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ABSTRACT

Effects of instruction in phonemic awareness during preschool and/or kindergarten on the metalinguistic development and subsequent reading achievement of young children with disabilities were investigated in this project. The main focus of study combined a longitudinal and experimental design in which 79 preschool children with disabilities received instruction in phonemic awareness during preschool and/or kindergarten and were followed through first grade. These children received 15-minute small group instruction three times a week on phonemic awareness that focused on rhyming, syllable blending, and segmentation. Following treatment, significant effects were found favoring the experimental group on their rhyming skills and their ability to repeat sequences of phonemes. During the second year, 16 children received 2 years of instruction in phonemic awareness in preschool and kindergarten, 17 children received 1 year of instruction in preschool, 6 children received 1 year of instruction in kindergarten, and 15 children did not receive any formal instruction in phonemic awareness skills. No significant differences were found on measures of phonemic awareness. A second replication study, with a new sample of 66 preschool and kindergarten children, also failed to reveal significant experimental group gains. Appendices include the different evaluation forms. (Contains 47 references.) (CR)

Final Report

Project # HO23N20011

PREPARING YOUNG CHILDREN WITH DISABILITIES FOR READING INSTRUCTION: AN INVESTIGATION OF EFFECTS OF EARLY INSTRUCTION IN PHONEMIC AWARENESS

Angela Notari, Co-Principal Investigator

ABSTRACT

This project investigated the effects of instruction in phonemic awareness during preschool and/or kindergarten on the metalinguistic development and subsequent reading achievement of young children with disabilities. Research with normally developing children has provided evidence that phonemic awareness can be taught to preschool children, that phonemic awareness is a strong predictor of reading in first grade, and that early instruction in phonemic awareness results in the improvement of reading skills. Initial evidence exists that preschool and kindergarten children with disabilities are able to learn rhyming, blending and segmenting skills following short-term intensive training.

This project consisted of two studies. The main study combined a longitudinal and experimental design where children received instruction in phonemic awareness during preschool and/or kindergarten and were followed through first grade. Seventy-nine preschool children with disabilities participated in the study. Children were randomly assigned to an experimental and a control group. The children in the experimental group participated in 15-minute small group instruction three times a week on phonemic awareness focusing on rhyming, and syllable blending and segmentation using a program developed by this project. Following treatment, and controlling for general ability and language, significant effects were found favoring the experimental group on their rhyming skills and their ability to repeat sequences of phonemes.

During the second year, 64 children continued to participate in the project. Children were assigned to one of four different groups: one group of 16 children who received 2 years of instruction in phonemic awareness in preschool and kindergarten; one group of 17 children who received 1 year of instruction in preschool; one group of 16 children who received 1 year of instruction in kindergarten; and one group of 15 children who did not receive any formal instruction in phonemic awareness skills during the 2 years (CC). The kindergarten instruction program included alliteration and first sound isolation in addition to the earlier skills taught during preschool. No significant differences between experimental and control groups were found on measures of phonemic awareness, nor were significant differences found on measures of phonemic awareness and reading during first grade. Factors that might be related to the failure to find differences include the nonrandom assignment of 25 percent of the kindergarten sample, the lower general ability scores of the experimental groups, differences in treatment implementation among instructors, and the facilitative effects of reading instruction in kindergarten and first grade. We will examine the possible role of these factors more in-depth.

The second study consisted of a replication study with a new sample of 66 preschool and kindergarten children. Again, statistical analyses failed to reveal significant experimental group gains.

This study showed that young children with disabilities are able to learn early phonemic awareness skills such as rhyming and syllable manipulations. Skills involving phonemes develop later. While children profited from phonemic awareness instruction during preschool, having received instruction did not appear to affect their later metalinguistic development or first grade reading. Moderate predictive relationships were found between preschool decentration measures and later metalinguistic and reading measures.

PROJECT OBJECTIVES

The overall goal of this project is to investigate the effects of instruction in phonemic awareness during preschool and/or kindergarten on the metalinguistic development of young children with disabilities, as well as on their subsequent reading achievement at the end of first grade.

This project has five major procedural goals:

Goal 1.0 To examine the effects of instruction in phonemic awareness **during preschool** on the metalinguistic development of young children with disabilities.

Goal 2.0 To examine the effects of instruction in phonemic awareness **during kindergarten** on the metalinguistic development of young children with disabilities.

Goal 3.0 To examine the effects of amount and timing of instruction in phonemic awareness on subsequent (end of first grade) reading achievement and metalinguistic development.

Goal 4.0 To examine the relationship between early metacognitive abilities and metalinguistic development in young children with disabilities.

Goal 5.0 To test the effects of a revised and enhanced program of instruction in phonemic awareness, based on Year 1 and Year 2 analyses of metalinguistic outcomes, on a new sample of preschool and kindergarten children with disabilities.

For each of these five major procedural goals, specific objectives and activities have been identified in order to evaluate the quality of implementation and the timeliness of the completion of tasks and activities. Objectives, activities, and timelines are presented in the following table.

Project Objectives, Activities and Timelines

Goal 1.0: To examine the effects of instruction in phonemic awareness **during preschool** on the metalinguistic development of young children with disabilities.

OBJECTIVES AND ACTIVITIES	PERSON(S) RESPONSIBLE	TIMELINE
1.1: To develop a program of instruction in phonemic awareness for preschool.		
a. Re-review the literature on early phonemic awareness.	Co-Principal Investigator	Month 1
b. Sequence early phonemic awareness skills and develop developmentally appropriate activities for preschool instruction.	Co-Principal Investigator	Months 2-6
c. Consult weekly with expert.	Principal Investigator, Co-Principal Investigator	Months 2-6

1.2: To pretest preschool children and assign children to groups.		
a. Work with Highline Public Schools to prepare for implementation of the study (obtain parent consent, inform teachers, schedule testing).	Co-Principal Investigator	Month 1
b. Train testers on the administration of measures.	Co-Principal Investigator, Testers	Months 1-2
c. Pretest preschool children on selected cognitive, language, early literacy, and metalinguistic measures.	Co-Principal Investigator, Testers	Month 2
1.3 To implement preschool instruction in phonemic awareness		
a. Randomly assign children to treatment and control groups.	Co-Principal Investigator	Month 2
b. Develop schedule for instruction in collaboration with preschool teachers.	Co-Principal Investigator, Trainers, Teachers	Month 2
c. Train trainers.	Co-Principal Investigator, Trainers	Months 2-8
d. Implement preschool instruction.	Co-Principal Investigator	Months 3-8
1.4: To conduct formative monitoring of the implementation of instruction.		
a. Collect anecdotal information on daily implementation of instructional activities.	Co-Principal Investigator, Trainers	Months 3-8
b. Observe and meet weekly with trainers.	Co-Principal Investigator, Trainers	Months 3-8
c. Consult weekly with expert.	Principal Investigator, Co-Principal Investigator	Months 3-8
1.5: To posttest children on effects of preschool instruction in phonemic awareness skills on metalinguistic development.		
a. Conduct testing of children on selected posttest measures.	Co-Principal Investigator, Testers	Month 8
1.6: To analyze data on effects of preschool instruction in phonemic awareness.		
a. Conduct statistical analyses on pre- and posttest data.	Co-Principal Investigator	Months 9-10
b. Interpret results.	Co-Principal Investigator	Months 9-10
c. Meet weekly with expert.	Principal Investigator, Co-Principal Investigator	Months 9-12
d. Prepare manuscript.	Co-Principal Investigator	Months 10-12

Goal 2.0: To examine the effects of instruction in phonemic awareness **during kindergarten** on the metalinguistic development of young children with disabilities.

OBJECTIVES AND ACTIVITIES	PERSON(S) RESPONSIBLE	TIMELINE
2.1: Prepare content of instruction in phonemic awareness for kindergarten.		
a. Revise and add to program content developed for use during the first year.	Co-Principal Investigator	Months 13-15

b. Consult with expert.	Principal Investigator, Co-Principal Investigator	Months 13-15
2.2 To pretest kindergarten children and assign children to groups.		
a. Work with Highline Public Schools to prepare for testing and implementation of instruction.	Co-Principal Investigator	Month 13
b. Train testers on the administration of measures.	Co-Principal Investigator, Testers	Months 13-14
c. Pretest kindergarten children on selected cognitive, early literacy, and metalinguistic measures.	Co-Principal Investigator, Testers	Month 14
2.3 To implement kindergarten instruction in phonemic awareness.		
a. Randomly assign children to treatment and control groups.	Co-Principal Investigator	Month 14
b. Develop schedule for instruction in collaboration with kindergarten teachers.	Co-Principal Investigator, Trainers, Teachers	Month 14
c. Train trainers.	Co-Principal Investigator, Trainers	Months 14-20
d. Implement kindergarten instruction.	Co-Principal Investigator, Trainers	Months 15-20
2.4 To conduct formative monitoring of the implementation of instruction.		
a. Collect anecdotal information on daily implementation of instructional activities.	Co-Principal Investigator, Trainers	Months 15-20
b. Observe and meet weekly with trainers.	Co-Principal Investigator, Trainers	Months 15-20
c. Consult weekly with expert.	Principal Investigator, Co-Principal Investigator	Months 15-20
2.5 To posttest children on effects of kindergarten instruction in phonemic awareness skills on metalinguistic development.		
a. Conduct testing of children on selected posttest measures.	Co-Principal Investigator, Testers	Month 20
2.6 To analyze data on effects of kindergarten instruction in phonemic awareness.		
a. Conduct statistical analyses on pre- and posttest data.	Co-Principal Investigator	Months 21-22
b. Interpret results	Co-Principal Investigator	Months 21-23
c. Meet with expert.	Principal Investigator, Co-Principal Investigator	Months 21-24
d. Prepare manuscript.	Co-Principal Investigator	Months 22-24

Goal 3.0: To examine the effects of amount and timing of instruction in phonemic awareness on subsequent (end of first grade) reading achievement and metalinguistic development.

OBJECTIVES AND ACTIVITIES	PERSON(S) RESPONSIBLE	TIMELINE
3.1: To identify first grade school placement of children in study.		
a. Obtain information from Highline Public Schools and parents.	Co-Principal Investigator	Months 28-30
3.2: To collect follow-up data on phonemic awareness, literacy, and reading achievement of experimental and control group children at the end of first grade.		
a. Train testers.	Co-Principal Investigator, Testers	Month 29
b. Conduct follow-up testing.	Co-Principal Investigator, Testers	Months 30-32
3.3: To analyze data on subsequent effects on first grade reading achievement and metalinguistic development of instruction in phonemic awareness during preschool and/or kindergarten.		
a. Conduct statistical analyses.	Co-Principal Investigator	Months 32-34
b. Interpret results.	Co-Principal Investigator	Months 33-34
c. Meet with expert.	Principal Investigator, Co-Principal Investigator	Months 32-36
d. Prepare manuscripts for dissemination.	Co-Principal Investigator	Months 34-36

Goal 4.0: To examine relationships between early metacognitive abilities and metalinguistic development in young children with disabilities.

OBJECTIVES AND ACTIVITIES	PERSON(S) RESPONSIBLE	TIMELINE
4.1: To develop a set of early decentration tasks appropriate for preschool and kindergarten age children and a set of operativity tasks for first graders.		
a. Select specific early decentration tasks and prepare testing protocol and materials.	Co-Principal Investigator	Months 1 and 25
b. Consult with expert.	Principal Investigator, Co-Principal Investigator	Months 1 and 25

4.2: To conduct testing of children's early decentration abilities at the beginning of preschool and at the beginning of kindergarten, and to conduct testing of operativity at the end of first grade.		
a. Train testers.	Co-Principal Investigator	Months 1-2, 13-14, and 29
b. Administer early decentration tasks to children during preschool and kindergarten pretesting sessions, and operativity tasks at the end of first grade.	Co-Principal Investigator, Testers	Months 2, 14, and 29
4.3: To analyze data on relationships between metacognitive and metalinguistic skills during preschool, kindergarten, and first grade.		
a. Conduct statistical analyses.	Co-Principal Investigator	Months 9-10, 21-22, and 32-33
b. Interpret results.	Co-Principal Investigator	Months 10-11, 22-23, and 33-34
c. Meet with expert.	Principal Investigator, Co-Principal Investigator	Months 9-12, 21-24, and 32-36
d. Prepare manuscript.	Co-Principal Investigator	Months 34-36

Goal 5.0: To test the effects of a revised and enhanced program of instruction in phonemic awareness, based on Year 1 and Year 2 analyses of metalinguistic outcomes on a new sample of preschool and kindergarten children with disabilities.

