in rhyming, the children in the two training classrooms fell below the lower boundary of the 95% confidence interval of the control children on this measure. Therefore, we cannot attribute the improvement in rhyming to our training, and indeed, it has been suggested that development in rhyming is not dependent on formal training (Lundberg et al., 1988). However, the students in the training classrooms performed well above the upper limits of the control group's confidence interval on the phoneme awareness measure. This finding suggests that our training contributed to their gains in phoneme awareness. It also fits with the idea that the development of phoneme awareness requires explicit

training (e.g., Lundberg et al., 1988). Furthermore, there was a reliable negative correlation between performance on the phoneme awareness tasks before treatment and the extent of gain on these tasks during the treatment period ($r = –.580$, $p < .05$), suggesting that children with the least phoneme awareness knowledge before treatment tended to be the ones that made the greatest gains. This speaks very well for clinicians' ability to influence change in phonological awareness in children with speech and/or language delays.

Another important aspect of these findings is that the two classrooms of children with speech and/or language disorders responded to the training in a similar fashion, in spite of being nearly a year apart in age. Age was not a critical variable in the outcome of our training, as both the 4- and 5-year-olds profited. Given that children with speech and language disorders are at risk for later reading difficulties, it is helpful to know that skills related to literacy development can profitably be trained in these children as young as 4 years of age. Our findings support the suggestion of Fey et al. (1995) that speech-language pathologists should train phonological awareness skills as early as possible when treating children with speech and language disorders, and they give speech-language pathologists and other educators a rather large window of opportunity for teaching phonological awareness skills to such children.

There are several aspects of this study that we would like to highlight. First, because all of our intervention was incorporated into the children's classrooms during their center time, the methods offer an example of one way in which speech-language pathologists might collaborate with preschool classroom teachers. Another attractive feature of the intervention is that it was relatively short, occurring primarily in two 15-minute sessions per week. This is important because phonological awareness would not be the only focus we would advocate for preschool children with speech and language disorders. Indeed, the children in our study participated in language intervention for other form, content, and use interactions at the same time they received our phonological awareness intervention. The intervention was quite easy to implement, and as such could easily be replicated clinically. It used books already available in the two classrooms in this school and activities that were not dissimilar to other kinds of activities that typically occur in preschool classrooms. The intervention was cost effective; we did not purchase any special materials to carry out the training. Last, but certainly not least, the intervention seemed to be fun for the children. They enjoyed the activities, and their teachers reported that they could be heard spontaneously using the rhyming and phoneme awareness skills they were being taught.

Our enthusiasm for our results are nonetheless tempered by some weaknesses in our design. It would have been preferable to have counterbalanced the rhyming and phoneme awareness segments of the training to begin to ferret out what contribution, if any, rhyming makes to phoneme awareness. Fortunately for the children (but unfortunately for our study), the two teachers liked to plan lessons together, and they resisted having different types of instruction occurring in their classrooms. The design would have been stronger if we had follow-up data on the children as they actually learned to decode print. Our assumption is that, armed with much-improved rhyming and phoneme awareness skills, our training groups of children with speech and/or language disorders would learn to read more readily. Our study did not test this assumption, however. Finally, a larger sample of children allowing a same-age control group would have been far more elegant. In spite of these shortcomings, we are heartened by the fact that the preschool children with speech and language disorders who participated in this study learned the phonological awareness skills we taught them and that pretraining levels of language skills and phonological awareness skills did not significantly affect the intervention results. In fact, the instruction was most helpful for children with little or no phonological awareness skills before training. Phonological awareness training in classroom contexts appears to be successful with preschool children with a wide range of speech and language abilities.

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