OBJECTIVES AND ACTIVITIES	PERSON(S) RESPONSIBLE	TIMELINE
5.1: To prepare a revised instructional program in phonemic awareness.		
a. Review data on children's acquisition of specific phonemic awareness skills during Year 1 and Year 2 study.	Co-Principal Investigator	Months 25-27
b. Revise instructional activities and prepare written materials.	Co-Principal Investigator	Months 25-27
5.2: To pretest preschool and kindergarten children and assign children to groups.		
a. Work with Highline Public Schools to prepare for testing and implementation of instruction (obtain parent consent, schedule testing).	Co-Principal Investigator	Month 25
b. Train testers on the administration of measures.	Co-Principal Investigator, Testers	Months 25-26
c. Pretest children on selected cognitive, language, early literacy, and metalinguistic measures.	Co-Principal Investigator, Testers	Month 26
5.3: To implement revised preschool and kindergarten instruction in phonemic awareness.		
a. Randomly assign children to treatment and control groups.	Co-Principal Investigator	Month 26

b. Develop schedule for instruction in collaboration with teachers.	Co-Principal Investigator, Trainers	Month 26
c. Train trainers.	Co-Principal Investigator, Trainers	Month 26
d. Implement revised preschool and kindergarten instruction.	Co-Principal Investigator, Trainers	Months 27-32
5.4: To conduct formative monitoring on the implementation of the revised instruction in phonemic awareness.		
a. Collect anecdotal information on daily implementation of revised instructional activities.	Co-Principal Investigator, Trainers	Months 27-32
b. Observe and meet weekly with trainers.	Co-Principal Investigator, Trainers	Months 27-32
c. Consult with expert.	Principal Investigator, Co-Principal Investigator	Months 27-32
5.5: To posttest preschool and kindergarten children on effects of the revised instruction in phonemic awareness on children's metalinguistic development.		
a. Conduct testing of children on selected posttest measures.	Co-Principal Investigator, Testers	Month 32
5.6: To analyze data on effects of the revised preschool and kindergarten instruction in phonemic awareness.		
a. Conduct statistical analyses on pre- and posttest data.	Co-Principal Investigator	Months 32-33
b. Interpret results.	Co-Principal Investigator	Months 33-34
c. Meet with expert.	Principal Investigator, Co-Principal Investigator	Months 32-36
d. Prepare manuscripts.	Co-Principal Investigator	Months 34-36

Introduction and Conceptual Framework

A major concern for early childhood special educators is to provide children with early learning experiences that will prepare them to enter first grade ready to benefit from formal school instruction.

One of the most critical academic tasks in the primary years is the development of literacy (Farran, 1990). By the end of the first grade, children with disabilities usually score in the bottom quartile on reading assessment measures and the likelihood is more than 80 percent that children who are poor readers in first grade will remain poor readers in fourth grade (Juel, 1988).

Children learn about literacy well before they enter school (e.g., Sulzby & Teale, 1990). The identification of early experiences and skills that are causally related to later reading achievement has important implications for developing interventions in preschool that could prevent reading failure for children with disabilities.

Recently there has been increasing theoretical interest and empirical investigation of the relationship between metalinguistic abilities and learning to read (Tunmer, Herriman, & Nesdale, 1988). Metalinguistic ability refers to the capacity to reflect upon and to manipulate the structural features of spoken language. Research with normally developing children has convincingly shown that one specific metalinguistic skill in particular, phonemic awareness, is a

strong predictor of first grade reading achievement, independent of IQ level (e.g., Maclean, Bryant, & Bradley, 1988; Mann, 1991), and that receiving instruction in early phonemic awareness skills resulted in improved reading achievement (e.g., Ball & Blachman, 1991; Bryant & Bradley, 1985; Cunningham, 1990; Lundberg, Frost, & Peterson, 1988). Phonemic awareness refers to the ability to reflect upon and manipulate the subunits of spoken language (phonemes) and includes skills such as rhyming, phoneme blending, and phoneme segmentation. There is initial evidence that not only normally developing preschool and kindergarten children, but also preschool and kindergarten children with disabilities are able to acquire early phonemic awareness skills following systematic instruction (O'Connor, Jenkins, Slocum, & Leicester, 1993).

This project investigated the effects on metalinguistic development of providing young children with disabilities instruction in early phonemic awareness skills and examined subsequent effects of instruction on first grade reading achievement.

The Link Between Oral Language and Literacy

Recently, formal models of reading development have emphasized the linguistic aspects of literacy, and, in particular, the link between metalinguistic abilities and reading (e.g., Frith, 1986; Morais, 1991; Sawyer, 1992). One metalinguistic ability that is present in children as young as 3 years of age is phonemic awareness, which is the ability to manipulate individual speech sounds and to break words and syllables into phonological segments. Early phonemic awareness includes a variety of skills such as sensitivity to rhyme, phoneme blending, and phoneme segmentation. A link has been postulated between phonemic awareness and literacy in that learning to read in an alphabet system requires the child to become aware that words can be segmented into small units of sound called phonemes (Liberman, Shankweiler, Fischer, & Carter, 1974; Lundberg, Frost, & Peterson, 1988; Mann, 1986; Stanovich, 1986).

Within this perspective, reading disorders are considered primarily as developmental language disorders (Kamhi & Catts, 1989). Empirical support for this view comes from longitudinal studies showing that young children who have language impairments in preschool tend to develop reading problems later in school (e.g., Aram, Nation, & Ekelman, 1986) and that preschool children who are later identified as having reading problems also demonstrate limited phonological awareness skills (Mann & Liberman, 1984; Stanovich, 1986; Tunmer, 1989). This view has lead to recommendations to provide young children at-risk for reading failure with instruction in phonemic awareness *before* they experience reading failure in school (Juel, 1988; Kamhi, 1992; Lundberg & Hoien, 1991).

The Link Between Metacognitive Abilities and Phonemic Awareness

Metacognitive abilities refer to broad processes that enable an individual to be aware of and reflect upon his or her own cognitive processes and strategies. Phonemic awareness requires the ability to reflect on and manipulate the phonemic segments of speech. Tunmer and Rohl (1991) suggest that the development of phonemic awareness is related to the development of broader metacognitive processes and in particular to decentration processes that enable the child to shift attention away from the message content to the properties of language used to convey the content. A study by Tunmer et al. (1988) showed strong correlations in first graders between measures of decentration ability and metalinguistic ability. They also found that children with low levels of phonemic awareness at school entry but high levels of decentration ability showed significantly greater improvement in phonemic awareness during the school year than children with similar levels of phonemic awareness but low levels of decentration ability, a finding which holds important implications for the early identification of children at risk for reading problems.

Teaching Phonemic Awareness to Young Children

Longitudinal and experimental studies conducted in several countries have shown a correlational and causal link between specific phonemic awareness skills and reading acquisition. Knowledge of nursery rhymes, for example, in children as young as 3 years of age was shown to be predictive of first grade reading independent of IQ (Maclean, Bryant, & Bradley, 1988). Phoneme segmentation ability in normally developing kindergartners predicted their first grade reading achievement (Mann, 1991). Improvement in reading performance occurred after normally developing kindergarten and first grade children received instruction in phonemic awareness skills (Ball & Blachman, 1991; Cunningham, 1990). Two important studies combining a longitudinal and a training design demonstrated subsequent effects on first grade reading of normally developing children following phonemic awareness instruction during preschool (Bryant & Bradley, 1985; Lundberg, Peterson, & Frost, 1988).

No studies, to date, have investigated long-term effects of phonemic awareness instruction on later reading achievement of children with disabilities. Intensive, short-term training was successful in improving phonemic awareness skills with at-risk kindergarten children (Bentim & Lesham, 1991; Slocum, 1991), and preschool and kindergarten children with disabilities (O'Connor, Jenkins, Slocum, & Leicester, 1993). The O'Connor et al. study showed that forty-seven 4 - 6 year old children with IQ levels ranging from 50 to 112 (with a mean of 71) made significant gains in rhyming, phoneme blending, and phoneme segmenting over an intensive 7-week training period as compared to a control group. Children made gains independent of their IQ levels.

It has been suggested that aspects of metacognitive development, such as decentration and operativity, rather than the traditional concept of IQ, may play an important role in children's acquisition and learning of phonemic awareness skills (Tunmer et al., 1988). No study to date has investigated the link between early processes, such as decentration, and phonemic awareness in young children with disabilities. Similar to early phonemic awareness abilities, such as rhyming, early forms of decentration abilities are demonstrated in children as young as 3 years of age (e.g., Flavell, Everett, Croft, & Flavell, 1981; Flavell, Shipstead, & Croft, 1978; Hughes & Donaldson, 1979; Masangkay et al., 1974).

While the O'Connor et al. study (1993) was instrumental in demonstrating for the first time that young children with disabilities can be taught early phonemic awareness skills, their study had some limitations. Because of the study's short term nature and the specificity and intensity of the training conducted in an experimental setting, the results do not allow us to draw inferences about instruction provided in regular settings and subsequent effects on later reading achievement. Further, children were trained on only one type of phonemic awareness skill (rhyming, blending, or segmenting), and their improved performance in one skill did not transfer to other skills.

There are individual differences in children's acquisition of phonemic awareness (Mann, 1991). In some studies, not all children showed gains in phonemic awareness despite training (Bradley & Bryant, 1985; Lundberg et al., 1988) and this could not be attributed to low IQ (Stanovich, Cunningham, & Cramer, 1984). One factor that appears to influence the acquisition of phonemic awareness is the level of children's decentration ability (Tunmer et al., 1988) but little evidence is currently available on the relationship between these particular metacognitive and metalinguistic skills.

This project investigated the effects of instruction in phonemic awareness during preschool and kindergarten on the metalinguistic development of young children with disabilities and the subsequent effect of this instruction on reading achievement at the end of first grade. The use of a combined longitudinal and experimental training design permitted a clear interpretation of a

causal relationship between early metalinguistic knowledge and later literacy (Bradley & Bryant, 1985), yielding practical implications for determining the importance and appropriateness of including instruction in phonemic awareness in early childhood special education preschool curricula.

This project also addressed questions regarding developmental readiness, in terms of age and grade level, for instruction in phonemic awareness, as well as optimal length of training. We separately examined the effects for children who have received instruction in preschool and/or in kindergarten, and we compared the reading achievement of children who have received 1 versus 2 years of instruction.

The content of training reflected an extensive sequence of phonemic awareness skills based on the content used in the O'Connor et al. (1993) and Lundberg et al. (1988) studies. In contrast to short term intensive training studies, instruction was implemented over 5 months to better reflect the manner in which instruction takes place in regular classroom settings.

In addition, this study explored the relationship between metacognitive ability and phonemic awareness in order to determine whether children's level of decentration constitutes a source of individual difference in children's ability to benefit from instruction in phonemic awareness.

Research Goals and Questions

This project had five major procedural goals:

1) To examine to the effects of instruction in phonemic awareness **during preschool** on the metalinguistic development of young children with disabilities.

2) To examine the effects of instruction in phonemic awareness **during kindergarten** on the metalinguistic development of young children with disabilities.

3) To examine the effects of amount and timing of instruction in phonemic awareness on subsequent (end of first grade) reading achievement and metalinguistic development.

4) To examine the relationship between early metacognitive abilities and metalinguistic development in young children with disabilities.

5) To test the effects of a revised and enhanced program of instruction in phonemic awareness, based on Year 1 and Year 2 analyses of metalinguistic outcomes, on a new sample of preschool and kindergarten children with disabilities.

From these five major procedural goals, 10 main research questions were derived.

Goal 1) To examine the effects of instruction in phonemic awareness **during preschool** on the metalinguistic development of young children with disabilities.

Research Question 1) When tested at the end of preschool, do young children with disabilities who had received instruction in phonemic awareness during preschool make greater gains on measures of metalinguistic development than children who had not received this instruction?

Goal 2) To examine the effects of instruction in phonemic awareness **during kindergarten** on the metalinguistic development of young children with disabilities.

Research Question 2) When tested at the end of kindergarten, do young children with disabilities who had received instruction in phonemic awareness during kindergarten make greater gains on measures of metalinguistic development than children who had not received this instruction?

Goal 3) To examine effects of amount and timing of instruction in phonemic awareness on subsequent reading achievement and metalinguistic development.

Research Question 3) Do children with disabilities who received instruction in phonemic awareness during preschool and/or kindergarten perform better than children who did not receive instruction on measures of reading achievement and of metalinguistic development at the end of first grade?

Research Question 4) Do children with disabilities who received 2 years of instruction in phonemic awareness (during preschool and kindergarten) perform better than children who received only 1 year of instruction (preschool or kindergarten) on measures of reading achievement and of metalinguistic development at the end of first grade?

Research Question 5) Do children with disabilities who received instruction in phonemic awareness only during kindergarten perform better than children who received instruction only during preschool on measures of reading achievement and metalinguistic development at the end of first grade?

Goal 4) To examine the relationship between early metacognitive abilities and metalinguistic development in young children with disabilities.

Research Question 6) Are early decentration abilities related to measures of phonemic awareness in young children with disabilities when tested at the end of preschool and kindergarten?

Research Question 7) Are decentration abilities related to measures of phonemic awareness in young children with disabilities at the end of first grade?

Research Question 8) Do preschool and kindergarten children with disabilities who have high levels of decentration make better gains in instruction in phonemic awareness than children with low levels of decentration?

Goal 5) To test the effects of a revised and enhanced program of instruction in phonemic awareness, based on Year 1 and Year 2 analyses of metalinguistic development with a new sample of preschool and kindergarten children with disabilities.

Research Question 9) Do preschool and kindergarten children with disabilities who received the revised instruction in phonemic awareness make greater gains on measures of metalinguistic development than control children in special education preschools and kindergarten classrooms?

Research Question 10) How do the original and the revised instruction program in phonemic awareness compare in terms of facilitating the acquisition of specific phonemic awareness skills in young children with disabilities?

Description of the Studies

In the following narrative, we present a detailed description of the project activities and findings. First described is the main study which investigated the effects of instruction in phonemic awareness during preschool and/or kindergarten on the metalinguistic development and subsequent reading achievement of young children with disabilities (Research Questions 1 through 8). Then, we describe a second study which examined the effectiveness of the re-implementation of a revised instructional program in phonemic awareness with a new sample of preschool and kindergarten children with disabilities (Research Questions 9, 10).

Study 1

Subjects

Seventy-nine children who were in their last year of preschool were followed longitudinally during 3 years from preschool through kindergarten until the end of first grade. All the children were qualified to receive special education services according to Washington State guidelines. Subjects were enrolled in the Seattle and Highline public school's preschool classrooms.

Measures

A variety of measures were used to assess different cognitive, intelligence, metalinguistic, literacy, and academic abilities and achievement of the children. Some tests were used for children in preschool and in kindergarten, others for children in first grade, and others for children at all grade levels.

Metalinguistic Measures

1. **The Lindamood Auditory Conceptualization Test - Revised** (LAC; Lindamood & Lindamood, 1979). This test was designed to measure auditory perception and conceptualization of speech sounds. The child manipulates wooden blocks of various colors which represent individual speech sounds. Tasks require the child to discriminate different speech sounds (e.g., /p/ from /b/) and to compare the number and sequence of sounds within spoken patterns, as in differentiating *at*, *pat*, *tap*, and *apt* from each other.

   Minimum performance scores for each grade or age level were determined on the basis of statistical data and clinical experience. Validity data were obtained for a sample of 660 children in *grades K through 12* representing a range of socioeconomic and ethnic groups. Predictive validity with the Wide Range Achievement Test (WRAT) Reading and Spelling subtests ranged from .66 to .81 for different grade levels with a mean of .73. Pre-post test reliability with alternate forms was .96 on a subsample of 52 subjects.

   The LAC was administered to children during kindergarten and first grade in order to measure changes in their metalinguistic development. No norms are available for

preschool children and the tasks included in the test are considered too difficult for very young children.

2. **The Auditory Analysis Test** (AAT; Rosner & Simon, 1971). This is an oral test of auditory perception which focuses on the deletion of sounds. Items consist of words in which the elimination of a phoneme or a syllable would still result in another English word (e.g., cow[boy], tooth[brush]). Validity data were collected on a sample of 284 while middle class children *K through 6th grade*. Validity with the Stanford Achievement Test (1970) Language Arts skills ranged from .53 to .84 with a mean of .65.

   The AAT was administered to children during kindergarten and first grade. The tasks included in the test are considered inappropriate for younger children and no data are available for preschool age children.

3. **Test of Phonemic Awareness** (O'Connor, 1991). O'Connor (1991) developed six subtests of phonemic awareness which *she has piloted on over 200 preschool and kindergarten children with disabilities* (e.g., O'Connor et al., 1993). Subtests measure skills such as rhyme production, phoneme blending and segmenting, sound repetition, and letter naming, and were derived from measures used in previous studies on various phonemic awareness skills in young children (Bradley & Bryant, 1983; Maclean, Bryant, & Bradley, 1987; Fox & Routh, 1975; Lewkowicz, 1980; Yopp, 1988). Each task begins with three practice items for which children are given corrective feedback. Examples of items include rhyming tasks such as, "Say a word that rhymes with land"; blending tasks such as, "If you put these sounds together, they make a word. d-ad. What word is that?"; and segmenting tasks, such as, "Say all the sounds in map." A test protocol is contained in Appendix A.

   This test was administered to all children during preschool, kindergarten and first grade, as the test has been shown to be appropriate for children with disabilities who are preschool-age and older.

Academic Achievement

The Woodcock-Johnson Psycho-Educational Battery-Revised (WJ-R; Woodcock & Johnson, 1989, 1990). The WJ-R is a wide-range, comprehensive set of individually administered tests for measuring cognitive abilities, scholastic aptitudes, and achievement. Normative data were obtained from a national standardization on 6,359 subjects aged from 24 months to 95 years of age. The distribution of subjects and of the norming data closely approximates the distribution in the U.S. population in terms of socioeconomic, ethnic, gender, and geographical variables. The kindergarten to 12th grade sample was composed of 3,265 subjects. The test yield age and grade equivalents as well as standard scores. The WJ-R was selected because it provides a broad measure of reading achievement, as well as measures of specific reading abilities. Four subtests were used: the **Letter-Word Identification** subtest, the **Passage Comprehension** subtest, the **Word Attack** subtest, and the **Reading Vocabulary** subtest. Internal consistency reliability coefficients for the four reading subtests range from .88 to .96 with standard errors of measurements ranging from 3.7 to 7.0 for ages 4 to 9 years. Concurrent validity of the WJ-R Broad Reading score was calculated with the PIAT-Reading Composite, the K-ABC Reading Composite, the WRAT-R Reading, the BASIS Reading, and the KTEA Reading Composite. Correlations ranged from .63 to .86 with a mean of .79.

This test was administered to children at the end of first grade.

Teacher questionnaire. A short questionnaire was developed to obtain information on the teacher's evaluation of children's classroom reading performance at the end of first grade. An example is included in Appendix B.

Early Literacy Measures

Concepts about Print (Clay, 1979). This test was developed by Clay (1979) to assess children's early literacy skills. The Concepts-about-Print Test measures children's understanding of concepts about printed language (e.g., that print, not the picture, tells the story). The test was administered to children during first grade, to examine relationships between early literacy skills, metalinguistic development and reading.

The Developing Skills Checklist (DSC) (CTB, 1990). Originally, we planned to use Concepts about Print (Clay, 1979) to measure changes in early literacy skills during preschool and kindergarten. This test, however, resulted beyond the abilities of preschool- and kindergarten-age children and was therefore substituted by the Print Concepts component of the Developing Skills Checklist (DSC). The DSC is a normed assessment that measures a range of skills and behaviors that children typically develop between preschool and the end of kindergarten. The Print Concepts component of the DSC measures skills that are important to reading development in young children. Beginning items ask children to open a book, turn the pages, and identify picture. Later items assess children's ability to differentiate print from pictures, and to identify components of written communication, such letters, words and sentences. Age norms are based on a total sample of over 5,000 children aged from 4 through 6 from diverse geographic areas, socioeconomic levels, and ethnic backgrounds, and includes children enrolled in special education programs. Split-half reliability for the Print Concepts component is .84. The test yields raw scores (ranging from 0 to 21), normal curve equivalents (NCE), national percentiles, and stanines.

Parent questionnaire. A simple questionnaire was developed to obtain information from parents about children's early exposure to emergent literacy events (e.g., storybook reading, environmental print, nursery rhymes, etc.). An example is included in Appendix B.

Teacher questionnaire. A simple questionnaire was developed to obtain information from teachers about early literacy activities (e.g., storybook reading) implemented in their classrooms.

The parent and teacher questionnaires were completed when children were in preschool in order to obtain information about possible relationships between early exposure to literacy and subsequent reading in first grade.

Decentration Measures

Early Decentration Abilities. A series of tasks derived from the developmental literature (e.g., Hughes et al., 1979; Flavell et al., 1981; Flavell et al., 1978; Masangkay et al., 1974) were used to evaluate children's decentration abilities. Tasks selected were those shown to be completed successfully by typically developing children as young as 2-3 years of age. They included three simple decentration tasks which assess children's knowledge about other people's visual perceptions such as requiring the child to know that if a picture is held vertically with its back towards the other person, the child sees the picture, but the other person does not (Masangkay et al., 1974) (The Picture Identification task); to be aware that objects present different appearances when viewed from different spatial locations (Flavell et al., 1981) (The Turtle task); to be able to hide objects from the view of other people (Hughes et al., 1979; Flavell et al., 1978) (The Hidden Toy task). These early decentration tasks were administered to

children at the beginning of preschool and kindergarten in order to examine the effects of individual differences in levels of decentration on children's acquisition of phonemic awareness skills, as well as relationships of early decentration abilities with subsequent reading achievement. A copy of the protocol is included in Appendix C.

Operativity Test. A series of tasks derived from Arlin (1981) and Tunmer et al. (1988) were used to measure children's level of decentration at the end of first grade through simple concrete operational tasks including simple seriation, classification, task inclusion, number conservation, and conservation of quantity. Relationships were examined between performance on these tasks and reading achievement. A copy of the protocol is included in Appendix D.

Intelligence and Language Tests

Intelligence and Language Tests. We chose to use different measures to control for intelligence and language from those originally planned, for the following reasons. We considered the Kaufman Assessment Battery for Children (K-ABC) (Kaufman & Kaufman, 1983) as better suited to testing young children with disabilities than our original choice, the McCarthy Scale of Children's Abilities (McCarthy, 1972), because exceptional children were included in the K-ABC's standardization sample. Also, performance on tasks covered in the K-ABC have been found to be associated with reading performance for children with disabilities. The Peabody Picture Vocabulary Test-Revised (Dunn & Dunn, 1981) was used instead of the Test of Early Language Development because of its stronger psychometric properties and its wider use in research related to reading.

Intelligence Test

Kaufman Assessment Battery for Children (K-ABC; Kaufman & Kaufman, 1983). The K-ABC was devised to assess cognitive abilities in children ages 2 1/2 to 12 1/2 years. The K-ABC was standardized on a national sample of 2,000 children. The stability reliability for preschoolers ranges from .77 to .88, and concurrent, predictive, and construct validity were supported by high correlations coefficients with the Luria-Nebraska Children's Battery (Golden, 1981).

All children were tested with the K-ABC once at the beginning of preschool. Children's Mental Composite Score was used to control for initial individual differences in intelligence.

Language

Peabody Picture Vocabulary Test - Revised (Dunn & Dunn, 1981). The PPVT-R is a normed, pictorial multiple choice test that evaluates semantic comprehension of children between 2.5 and 18 years. The test yields a raw score, a language quotient, and language ages. The PPVT-R is a widely used measure that presents excellent standardization, reliability, and validity (Sattler, 1988).

The PPVT-R was administered to all children once at the beginning of preschool. PPVT-R standard scores were used to control for initial individual differences in oral language abilities.

Treatment

An instructional program for teaching phonemic awareness skills was developed based upon the content successfully taught by O'Connor et al. (1993) to preschool children with

disabilities and by Lundberg et al. (1988) to normally developing preschool children. Skills were integrated within developmentally appropriate games and activities, such as looking at books, motor activities, dancing, pretend play, and art activities (Morrow, 1989). The program was structured according to difficulty and developmental sequence of skills, beginning with listening to verbal and nonverbal sounds, and to nursery rhymes, and then progressing to rhyme production, oddity tasks (recognizing whether sounds are the same or different), syllable discrimination (separating words into syllables, i.e., through clapping hands to syllables), sound blending (c + a + t = cat) and phonemic segmentation (segmenting words into separate sounds, e.g., dog = d + o + g). Instruction in terms of rate of progression through sequences of skills and amount of instructional support was individualized according to the child's individual needs. During the first year, in preschool, instruction focused primarily on listening to sounds, the learning of nursery rhymes, rhyme tasks and syllable blending and segmentation. During the second year, in kindergarten, alliteration and first sound tasks were also incorporated into the curriculum. A copy of the final version of the curriculum is included with this report in Appendix E.

Design

The study used a combined longitudinal and experimental design with block random assignment of subjects to experimental and control groups.

Figure 1 presents a schematic of the design and describes the conditions of the three experimental and the one control group.

Figure 1. Schematic of Design

Year of Study	Grade	Groups			
1	Preschool (n = 79)	Phonemic Awareness Instruction (n = 39)		No Instruction (n = 38)	
2	Kindergarten (n = 64)	Phonemic Awareness Instruction (n = 16)	No Instruction (n = 17)	Phonemic Awareness Instruction (n = 16)	No Instruction (n = 15
		V	V	V	V
3	First Grade (n = 57)	Two years instruction (preschool and kindergarten) (n = 14)	One year preschool instruction (n = 16)	One year kindergarten instruction (n = 14)	No instruction (n = 13)

Procedures

Year 1:

Pretesting. Seventy-nine children were tested individually by two trained testers, blind to the purposes of this study, on a variety of measures. The K-ABC and the PPVT-R served to

control for possible effects of intelligence and language on phonemic awareness training and on reading achievement. The Phonemic Awareness Test (O'Connor, 1992) served as pretest to measure children's initial knowledge of phonemic awareness. Early decentration measures were gathered to investigate the effects of individual differences in this ability on metalinguistic development and reading. Testing was conducted over two 20-30 minute sessions. The Phonemic Awareness Test and the decentration tasks were administered during the first session, and the K-ABC and the PPVT-R were administered during the second session. Information from teachers and parents on children's early home and classroom literacy experiences were gathered through questionnaires in order to evaluate the effects of early exposure to literacy on phonemic awareness training and reading. Teachers completed questionnaires on a total of 54 children, and parents completed questionnaires on a total of 56 children.

Training. Children were matched as closely as possible on the basis of their K-ABC and PPVT-R scores and randomly assigned to either one of the experimental groups or to the control group. Thirty-nine children were assigned to the experimental group and 38 children were assigned to the control group. Trainers conducted instructional activities with a total of 15 groups of 2 - 3 children located in five different school buildings in Highline and five different school buildings in Seattle. The large number of sites and the constraints of random assignment resulted in having a larger number of small groups than originally planned and required the hiring of additional trainers to accommodate teacher schedules and multiple school sites. Children received 15 minutes of instruction three times a week over a 5-month period. The content of instruction was originally designed to include sound awareness and listening skills, rhyming, blending and segmentation. However, the skills actually taught consisted primarily of sound awareness and rhyming, as well as some blending and segmentation of syllables. Alliteration, first sound isolation, blending and segmentation of phonemes resulted beyond the cognitive abilities of these preschool children.

Fidelity of Treatment. The Co-Principal Investigator trained the trainer prior to the implementation of instructional activities and observed them to ensure that instructional activities were implemented in a reliable and valid manner. The Co-Principal Investigator met with the trainers on a weekly basis to provide on-going training, to discuss problems, and give feedback from classroom observations. Trainers maintained written records on the daily implementation of activities.

Posttesting. All children were posttested individually the Phonemic Awareness Test (O'Connor, 1991) by two trained testers, blind to the purposes of the study, in order to evaluate the effects of instruction in phonemic awareness.

Year 2:

Pretesting. Of the 76 children posttested at the end of preschool, we were able to locate a total of 64 children for whom consent was given for continued participation in the study. In order to begin instruction in a timely manner, we decided to use the preschool posttest measures collected in June as pretest measures as children had received no instruction in phonemic awareness during the summer.

Training. Children were matched as closely as possible on their K-ABC Mental Composite and PPVT-R standard scores and randomly assigned to either one of the experimental groups or to the control group. It was, however, not possible to assign all children to groups on a random basis. Because of the school districts' inclusion policies, many children who qualified for special education services were integrated in regular kindergarten classrooms in their neighborhood school. Because of design of the study and time constraints, when a child was the only subject in a particular classroom and school, it was not possible to include the child in an

experimental group. Also, two kindergarten teachers consented to children's participation only as controls. A total of 16 children (25% of the sample) were therefore assigned nonrandomly to the control group.

A total of 32 children were assigned to the kindergarten experimental group and 32 were also assigned to the control group, constituting four different groups at the end of kindergarten: one group of 16 children who received two years of instruction in phonemic awareness in preschool and kindergarten (EE); one group of 17 children who received one year of instruction in preschool (EC); one group of 16 children who received one year of instruction in kindergarten (CE); and one group of 15 children who did not receive any formal instruction in phonemic awareness skills during the two years (CC).

The 32 children assigned to the kindergarten experimental group received 15 minutes of instruction in small groups of 2-3 children three times a week over a 5-month period. In addition to the listening skills, sound awareness, rhyming and syllable blending and segmentation taught earlier during preschool, alliteration and first sound isolation were also taught.

Fidelity of Treatment. Trainers maintained written records on the daily implementation of activities and were observed by the Co-PI to ensure that instructional activities were implemented in a reliable and valid manner. The Co-PI also met weekly with the trainers to provide feedback, to evaluate and plan activities, and discuss children's learning of skills.

Posttesting. Fifty-seven children were posttested individually on the Phonemic Awareness Tests, the Lindamood Auditory Conceptualization Test, the Auditory Analysis Test, and the Print Concepts component of the Developing Skills Checklist. Seven children had moved out of the Seattle and Highline School districts during the year. Testing was conducted over two 20-30 minute sessions, with the Phonemic Awareness Test administered during the first session and the other three tests administered during the second session.

Year 3:

Follow-up Testing. Fifty-two of the original preschool sample of 79 children were located and tested at the beginning of the school year on five types of Piagetian tasks: conservation of substance, conservation of number, simple classification, class inclusion and simple seriation tasks. The protocols were modifications of the original tasks developed by Piaget and Inhelder. Scoring of the tasks was based upon procedures developed by Arlin (1981). At the end of the school year these children were also tested on the four reading subtests of the Woodcock-Johnson-Revised: the Letter Word Identification, the Word Attack, Passage Comprehension and Reading Vocabulary, the Concepts about Print (Clay, 1979), the Phonemic Awareness Test, the Lindamood Auditory Conceptualization Test, and the Auditory Analysis Test. Testing was conducted over two 20-30 minute sessions, with the Phonemic Awareness Test, the Lindamood Auditory Conceptualization Test, and the Auditory Analysis Test administered during the first session and the reading tests administered during the second session.

Results

Year 1: Preschool

Table 1 presents age, general intelligence, decentration and language characteristics for the experimental and control group preschool children prior to treatment. A multivariate analysis of variance (MANOVA) shows no differences between the two groups on any of these variables.

TABLE 1
Age, Intelligence, and Language Characteristics for Preschool Groups

	Experimental (n = 39)		*Control (n = 38)*	
Measure	*M*	*SD*	*M*	*SD*
Chronological age (months)	56.23	(4.15)	56.08	(4.43)
K-ABC - MC	75.51	(11.87)	79.76	(10.85)
PPVT-R - SS	73.72	(18.09)	75.05	(19.08)
DEC PI	4.15	(1.76)	3.97	(1.88)
DEC HT	2.77	(1.60)	2.53	(1.54)
DEC - Turt	0.10	(0.31)	0.13	(0.34)

K-ABC-MC: Kaufman Assessment Battery for Children Mental Composite
PPVT-R-SS: Peabody Picture Vocabulary Test - Revised Standard Score
DEC-PI: Decentration Task - Picture Identification
DEC-HT: Decentration Task - Hidden Toy
DEC-Turt: Decentration Task - Turtle

Table 2 shows pretest and posttest means and standard deviations for the 10 subtests of the Phonemic Awareness test; Nursery Rhymes, Rhyme Detection, Rhyme Production, Detection of Alliteration, Production of Alliteration, Syllable Blending, Phoneme Blending, Multisyllable Word Repetition, Sound Repetition, and First Sound Isolation. Scores for individual subtests ranged from 6 to 30 points. Scores for individual subtests were transformed into z-scores to calculate composite scores for the total test, the three rhyming subtests, the alliteration subtests, the blending subtest and the word and sound repetition subtests. (See Table 2 on next page.)

TABLE 2
Preschool Pre- and Posttest Score Means and Standard Deviations on Phonemic Awareness Measures

	Pretest				*Posttest*			
	Experimental (n = 39)		*Control (n = 38)*		*Experimental (n = 38)*		*Control (n = 38)*	
Measure	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Nursery rhymes	8.46	(7.75)	8.32	(6.84)	16.74	(9.61)	14.24	(7.44)
Rhyme detection	1.03	(1.51)	0.74	(1.22)	2.50	(1.83)	2.05	(1.90)
Rhyme production	0.31	(1.06)	0.32	(0.81)	1.18	(1.98)	0.84	(1.57)
Detection of alliteration	0.33	(0.87)	0.63	(1.26)	1.03	(1.39)	1.47	(1.62)
Production of alliteration	0.51	(0.22)	0.13	(0.53)	0.29	(1.14)	0.55	(1.27)
Syllable blending	2.90	(2.67)	3.42	(2.60)	3.37	(2.67)	3.05	(2.61)
Phoneme blending	0.90	(1.82)	0.92	(1.62)	1.50	(2.79)	1.00	(1.79)
Multisyllable word repetition	13.92	(5.60)	15.05	(5.27)	17.16	(2.92)	17.63	(2.14)
Sound repetition	13.74	(7.94)	14.40	(7.83)	19.11	(6.77)	17.18	(7.50)
First sound	0.26	(0.16)	0.53	(0.32)	0.53	(2.27)	0.45	(2.00)

The means for the pretest scores for the Rhyme Detection and Production subtests, the two alliteration tasks, the phoneme blending and the first sound isolation tasks were very low with large standard deviations indicating that these tasks may well be below the abilities of children at this stage. At posttest, scores improved slightly for the Rhyme Detection subtest, but the other tasks remained too difficult for these children.

A MANOVA on pretest scores showed no significant differences between experimental and control groups on these variables, whereas at posttest, controlling for ability levels (K-ABC-MC) and language (PPVT-R), significant effects were found favoring the experimental group on the Sound Repetition subtest, $F(1, 72) = 4.15$, $p = .045$ (Wilks's lambda = .803), and the composite score for Rhyming, $F(1, 72) = 4.41$, $p = .039$ (Wilks's lambda = .803).

Table 3 presents Pearson Product Moment correlation coefficients between the three measures of decentration, the K-ABC-MC and the PPVT-R standard scores with pretest and posttest measures of phonemic awareness skills. (See Table 3 on next page.)

TABLE 3
Correlations Between Measures of Decentration, Intelligence, and Language at the Beginning of Preschool With Preschool Pre- and Posttest Measures of Phonemic Awareness Skills

	Pretest										Posttest									
Measure	*NR*	*RD*	*RP*	*DA*	*PA*	*SB*	*PB*	*MSWR*	*SR*	*FS*	*NR*	*RD*	*RP*	*DA*	*PA*	*SB*	*PB*	*MSWR*	*SR*	*FS*
Decentration picture identification	.35**	.26**	.06	.19*	.21*	.26*	.04	.16	.36**	.14	.19*	.21*	.16	.26**	.29**	.21*	.31**	.33**	.14	.23*
Decentration hidden toy	.28**	.18	.19*	.16	.05	.31**	.10	.27**	.35**	.13	.24*	.30**	.27**	.31**	.19*	.34***	.34***	.45***	.26*	.17
Decentration turtle	-.01	.18	.19	.07	.32**	.18	.31**	.01	.05	.11	-.02	.07	.07	.24*	.08	-.05	.12	.12	.00	.11
K-ABC-MC	.04	.30**	.21*	.16	.15	.36**	.38**	.32**	.41**	.08	.20*	.36***	.37***	.38***	.10	.28**	.40***	.36***	.37***	.20*
PPVT-R-SS	.26*	.33**	.15	.32**	.21*	.17	.32**	.19	.20*	.10	.20*	.39***	.22*	.25*	.35***	.28**	.40***	.33***	-.02	.29**

NR: Nursery rhymes
RD: Rhyme detection
RP: Rhyme production
DA: Detection of alliteration
PA: Production of alliteration
SB: Syllable blending
PB: Phoneme blending
MSWR: Multisyllable word repetition
SR: Sound repetition
FS: First sound
K-ABC-MC: Kaufman Assessment Battery for Children Mental Composite
PPVT-R-SS: Peabody Picture Vocabulary Test - Revised Standard Score
*p < .05. **p < .01. ***p < .001, one tailed.

Pretest correlations ranged from -.01 to .41. Two decentration measures: Picture Identification and the Hidden Toy, the K-ABC-MC and the PPVT-R SS were significantly related with the Rhyming subtasks, with slightly higher correlations for the two decentration tasks. The language scores, and two decentration tasks: the Picture Identification and the Turtle were significantly correlated with the alliteration tasks. The K-ABC-MC had the strongest correlations with the Blending and the Sound Repetition tasks. Overall, the strongest correlations were found for the K-ABC-MC and the Decentration Picture Identification tasks. Correlations with posttest scores were slightly stronger and ranged from -.02 to .45. Patterns were similar for the Rhyming measures. Compared to the pretest scores, the K-ABC-MC had stronger correlations with the alliteration and first sound tasks, and the Hidden Toy decentration tasks had stronger correlations with the posttest measures of alliteration, blending and repetition. The strongest overall associations were with the Decentration Hidden Toy and the K-ABC-MC.

Year 2: Kindergarten

Table 4 presents age, general intelligence, decentration and language characteristics for the experimental and control groups of kindergarten-age children prior to treatment. A multivariate analysis of variance (MANOVA) shows no differences between the four groups on any of these variables. Children in the three experimental groups had lower mean scores on the K-ABC-MC than children in the control group. The children assigned to the group who received phonemic awareness instruction both in preschool and kindergarten (EE) had the lowest mean scores on the K-ABC-MC.

TABLE 4
Age, Intelligence, and Language Characteristics for Kindergarten Groups

	Experimental - Experimental (EE) (n = 16)		*Experimental Control (EC) (n = 17)*		*Control - Experimental (CE) (n = 16*		*Control - Control (CC) (n = 15)*	
Pretest Measure	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Chronological Age	67.88	(4.23)	68.47	(4.47)	67.75	(4.09)	69.88	(4.35)
K-ABC - MC	74.19	(10.97)	76.12	(14.14)	78.13	(10.34)	81.47	(10.82)
PPVT-R - SS	71.31	(18.64)	73.65	(19.23)	79.38	(20.38)	72.50	(18.16)
DEC - PI	4.25	(1.53)	4.06	(1.95)	3.56	(1.83)	4.50	(2.03)
DEC - HT	2.38	(1.63)	2.88	(1.73)	2.50	(1.63)	2.75	(1.48)
DEC - Turt	0.13	(0.34)	0.12	(0.33)	0.13	(0.34)	0.19	(0.40)

K-ABC-MC: Kaufman Assessment Battery for Children Mental Composite
PPVT-R-SS: Peabody Picture Vocabulary Test - Revised Standard Score
DEC-PI: Decentration Task - Picture Identification
DEC-HT: Decentration Task - Hidden Toy
DEC-Turt: Decentration Task - Turtle

Table 5 shows pretest and posttest means and standard deviations for the 10 subtests of the Phonemic Awareness test: Nursery Rhymes, Rhyme Detection, Rhyme Production,

Detection of Alliteration, Production of Alliteration, Syllable Blending, Phoneme Blending, multisyllable Word Repetition, Sound Repetition, and First Sound isolation. Scores for individual subtests ranged from 6 to 30 points. Scores for individual subtests were transformed into *z*-scores to calculate composite scores for the total test, the three rhyming subtests, the alliteration subtests, the blending subtest and the word and sound repetition subtests. (See Table 5 on next page.)

TABLE 5
Kindergarten Pre- and Posttest Score Means and Standard Deviations on Phonemic Awareness Measures

	Pretest (n = 64)								*Posttest (n = 57)*							
	EE (n = 16)		*EC (n = 17)*		*CE (n = 16)*		*CC (n = 15)*		*EE (n = 14)*		*EC (n = 16)*		*CE (n = 14)*		*CC (n = 13)*	
Measure	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Nursery rhymes	15.44	(8.12)	17.47	(11.94)	12.69	(6.70)	13.40	(6.65)	20.14	(6.34)	16.31	(9.76)	21.43	(7.30)	15.92	(8.97)
Rhyme detection	2.13	(1.41)	2.05	(2.29)	1.88	(2.06)	1.93	(1.71)	3.21	(1.76)	3.25	(2.18)	4.14	(1.66)	4.23	(2.17)
Rhyme production	0.50	(1.32)	1.94	(2.36)	0.88	(1.63)	0.60	(1.40)	1.57	(1.79)	2.25	(2.05)	2.86	(2.11)	2.23	(2.09)
Detection of alliteration	0.88	(1.09)	1.06	(1.68)	1.38	(1.59)	1.53	(1.51)	2.79	(1.58)	2.75	(2.46)	3.00	(1.71)	4.00	(1.68)
Production of alliteration	0.00	0.00	0.59	(1.66)	0.69	(1.40)	0.67	(1.40)	1.43	(1.91)	1.75	(1.88)	0.64	(1.39)	1.39	(1.85)
Syllable blending	2.75	(2.65)	3.71	(2.71)	2.81	(2.83)	3.87	(2.27)	3.36	(2.74)	4.38	(2.34)	3.36	(2.56)	4.85	(1.77)
Phoneme blending	0.69	(1.45)	2.47	(3.70)	0.63	(1.09)	1.60	(2.50)	3.00	(3.47)	3.31	(4.14)	4.00	(3.16)	3.92	(3.57)
Multisyllable word repetition	17.38	(2.58)	16.82	(3.50)	18.06	(1.20)	18.27	(1.44)	15.79	(4.32)	13.94	(6.96)	17.64	(2.21)	17.85	(1.46)
Sound repetition	17.81	(6.15)	19.88	(7.07)	16.13	(7.64)	18.60	(7.78)	19.50	(4.82)	15.50	(8.76)	18.57	(7.88)	19.69	(5.89)
First sound isolation	0.00	0.00	1.18	(3.32)	0.00	0.00	1.13	(3.04)	1.43	(2.90)	1.88	(4.03)	0.79	(2.67)	4.46	(5.04)
Lindamood Auditory Conceptualization converted score	-	-	-	-	-	-	-	-	0.50	(1.40)	7.44	(12.65)	5.64	(8.08)	10.85	(16.36)
Auditory Analysis Test	-	-	-	-	-	-	-	-	0.36	(0.75)	1.44	(1.32)	1.36	(1.40)	1.23	(1.24)

EE: Experimental - Experimental
EC: Experimental - Control
CE: Control - Experimental
CC: Control - Control

The means for the pretest scores for the Rhyme Production subtests, the two alliteration tasks, the phoneme blending and the first sound isolation tasks were very low with large standard deviations indicating that these tasks appear well below the abilities of children at this stage. At posttest, scores improved slightly for the Rhyme Production and Detection of Alliteration subtests, but the other tasks remained too difficult for these children. Gains for the children in the two groups who received instruction in kindergarten (EE and CE) appeared stronger than those of the children who did not receive instruction in kindergarten (EC and CC) for the Nursery Rhyme, Rhyme Production, Phoneme Blending, and Sound Repetition subtests. While the group who received instruction in preschool only (EC) began kindergarten with higher scores than the group who did not receive instruction in preschool, but received instruction in kindergarten (CE) on the Nursery Rhyme, Rhyme Detection, Rhyme Production, Syllable Blending, Phoneme Blending, Sound Repetition, and First Sound subtests, at the end of kindergarten the group who did receive instruction (CE) had higher scores than the group who did not (EC) on the Nursery Rhyme, Rhyme Detection, Rhyme Production, Phoneme Blending, and Sound Repetition subtests.

A MANOVA on pretest scores, however, showed no significant differences between experimental and control groups on these variables, nor were significant differences ($p < .05$) found at posttest for the Phonemic Awareness Test, the LAC or the AAT, even when controlling for K-ABC-MC and PPVT-R standard scores.

Table 6 presents Pearson Product Moment correlation coefficients between the three measures of decentration, the K-ABC-MC and the PPVT-R standard scores with posttest measures of phonemic awareness skills at the end of kindergarten. (See Table 6 on next page.)

TABLE 6

Correlations Between Measures of Decentration, Intelligence, and Language at the Beginning of Preschool With Posttest Measures of Phonemic Awareness Skills at the End of Kindergarten

	Pretest											
Measure	*NR*	*RD*	*RP*	*DA*	*PA*	*SB*	*PB*	*MSWR*	*SR*	*FS*	*LAC-CS*	*ATT*
Decentration picture identification	.19	.22*	.25*	.33*	.08	.20	.08	.13	.13	.01	.37***	.17
Decentration hidden toy	-.16	.17	.32**	.31**	.22*	.31**	.20	.32**	.05	.11	.30**	.34**
Decentration turtle	.16	.33**	.21	.27*	-.11	-.04	.05	.13	.01	.12	.36**	.18
K-ABC -MC	.14	.33**	.32**	.43***	.21	.26*	.35**	.45***	.29**	.15	.37**	.34**
PPVT-R -SS	-.03	.41***	.37***	.40***	.28*	.34**	.35**	.20	.05	.27*	.23*	.45***

NR: Nursery rhymes
RD: Rhyme detection
RP: Rhyme production
DA: Detection of alliteration
PA: Production of alliteration
SB: Syllable blending
PB: Phoneme blending
MSWR: Multisyllable word repetition
SR: Sound repetition
FS: First sound
LAC-CS: Lindamood Auditory Conceptualization - Converted Score
ATT: Auditory Analysis test
K-ABC-MC: Kaufman Assessment Battery for Children Mental Composite
PPVT-R-SS: Peabody Picture Vocabulary Test - Revised Standard Score

*p < .05. **p < .01. ***p < .001, one tailed.

Correlations ranged from -.03 to .45. The three decentration measures, the K-ABC-MC and the PPVT-R SS were significantly related to the Rhyme Detection and Production and the Alliteration subtests. The K-ABC-MC, the PPVT-R and the Hidden Toy decentration task were significantly correlated with the Blending tasks. The K-ABC-MC and the Hidden Toy decentration task were significantly correlated with the Repetition tasks, and the PPVT-R was associated with the First Sound isolation task. All preschool measures were significantly correlated with the kindergarten LAC, and the K-ABC-MC, the PPVT-R and the Hidden Toy decentration task were significantly correlated with the AAT. The strongest overall associations were with the Decentration Hidden Toy, the K-ABC-MC, and the PPVT-R.

Year 3: First Grade Follow-Up

Table 7 presents preschool general intelligence, language, and decentration and first grade operativity scores for the three experimental and one control group. The control group children had the highest scores on the K-ABC-MC ($m = 81.47$), almost a seven point difference with the experimental group of children who received 2 years of instruction in preschool and kindergarten (EE) and who had the lowest K-ABC-MC scores ($m = 74.19$). The control group also scored higher on the total operativity ($m = 7.67$) and on the seriation task ($m = 3.42$), in particular, compared to the EE group who had the lowest operativity ($m = 4.50$) and seriation ($m = 1.67$) scores. No significant differences ($p < .05$), however, were found among the four groups for these variables. (See Table 7 on next page.)

TABLE 7
Age, Preschool Intelligence, Language and Decentration and First Grade Operativity Characteristics for Experimental and Control Groups at the Beginning of First Grade

	Experimental - Experimental (EE) (n = 16)		*Experimental Control (EC) (n = 17)*		*Control - Experimental (CE) (n = 16*		*Control - Control (CC) (n = 15)*	
Measure	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Chronological Age	79.88	(4.23)	80.47	(4.47)	79.75	(4.09)	81.88	(4.35)
K-ABC - MC	74.19	(10.97)	76.12	(14.14)	78.13	(10.34)	81.47	(10.82)
PPVT-R - SS	71.31	(18.64)	73.65	(19.23)	79.38	(20.38)	72.50	(18.16)
DEC - PI	4.25	(1.53)	4.06	(1.95)	3.56	(1.83)	4.50	(2.03)
DEC - HT	2.38	(1.63)	2.88	(1.73)	2.50	(1.63)	2.75	(1.48)
DEC - Turt	0.13	(0.34)	0.12	(0.33)	0.13	(0.34)	0.19	(0.40)
Total Operativity Score	4.50	(3.61)	6.43	(4.01)	4.23	(2.42)	7.67	(4.87)
Conservation	0.50	(0.91)	1.21	(1.42)	0.69	(1.11)	1.42	(1.83)
Classification	2.33	(1.88)	2.86	(2.07)	1.77	(1.30)	2.83	(1.95)
Seriation	1.67	(1.44)	2.36	(2.02)	2.00	(2.12)	3.42	(1.93)

K-ABC-MC: Kaufman Assessment Battery for Children Mental Composite
PPVT-R-SS: Peabody Picture Vocabulary Test - Revised Standard Score
DEC-PI: Decentration Task - Picture Identification
DEC-HT: Decentration Task - Hidden Toy
DEC-Turt: Decentration Task - Turtle

Table 8 presents means and standard deviations for the three experimental and one control group at the end of first grade on phonemic awareness and reading measures. Of the three experimental groups, the children who received 1 year of instruction in kindergarten (CE) tended to perform better overall on the phonemic awareness subtests. This group also had the highest K-ABC-MC (m = 78.13) and PPVT-R (m = 79.38) scores. The control group, who had higher K-ABC-MC scores than the experimental groups, also had the highest scores on the Rhyme Detection, Detection of Alliteration, Phoneme Blending, and First Sound subtests, as well as on the LAC.

A different pattern emerged for the reading scores. Mean scores for the four groups on the reading subtests ranged from 77.17 to 95.08, indicating that children, on average, had acquired a sufficient level of phonological skills to be able to learn to read. The children who received 1 year of instruction in preschool only (EC) had higher Letter-Word Identification and the Basic Reading scores, while the children who received 1 year of instruction in kindergarten (CE) performed the best on the Word Attack and Passage Comprehension subtests. The control group performed better than the experimental groups on the Reading Vocabulary and the Concepts About Print. Even controlling for K-ABC-MC and PPVT-R, no significant differences ($p < .05$), however, were found among groups on any of these variables.

TABLE 8
Means and Standard Deviations for the Three Experimental and One Control Group at the End of First Grade on Phonemic Awareness and Reading Measures

	Experimental - Experimental (EE) (n = 12)		*Experimental Control (EC) (n = 14)*		*Control - Experimental (CE) (n = 13)*		*Control - Control (CC) (n = 12)*	
Measure	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Phonemic Awareness								
Nursery rhymes	11.42	(6.61)	14.00	(12.13)	18.46	(17.89)	12.67	(8.09)
Rhyme detection	3.67	(1.16)	3.79	(2.12)	3.85	(2.08)	5.17	(1.03)
Rhyme production	2.83	(2.13)	2.50	(2.18)	3.08	(2.22)	3.83	(1.90)
Detection of alliteration	4.08	(2.15)	4.57	(1.65)	4.85	(1.28)	5.33	(0.89)
Production of alliteration	1.58	(1.73)	3.43	(1.87)	3.00	(2.12)	3.92	(1.31)
Syllable blending	4.75	(2.30)	5.36	(1.60)	5.23	(1.48)	5.92	(0.29)
Phoneme blending	5.92	(4.60)	6.71	(3.73)	7.08	(4.23)	8.33	(3.06)
Multisyllable word repetition	18.42	(0.79)	17.00	(2.72)	18.62	(0.87)	18.17	(1.12)
Sound repetition	24.08	(2.07)	18.86	(8.10)	23.08	(6.56)	25.58	(1.51
First sound	5.70	(4.42)	7.07	(4.10)	6.85	(4.04)	9.42	(1.24)
LAC-CS	12.17	(15.46)	15.47	(17.39)	16.62	(15.21)	30.33	(24.74)
AAT	1.67	(1.56)	2.40	(1.96)	3.08	(2.18)	3.17	(1.59)
Reading								
LWID	78.50	(10.62)	91.64	(21.17)	87.08	(16.63)	87.25	(8.08)
WA	77.17	(22.28)	92.71	(14.75)	95.08	(12.17)	92.17	(9.92)
RV	85.92	(12.94)	91.00	(15.94)	89.31	(16.07)	92.42	(13.52)
PC	80.00	(10.85)	85.86	(19.46)	90.77	(11.48)	82.33	(10.81)
RC	81.27	(11.21)	87.14	(17.39)	90.15	(10.61)	86.83	(9.46)
BRS	79.17	(11.09)	90.79	(19.04)	89.23	(14.90)	88.33	(9.37)
WJ-BR	77.50	(10.43)	87.00	(20.68)	87.77	(14.61)	83.00	(9.61)
SANDS	3.08	(1.78)	4.07	(2.05)	4.00	(1.78)	4.08	(1.78)
SANDRS	12.50	(4.87)	14.20	(5.52)	14.08	(5.07)	15.42	(3.70)

LAC-CS : Lindamood Auditory Conceptualization converted score
ATT: Auditory Analysis Test
LWID: Letter word identification
WA: Word attack
RV: Reading vocabulary
PC: Passage comprehension
RC: Reading comprehension
BRS: Basic reading skills
WJ-BR: Woodcock-Johnson Broad Reading
SANDS: Concepts about Print stanine score
SANDRS: Concepts About Print raw score

Table 9 shows correlations between early decentration, general intelligence and language measures, beginning of first grade operativity and end of first grade phonemic awareness and reading measures. (See Table 9 on next page.)

TABLE 9
Correlations Between Decentration, Intelligence, and Language Measures and First Grade Operativity With End of First Grade Phonemic Awareness and Reading Measures

	Phonemic Awareness												*Reading*								
Measure	*NR*	*RD*	*RP*	*DA*	*PA*	*SB*	*PB*	*MSWR*	*SR*	*FS*	*LACCS*	*AAT*	*LWID*	*WA*	*RV*	*PC*	*RC*	*BRS*	*WJ-BR*	*SANDS*	*SANDRS*
K-ABC - MC	.09	.45**	.50**	.50**	.39**	.27*	.36**	.22	.22	.38**	.49**	.44**	.28*	.22	.49**	.34**	.46**	.30*	.30*	.47**	.51**
PPVT-R-SS	.17	.25*	.17	.27*	.31*	.14	.28*	.39**	.13	.33**	.30*	.25*	.23	.10	.27*	.19	.24*	.12	.16	.34**	.38**
DEC-PI	-.23	.13	.25**	.09	.05	.00	.15	.20	.11	.05	.28*	.00	-.07	-.14	-.20	-.12	-.18	-.08	-.12	.26*	.31*
DEC-HT	.09	.48**	.34**	.25*	.33**	.28*	.35**	.28*	.21	.25*	.31*	.30*	.33*	.11	.23*	.23*	.23*	.29*	.26*	.44**	.51**
DEC-Turt	-.13	.11	.16	.11	.00	-.30*	-.19	-.01	.05	-.03	.27*	.23*	.07	.02	.10	.03	.10	.03	.05	.15	.17
Total operativity score	.10	.26*	.33**	.32*	.30*	.24*	.20	.01	.23	.28*	.37**	32**	.10	.29*	.04	.23	.21	.15	.16	.39**	.37**
Conservation	.07	.08	.10	.20	.26*	.06	.03	-.06	.16	.00	.30*	.28*	.19	.13	-.11	.21	.13	.20	.21	.38**	.36**
Classification	.04	.10	.13	.08	-.03	.10	.08	.00	.10	.12	.33**	.04	-.16	.13	-.05	-.06	-.01	-.09	-.11	.02	.02
Seriation	.09	.35**	.43**	.40**	.42**	.25*	.25*	.09	.25*	.39**	.25*	.39**	.22	.35**	.19	.36**	.34**	.25*	.29*	.48**	.47**

K-ABC-MC: Kaufman Assessment Battery for Children Mental Composite
PPVT-R-SS: Peabody Picture Vocabulary Test - Revised Standard Score
DEC-PI: Decentration Task - Picture Identification
DEC-HT: Decentration Task - Hidden Toy
DEC-Turt: Decentration Task - Turtle
*p < .05. **p < .01. ***p < .001, one tailed.

Correlation coefficients ranged from -.23 to .51. Overall, for both the end of first grade phonemic awareness and the reading measures, the strongest correlations were found with the K-ABC-MC, the Decentration Hidden Toy and the Seriation tasks.

To examine developmental changes in phonemic awareness skills from the beginning of preschool through the end of first grade, mean scores and standard deviations for the 10 specific skill areas on the Phonemic Awareness Test were calculated at four different points in time combining scores of experimental and control children, as no significant differences had been found between groups, except for the Sound Repetition score for the preschool sample. Means and standard deviations are presented in Table 10.

TABLE 10
Phoenic Awareness Scores of Entire Sample at Beginnng and End of Preschool, End of Kindergarten, and End of First Grade

	Beginning of preschool (n = 54)		*End of preschool (n = 54*		*End of kindergarten (n = 54)*		*End of First grade (n = 54)*	
Measure	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Nursery rhymes	8.48	(7.30)	15.28	(9.22)	18.43	(8.94)	14.48	(12.04)
Rhyme detection	0.78	(1.37)	2.39	(1.93)	3.70	(1.97)	4.06	(1.77)
Rhyme production	0.43	(1.09)	1.09	(1.87)	2.32	(2.02)	3.00	(2.11)
Detection of alliteration	0.39	(0.92)	1.22	(1.45)	3.06	(1.92)	4.67	(1.63)
Production of alliteration	0.07	(0.26)	0.52	(1.36)	1.35	(1.76)	3.04	(1.94)
Syllable blending	3.30	(2.60)	3.50	(2.60)	4.07	(2.41)	5.33	(1.55)
Phoneme blending	0.94	(1.74)	1.50	(2.65)	3.83	(3.60)	6.96	(3.96)
Multisyllable word repetition	14.85	(5.12)	17.52	(2.42)	16.00	(4.73)	18.06	(1.68)
Sound repetition	14.39	(7.63)	18.30	(6.79)	18.32	(7.23)	22.76	(5.79)
First sound	0.04	(0.28)	0.71	(2.52)	2.35	(4.13)	7.27	(3.86)

A MANOVA Repeated Measures analysis revealed significant differences ($p < .05$) for all 10 areas between beginning of preschool and end of preschool scores, except for the First Sound subtest, between end of preschool and end of kindergarten, and between the end of kindergarten and the end of first grade. All scores increased with age except for the nursery rhyme score which decreased between the end of kindergarten and the end of first grade, and the Multisyllable Word Repetition score which decreased between end of preschool and end of kindergarten.

Study 2

The second part of the project consisted of a replication of the first study to examine the effects on a new sample of children of the complete revised version of the preschool and kindergarten instruction in phonemic awareness developed and refined during the first 2 years of the project. A copy of this curriculum is included in the Appendix E.

Subjects

Twenty-four preschool and 42 kindergarten children with disabilities enrolled in the Highline and Seattle public schools participated in this replication study.

Measures

Metalinguistic Measures

The Lindamood Auditory Conceptualization Test (Lindamood & Lindamood, 1979)
The Auditory Analysis Test (Rosner & Simon, 1971)
Test of Phonemic Awareness
Two additional subtests were added to this test: Syllable Segmentation and Onset-Rime Segmentation to cover all areas that were part of the instruction.

Early Literacy Measures

Developing Skills Checklist - Print Concepts (CTB, 1990)
Parent questionnaire
Teacher questionnaire

Decentration Measures

Early Decentration Abilities:
- Picture Identification
- Hidden Toy
- Turtle

Intelligence

Kaufman Assessment Battery for Children (Kaufman & Kaufman, 1983)

Language

Peabody Picture Vocabulary Test-Revised (Dunn & Dunn, 1981).

These measures have been described in the measures section for Study 1.

Treatment

The instructional activities and materials developed during the first 2 years were revised and compiled into a final version containing a total of 35 developmentally sequenced activities covering four areas: Sound Awareness, Rhyming, Syllable Blending and Segmentation and Phoneme Blending and Segmentation. Also included were a list of children's books and sample pictures for teachers to copy and use with children for coloring pictures, puzzles and cards for various games.

Procedures

Pretesting. The 66 children were tested individually by trained testers on the K-ABC, the PPVT-R, the Test of Phonemic Awareness and the Decentration Measures. Testing was conducted over two 20-30 minute sessions, with the Phonemic Awareness Test and the Decentration Tasks administered during the first session and the K-ABC and the PPVT-R administered during the second session.

The children's parents and teachers completed short questionnaires on children's early literacy experiences. Teachers returned questionnaires on 52 children, and parents returned questionnaires on 31 children.

Training. Children were matched as closely as possible on their K-ABC Mental Composite (MC) and PPVT-R standard scores (SS) and randomly assigned to either one of the experimental groups or to the control group. It was not possible, however, to assign all children to groups on a random basis. One preschool teacher consented to participate in the study only if her students served as controls. Also, one kindergarten teacher consented to participate only if the majority of the children in her class received instruction. Again, because of the school's inclusion policies, many children who qualified for special education services were integrated in regular kindergarten classrooms in their neighborhood school. Because of design of the study and time constraints, when a child was the only subject in a particular classroom and school, the child could not be included in an experimental group.

Fourteen children were assigned to the preschool experimental group and 10 were assigned to the control group. Twenty-four children were assigned to the kindergarten experimental group and 18 were assigned to the control group. The children assigned to the experimental group received 15 minutes of instruction in small groups of 2-3 children three times a week over a 5-month period.

Fidelity of Treatment. Trainers maintained written records on the daily implementation of activities and were observed by the Co-PI to ensure that instructional activities were implemented in a reliable and valid manner. The Co-PI also met weekly with the trainers to provide feedback, to evaluate and plan activities, and discuss children's learning of skills.

Posttesting. Sixteen preschool and 34 kindergarten children were posttested individually on the Phonemic Awareness Tests, the Lindamood Auditory Conceptualization Test, the Auditory Analysis Test, and the Print Concepts component of the Developing Skills Checklist. The preschoolers were tested on the Phonemic Awareness Test. For the kindergarten children, testing was conducted over two 20-30 minute sessions, with the Phonemic Awareness Test administered during the first session and the other three test during the second session. Sixteen children had moved out of the Seattle and Highline school districts during the year.

Results

Table 11 presents age, general intelligence, decentration and language characteristics for the experimental and control groups of preschool and kindergarten-age children prior to treatment. The preschool control group had higher scores for the K-ABC-MC and the PPVT-R than the experimental group. A multivariate analysis of variance (MANOVA) showed no differences, however, between the experimental and control groups on any of these variables. (See Table 11 on next page.)

TABLE 11
Age, Intelligence, and Language Characteristics for Preschool and Kindergarten Childen

	Preschool (n = 24)				*Kindergarten (n = 42)*			
	Experimental (n = 14)		*Control (n = 10)*		*Experimental (n = 24)*		*Control (n = 18)*	
Pretest Measure	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Chronological Age (Months)	55.64	(9.21)	55.22	(5.04)	66.58	(4.97)	67.44	(4.58)
K-ABC - MC	73.50	(12.33)	82.22	(12.17)	76.21	(10.24)	75.83	(14.67)
PPVT-R - SS	73.29	(23.10)	77.87	(21.35)	74.42	(19.96)	71.61	(21.21)
DEC - PI	3.93	(1.60)	4.78	(1.49)	4.50	(1.82)	5.17	(1.20)
DEC - HT	2.50	(1.83)	3.11	(1.37)	2.96	(1.46)	3.11	(1.41)
DEC - Turt	0.14	(0.36)	0.11	(0.33)	0.21	(0.42)	0.33	(0.49)

K-ABC-MC: Kaufman Assessment Battery for Children Mental Composite
PPVT-R-SS: Peabody Picture Vocabulary Test - Revised Standard Score
DEC-PI: Decentration Task - Picture Identification
DEC-HT: Decentration Task - Hidden Toy
DEC-Turt: Decentration Task - Turtle

Table 12 shows pretest and posttest means and standard deviations for preschool and kindergarten experimental and control groups on the 12 subtests of the Phonemic Awareness test: Nursery Rhymes, Rhyme Detection, Rhyme Production, Detection of Alliteration, Production of Alliteration, Syllable Blending, Phoneme Blending, Syllable Segmentation, Multisyllable Word Repetition, Sound Repetition, First Sound Isolation and Onset Rime Segmentation. Scores for individual subtests ranged from 6 to 30 points. Scores for individual subtests were transformed into *z*-scores to calculate composite scores for the total test, the three rhyming subtests, the alliteration subtests, the blending subtest, the segmentation subtest and the word and sound repetition subtests. (See Table 12 on next page.)

TABLE 12
Pretest and Posttest Means and Standard Deviations for the Preschool and Kindergarten Groups

	Preschool								*Kindergarten*							
	Pretest (n = 24)				*Posttest (n = 16)*				*Pretest (n = 42)*				*Posttest (n = 34)*			
	Experimental (n = 14)		*Control (n = 10)*		*Experimental (n = 11)*		*Control (n = 5)*		*Experimental (n = 24)*		*Control (n = 18)*		*Experimental (n = 21)*		*Control (n = 13)*	
Needs Header	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Nursery rhymes	3.71	(5.18)	6.70	(8.15)	6.55	(7.50)	18.20	(10.96)	11.46	(9.64)	10.00	(8.51)	15.62	(12.16)	17.38	(9.56)
Rhyme detection	1.71	(1.69)	1.40	(1.17)	2.36	(2.50)	1.20	(0.84)	1.79	(1.74)	2.50	(1.79)	3.95	(2.11)	3.54	(2.29)
Rhyme production	1.00	(2.00)	0.20	(0.42)	2.00	(1.89)	1.20	(2.17)	0.96	(1.55)	1.33	(2.00)	3.14	(1.96)	2.85	(2.30)
Detection of alliteration	1.71	(1.59)	1.90	(0.99)	2.18	(2.36)	1.60	(0.89)	1.75	(1.51)	1.78	(1.48)	3.09	(1.92)	3.77	(2.01)
Production of alliteration	0.64	(1.01)	0.10	(0.32)	1.64	(2.34)	0.20	(0.45)	0.38	(0.97)	0.50	(1.25)	1.62	(1.99)	1.85	(2.04)
Syllable blending	1.29	(2.30)	1.60	(2.46)	3.28	(2.83)	1.60	(1.82)	1.92	(2.32)	1.89	(2.42)	4.19	(2.27)	4.15	(2.54)
Phoneme blending	0.71	(1.44)	0.20	(0.42)	1.45	(2.07)	3.40	(3.13)	0.75	(1.94)	1.28	(2.49)	2.76	(3.48)	3.31	(3.30)
Multisyllable word repetition	12.29	(5.06)	16.90	(3.51)	15.55	(4.13)	18.20	(1.79)	17.04	(3.75)	18.17	(1.47)	18.29	(1.38)	17.00	(3.08)
Sound repetition	15.14	(7.60)	17.40	(8.00)	15.55	(8.72)	17.40	(7.50)	19.00	(6.84)	21.33	(4.81)	20.48	(6.27)	21.69	(8.00)
Syllable segmentation	3.36	(5.51)	2.40	(5.26)	6.09	(7.36)	5.00	(4.24)	2.29	(4.30)	1.83	(4.02)	8.81	(5.85)	10.39	(4.96)
First sound	0.71	(2.67)	0.00	0.00	2.27	(3.95)	0.00	0.00	0.04	(0.20)	1.50	(3.50)	2.57	(3.79)	4.15	(4.71)
Onset-rime segmentation	0.43	(1.60)	0.00	0.00	1.00	(3.16)	0.00	0.00	0.00	0.00	1.00	(3.09)	0.14	(0.48)	2.85	(4.47)
Lindamood Auditory Conceptualization converted score	-	-	-	-	-	-	-	-	-	-	-	-	3.43	(6.30)	11.46	(12.99)
Auditory Analysis Test	-	-	-	-	-	-	-	-	-	-	-	-	0.81	(1.68)	1.39	(1.98)

EE: Experimental - Experimental
EC: Experimental - Control
CE: Control - Experimental
CC: Control - Control

For the preschool children, the means for both the pre- and posttest scores for all the Phonemic Awareness subtests except for the Rhyme Detection and Detection of Alliteration subtests, the two word and sound repetition tasks were very low with large standard deviations suggesting that these tasks may be well below the abilities of children at this stage. For all areas, scores increased with age and the highest scores were found for children at the end of kindergarten. Scores for the Phoneme Blending, First Sound, Onset-Rime Segmentation, the LAC and the AAT remained, however, low with large standard deviations, likely too difficult for children at this age. For the preschool children, the experimental group appeared to have made greater gains than the controls for the Rhyme Detection, Detection of Alliteration, Production of Alliteration, Syllable Blending, Phoneme Blending, Multisyllable Word Repetition, First Sound Isolation and Onset Rime Segmentation subtests. For the kindergarten children, the experimental group appeared to have made greater gains than the controls for the Rhyme Detection, Rhyme Production, Multisyllable Word Repetition and First Sound subtests.

For both the preschool and the kindergarten populations, a MANOVA on pretest scores showed no significant differences ($p < .05$) between experimental and control groups on these variables, except for the Multisyllable Word Repetition score in favor of the preschool control group, and for the First Sound subtest also in favor of the control group for the kindergarten children. At posttest, controlling for differences in K-ABC-MC and PPVT-R scores, no significant differences ($p < .05$) were found for the preschool group on any of the variables, showing that the experimental group had improved to the same level as the control group on the Multisyllable Word Repetition subtest. Similarly, the kindergarten group improved to the same level as the control group on the First Sound subtest, but the control group performed significantly better on the Onset-Rime Segmentation and the LAC.

Discussion

Research Question 1) When tested at the end of preschool, do young children with disabilities who had received instruction in phonemic awareness during preschool maker greater gains on measures of metalinguistic development than children who had not received this instruction ?

The preschool children who received instruction in phonemic awareness made overall gains in rhyming, alliteration and segmentation, and their gains in the areas of rhyming and sound repetition were significantly greater than those made by children who did not receive instruction. These findings suggest that during preschool young children with disabilities can benefit from instruction in phonemic awareness. At this age, (4 years 8 months, on average) children can significantly improve their ability to repeat sequences of sounds and their sensitivity to rhyme. Although instruction did not result in significant gains in other areas, it did appear to also improve children's blending and syllable segmentation skills. These findings are consistent with the literature on the development of phonemic awareness skills in young children. In our study, children made the greatest gains on skills that emerge earlier in development: sound repetition, a measure of phonological memory for sounds and sensitivity to rhyme requiring the processing of holistic units which are more accessible to young children than individual phonemes (Fowler, 1991). As a whole, preschool children did significantly better at the end of preschool compared to the end of preschool in all areas except for First Sound Isolation. Pretest scores were in general low, but similar to those of the slightly older children with learning disabilities in the O'Connor et al. 1993 study who were taught rhyming, blending and segmentation skills using an intensive direct instruction approach. Although these children made stronger gains than the children in our study, many were unable to generalize from the trained words to new words. Our instruction was based upon a less intensive approach that integrated teaching of skills within the context of naturalistic class activities (e.g., reading a story chosen by the child). Differences in performance may be explained by Losardo & Bricker's (1994) findings that direct instruction approaches favored rapid acquisition of new language

skills in young children with disabilities, but that activity-based instruction was more effective for the generalization of skills. Byrne & Fielding-Barnsley (1995) also found smaller effects of phonemic awareness instruction when implemented in a less intensive manner in regular preschool environments compared to a tightly controlled experimental setting.

Research Question 2) When tested at the end of kindergarten, do young children with disabilities who had received instruction in phonemic awareness during kindergarten make greater gains on measures of metalinguistic development than children who had not received this instruction?

The 27 kindergarten children who had not received instruction in phonemic awareness during preschool were assigned either to a treatment (n = 14) or a control group (n = 13). Although patterns appeared to favor the children who received instruction on the Nursery Rhyme, Rhyme Detection, Phoneme Blending, and Sound Repetition subtests, no significant differences were found between kindergarten children who received instruction and those who did not, even controlling for K-ABC-MC and PPVT-R.

The examination of all four groups of children showed that the children who received instruction in preschool (EC), but not in kindergarten lost their initial advantages in rhyming, blending and sound repetition over the children who did not receive instruction in preschool, but did later in kindergarten (CE). This suggests that kindergarten instruction may positively affect the acquisition of phonemic awareness skills.

Children who received 2 years of instruction tended to perform better than children who received only 1 year of instruction on the more difficult tasks of alliteration and segmentation. The failure to find group differences was unexpected, particularly as one would tend to think that older kindergarten age children might profit more from instruction in phonemic awareness than preschoolers. For this same reason, however, it may be that instruction in some phonemic awarness skills such as letter sounds, alliteration, and first sound isolation, in addition to letter recognition, may have been incorporated into the regular kindergarten classroom curriculum to which all children were exposed. We will analyze information collected from our kindergarten teacher questionnaires to explore this possibility.

Research Question 3) Do children with disabilities who received instruction in phonemic awareness during preschool and/or kindergarten perform better than children who did not receive instruction on measures of reading achievement and of metalinguistic development at the end of first grade?

No significant differences were found between children who received instruction in phonemic awareness during preschool and/or kindergarten and children who did not receive instruction on measures of reading achievement and of metalinguistic development at the end of first grade. Even though analyses controlled for substantial differences among groups on the K-ABC-MC and PPVT-R, the fact that the control group had the highest scores and the experimental group that received 2 years of instruction had the lowest scores on the K-ABC-MC may have confounded the results and made findings difficult to interpret.

Trends showed that that the control group tended to have higher scores on some of the metalinguistic measures (the Rhyme Detection, Detection of Alliteration, Phoneme Blending, First Sound and the LAC). For the reading measures, however, trends favored at least one of the experimental groups over the control, except for Reading Vocabulary.

Overall, both the experimental and the control group children made significant progress on the acquisition of phonemic awareness skills from preschool to kindergarten, and from kindergarten to first grade, regardless of whether they received specific instruction in these skills.

While higher-level phonemic awareness may require formal instruction, it may be that basic level metalinguistic skills such as those manifested by young children presenting developmental delays may emerge spontaneously. For example, in Lundberg et al.'s (1988) study the main training effect was for the phonemic factor, with only modest changes in rhyming and syllable manipulation. The children in Lundberg's study were 6 - 7 years old.

Younger children with disabilities can, however, benefit from instruction in phonemic awareness during preschool and improve their rhyming (similar to findings from Bryant & Bradley's 1985 training study with 5-6 year-old children) and sound repetition skills compared to children who do not receive instruction. The lack of formal instruction of these very early skills, however, does not appear to significantly affect the development of later metalinguistic and reading skills. The children in this study presented a variety of disabilities, and the development of their metalinguistic skills was likely delayed with respect to the young children who did not present disabilities in other training studies (Bryant & Bradley, 1985; Lundberg et al., 1988) who were able to learn a broader range of higher level phonemic awareness skills, including blending and segmentation which may have a stronger relationship with later reading.

In our sample the phonemic awareness skills that correlated the strongest with the end of first grade reading measures were the Multisyllable Word Repetition at the beginning of preschool, the Detection of Alliteration, and the Rhyme Detection at the end of preschool, the Phoneme Blending with WJ-R subtests and the Detection of Alliteration with the Concepts About Print at the end of kindergarten, and the Detection and Production of Alliteration, First Sound, Rhyme Detection and the AAT at the end of first grade. Correlations were moderate ranging between .24 and .65 and stronger at the end of first grade than in preschool and kindergarten. Overall, mean scores for the WJ-R Reading subtests ranged from 77.17 to 95.08, indicating that children had acquired a sufficient level of phonological skills to be able to learn to read. On the Concepts About Print, children's mean raw scores ranged from 12.50 to 15.42, below the average score (17.0) of the slightly younger children in Tunmer et al.'s (1988) study.

A factor that needs further investigation are the possible effects of reading on the performance on the first grade phonemic awareness measures. Research (e.g., Tunmer et al. 1988) suggests reciprocal influences between learning to read and the development of more advanced metalinguistic skills. Findings have shown consistently that combining instruction in phoenic awareness with instruction in letter recognition is superior to phonemic awareness instruction alone (e.g., Ball & Blachman, 1991).

Research Question 4) Do children with disabilities who received 2 years of instruction in phonemic awareness (during preschool and kindergarten) perform better than children who received only 1 year of instruction (preschool or kindergarten) on measures of reading achievement and of metalinguistic development at the end of first grade?

No significant differences were found between children who received 2 years of instruction in phonemic awareness (preschool and kindergarten) and children who received only 1 year of instruction (preschool or kindergarten) on measures of reading achievement and of metalinguistic development at the end of first grade. The children who received 2 years of instruction had, however, the lowest K-ABC-MC scores and also scored the lowest on the metalinguistic and reading tasks.

Research Question 5) Do children with disabilities who received instruction in phonemic awareness only during kindergarten perform better than children who received instruction only during preschool on measures of reading achievement and of metalinguistic development at the end of first grade?

No significant differences were found between children who received instruction in phonemic awareness only during kindergarten and children who received instruction only during preschool on measures of reading achievement and of metalinguistic development at the end of first grade.

Trends show that children who received instruction during preschool only appear to have higher Letter Word Identification, Reading Vocabulary and Basic Reading scores, while the children who received instruction during kindergarten only appear to have higher Word Attack, Passage Comprehension and Reading Comprehension scores, as well as slightly higher metalinguistic scores.

Research Question 6) Are early decentration abilities related to measures of phonemic awareness in young children with disabilities when tested at the end of preschool and kindergarten?

Two measures of early decentration, the Picture Identification (PI) and the Hidden Toy (HT) tasks were significantly related, but only moderately so, to measures of phonemic awareness at the beginning and the end of preschool. The strongest correlations at the beginning of preschool were between the PI and the Nursery Rhyme (.35) and the Sound Repetition (.36) subtests, and at the end of preschool, between the HT and the Syllable Blending (.34), the Phoneme Blending (.34) and the Multisyllable Word Repetition (.45) subtests. At the end of kindergarten, the strongest correlations were between the PI and the LAC (.37), the HT and the Rhyme Production (.32), and Multisyllable Word Repetition (.32) subtests, the LAC (.30) and the AAT (.34), and between the Turtle task and the LAC (.36). The relationship between early decentration skills and phonemic awareness appeared to strengthen with age.

Tunmer et al. (1988) found that decentration measures played a more important role than verbal intelligence in the development of metalinguistic skills. Using a stepwise multiple regression analysis with the early decentration score and the PPVT-R standard score as the predictor variables and each of the phonemic awareness measures at the end of preschool and end of kindergarten as criterion variables, we also found that decentration skills were stronger predictors than language for Detection of Alliteration ($R2 = .13, p = .001$), Syllable Blending ($R2 = .10, p = .005$), and Multisyllable Word Repetition ($R2 = .20, p = .000$). Language was a stronger predictor for Rhyme Detection ($R2 = .15, p = .000$), Production of Alliteration (R2 = .13, p = .002)and Phoneme Blending ($R2 = .16, p =,000$), although early decentration skills contributed significantly to the prediction for Phoneme Blending beyond language ($R2$ change = $.05, p = .04$). At the end of kindergarten, decentration skills were stronger predictors than language only for the LAC ($R2 = .18, p = .000$), while language was a stronger predictor for Rhyme Detection ($R2 = .16, p = .001$), Rhyme Production ($R2 = .14, p = .003$), Detection of Alliteration ($R2 = .16, p = .001$), Syllable Blending ($R2 = .11, p = .006$), Phoneme Blending ($R2 = .12, p = .005$) and the AAT ($R2 = .20, p = .000$). Decentration skills made a unique contribution to the prediction beyond that of language for Detection of Alliteration ($R2$ change = $.05, p = .04$).

The differences in predictive patterns compared to Tunmer et al.'s findings may be due to the fact that the decentration measures in this study reflect earlier skills than those tested by Tunmer et al. on first grade children. Early decentration measures appear to play a more significant role in the development of alliteration, blending and word repetition skills during preschool, than does language. Language appears to play a more important role later in kindergarten.

Research Question 7) Are early decentration abilities related to measures of phonemic awareness in young children with disabilities when at the end of first grade?

The preschool Decentration Hidden Toy task was significantly correlated (correlations ranging from .25 to .48) with all end of first grade metalinguistic measures except for the Nursery Rhyme and the Sound Repetition subtests, as well as with all the reading measures (correlations ranging from .23 to .51) except the Word Attack. A similar pattern was found for the seriation task, a measure of operativity administered at the beginning of first grade with end of first grade metalinguistic measures (correlations ranging from .25 to .43), and all reading measures (correlations ranging from .29 to .48), except for the Letter-Word Identification and the Reading Vocabulary.

Using a stepwise multiple regression analysis with the early decentration score and the PPVT-R standard score as the predictor variables and each of the phonemic awareness measures at the end of first grade as criterion variables, we also found stronger predictive relations between early decentration skills and Rhyme Detection ($R2 = .12$, $p = .010$), Rhyme Production ($R2 = .12$, $p = .009$),and the LAC ($R2 = .13$, $p = .007$). Language had a stronger relationship only with the First Sound Isolation ($R2 = .11$, $p = .016$).

Decentration involves metacognitive abilities enabling the shifting of attention from different perspectives and tasks require primarily visual-spatial abilities (Tunmer et al. 1988). Preschool decentration tasks significantly predicted end of first grade reading on the Concepts About Print ($R2 = .22$, $p = .000$), but not any of the other reading measures. The stronger relationship with the Concepts About Print may reflect the greater involvement of general cognitive, problem-solving skills compared to more technical early reading skills measured in the WJ-R subtests. Preschool language scores did not predict any first grade reading measures. Notari-Syverson, Dale, Cole, Mills and Jenkins (1995) also found that preschool visual-perceptive skills were stronger predictors of beginning reading than language in children with disabilities.

Research Question 8) Do preschool and kindergarten children with disabilities who have high levels of decentration make better gains in instruction in phonemic awareness than children with low levels of decentration?

Children in the first and second study who received instruction in phonemic awareness were divided into two groups: those scoring 6 or above on the decentration tasks, and those scoring below 6. A series of ANOVAs repeated measures with K-ABC-MC and PPVT-R SS as covariates were conducted. In the first study, preschool children in the high-decentration group ($n = 26$) made greater gains than children in the low-decentration group ($n = 12$) on the Detection of Alliteration subtest, $F(1, 36) = 6.16$, $p = .02$. In the second study, children in the high-decentration group ($n = 9$) made greater gains than children in the low-decentration group ($n = 5$) on the Syllable Blending, $F(1, 12) = 5.67$, $p = .04$, the Phoneme Blending, $F(1, 12) = 5.87$, $p = .03$, and the Production of Alliteration, $F(1, 12) = 3.93$, $p = .07$ subtests. In the first study, kindergarten children (who had not received instruction during preschool) in the high-decentration group ($n = 9$) made greater gains than children in the low-decentration group ($n = 9$) on the syllable and phoneme blending composite z-score, $F(1, 16) = 3.96$, $p = .06$. In the second study children in the high-decentration group ($n = 18$) made greater gains than children in the low-decentration group ($n = 5$) on the Detection of Alliteration, $F(1, 21) = 5.58$, $p = .03$ subtest. Early decentration abilities appear to play a role in the acquisition of blending and alliteration skills.

Research Question 9) Do preschool and kindergarten children with disabilities who received the revised instruction in phonemic awareness make greater gains on measures of metalinguistic development than control children in special education preschool and kindergarten classrooms?

Preschool children who received the revised instruction made greater gains than children who did not receive instruction only for the Multisyllable Word Repetition subtest. Trends were in favor of the experimental group for rhyming, alliteration, blending and segmentation. Kindergarten children who received the revised instruction made greater gains than controls only for the First Sound Isolation subtest. Although trends were in favor of the experimental group for rhyming and word and sound repetition, the control group actually performed significantly better on the Onset-Rime Segmentation subtest and the LAC.

Research Question 10) How do the original and the revised instruction program in phonemic awareness compare in terms of facilitating the acquisition of specific phonemic awareness skills in young children with disabilities?

Similar trends in gains were found for the preschool children in rhyming, alliteration, blending and segmentation skills. However, the significant gains in rhyming and sound repetition found in the original study were not replicated. The kindergarten children in the two studies showed similar trends in gains in rhyming and word and sound repetition, but not for blending. We will be analyzing results for a small group of children who received instruction during the second year of the project to examine patterns of gains and compare them to current findings.

Possible explanations for differences are that the preschool control group in the replication study had higher K-ABC-MC and PPVT-R scores than the control group in the original study, and the kindergarten children in the replication study had lower K-ABC-MC and PPVT-R scores than the children in the original study. Also group sizes were smaller in the replication study.

Project Impact

Contributions to Current Knowledge and Practice

Little information is available on the development of metalinguistic skills and early reading performance in young children with disabilities. The findings from this study showed that young children with disabilities develop phonemic awareness skills such as rhyming, blending and segmentation gradually. The first skills to develop are the ability to learn nursery rhymes, the ability to recognize words that rhyme and words that begin with the same sound, the blending of syllables and the ability to correctly repeat sequences of phonemes. Skills improve with age. Kindergartners begin to perform better on producing words that rhyme, and blending of phonemes. First graders become also able to find words that begin with a same letter and to detect the first sound of words. The range of performance on these different skills was large, suggesting a broad heterogeneity of skill levels. Mean scores at the end of first grade represented mid-range performances on individual subtests (i.e., three correct answers out of six possible), showing room for continuing development of metalinguistic skills beyond first grade.

Findings from the first year showed that preschool children with disabilities improved their rhyming abilities and their ability to repeat sequences of phonemes thanks to their participation in the phonemic awareness instructional program developed for this project. In kindergarten, however, instruction did not appear to accelerate the metalinguistic development of children who received treatment compared to those who did not. As a group, all children continued to make gains from kindergarten to the end of first grade. One conclusion from these findings is that kindergarten and first grade children in our study were able to learn phonemic awareness skills through participation in regular school curriculum, whereas in preschool the children benefited from specific instruction in rhyming and sound repetition. The findings from the second year of the study were, unfortunately, confounded by the nonrandom assignment to

experimental and control groups of approximately one-third of the children in the study, and it may well be that additional instruction during kindergarten may have resulted in greater benefits for treatment groups in better controlled circumstances, or with a more intensive direct instruction approach.

Because children with disabilities do progress over time but do not perform as well as children who are developing normally on phonemic awareness tasks by the end of first grade, it is recommended that teachers, primarily as a way of orienting the child's attention to the structure of speech, at a more holistic rather than segmented level, incorporate instruction of phonemic awareness into their regular curriculum. At the preschool level, instruction should, however, focus on the teaching of nursery rhymes, developing awareness of rhymes, the segmentation and blending of syllables and increasing memory for sound sequences within the context of developmentally appropriate and meaningful activities. Requesting children to produce rhyming words and words beginning with the same first sound, as well as first sound isolation and phoneme blending are too sophisticated for children at this age. The advantage gained from preschool exposure to instruction in phonemic awareness does not appear to significantly affect later metalinguistic awareness or reading development. On average, the children in our sample did not appear to present major delays in reading, suggesting that they had acquired a minimal level of phonological skills necessary for beginning reading. It may be that more problems will develop later as reading requirements become more complex requiring higher level phonemic awareness skills.

Early decentration measures appear to show predictive relations with some aspects of later phonemic awareness and reading, and may serve as useful early identification measures for children that may present later reading difficulties. The tasks developed for this study were fun and easy to use.

Impact on Young Children and Their Families

Many children benefited from participating in additional small group instruction, and quite a few parents showed interest in learning about the area of phonemic awareness. Often instructional materials (e.g., coloring sheets illustrating popular nursery rhymes or objects starting with a same sound) were sent home with the children and enhanced parents' involvement with their child's learning.

Impact on Teachers

Teachers were interested in the content of instruction and materials used. Although they were unaware of the specific aspects of the study, they did however become sensitized to the general issue of phonemic awareness. From our observations, many teachers began to incorporate the teaching of nursery rhymes for example, into their general curriculum, which may have influenced the results of the study. At the end of the study, each participating teacher and a number of communication disorders specialists who had manifested interest, received a bound copy of the curriculum activities and materials developed during the project.

Future Activities and Dissemination of Findings

We will be continuing to analyze the data generated from this project to investigate more in-depth factors and variables that may have influenced the findings reported here. Information on home literacy environments and teacher reading curricula from the parent and teacher questionnaires will be analyzed to examine possible effects on first grade metalinguistic and reading performance. Also, possible differences among trainers on the fidelity of implementation of the instructional program will be examined. Effects of child variables such as type and level of disability, environmental factors such as family socioeconomic status, and

classroom setting (integrated versus self-contained) will also be explored. We will be preparing a manuscript for publication on the findings on the effects of the first year instruction during preschool, as well as on the relationship of early decentration and operativity with early metalinguistic development. We will also submit a proposal to the 1997 AERA conference.

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Appendix A

Phonemic Awareness Test

PRESCHOOL PHONEMIC AWARENESS TESTS
AN 11/92; 9/94

Child's name: _____ Date of Birth: _____

School and class: _____

Date of test: _____ Tester: _____

I. **KNOWLEDGE OF NURSERY RHYMES** (Maclean, Bryant, & Bradley, 1988)

We are going to say some nursery rhymes. Do you know Jack and Jill? It goes like this: (tester recites rhyme). Do you know some ?

		Child knows Rhyme		
		Whole	Part	None
Can you say	Twinkle Twinkle Little Star?			
	No prompt	___	___	___
	Prompt	___	___	___
	Along with	___	___	___
	Pat-a-cake?			
	No prompt	___	___	___
	Prompt	___	___	___
	Along with	___	___	___
	Humpty Dumpty?			
	No prompt	___	___	___
	Prompt	___	___	___
	Along with	___	___	___
	Hickory Dickory Dock?			
	No prompt	___	___	___
	Prompt	___	___	___
	Along with	___	___	___
	Baa-Baa Black Sheep?			
	No prompt	___	___	___
	Prompt	___	___	___
	Along with	___	___	___

Other rhymes the child knows:

2. **RHYME DETECTION** (Maclean, Bryant, & Bradley, 1988)

Materials: PICTURES

Task: "Let's play a game. First, we put some cards down." Tester names pictures. Now there's one picture that doesn't belong with the others, and that's the one we have to find. **Hen, pen, knife.**.Can you hear the one that's a bit different? Hen and pen sound the same in the middle and the end. Knife sounds different, so knife doesn't belong. (Remove card). Let's do these:

Practice: rat cat boat
pig shoe blue

Test

1.	cat hat bell	3. key tree fish	5. cup mouse house
2.	car book star	4. doll bed head	6. lake horse cake

3. **RHYME PRODUCTION** (O'Connor, 1992)

Materials: TROLL

Practice: 3 trials : MAKE (lake, shake,bake) LAND (sand, hand, fand) BUN (fun, tun, wun))

The troll is going to ask you to play a guessing game.

"Guess a word that rhymes with *make*."
(if child does not give a correct answer, the troll asks the tester, who answers: "I can rhyme with make. Lake; shake. The troll asks the child again: "Guess a word that rhymes with make.")

Test

1. mat _____ 3. key _____ 5. mouse _____

2. toy _____ 5. wing _____

(Nonsense or real words)

4. **SYLLABLE BLENDING** (O'Connor, 1992)

Materials: PICTURES for practice [TROLL]

"I (this troll) am (is) going to speak in a funny way. I (he) am (is) going to say some sounds.. If you put them together, they make a word that tells you the name of the picture." Tester (troll) says: **"Sweat --shirt"** Tester asks child: "What word is that?" (to correct, tester says: Sweat --shirt. Sweatshirt. What word is sweat -- shirt?).

Practice: dog -- house
news--paper

Test (no pictures)

1. dump -- truck _____
2. neck--lace _____
3. paint--brush _____
4. cow --boy _____
5. pen -- cil _____
6. pa --per _____

5.. **PHONEME BLENDING** (O"Connor, 1992)

Materials: TROLL (PICTURES for practice)

Task: " I (the troll) am (is) still going to speak in a funny way, but, if you put the sounds he says together, they make a word. Can you guess what I (he) is saying?"

Practice (pictures) : G(pause)--ate "What word is that?"
B --- ear
J --- ar

Test (no pictures)

1. *s* -ea_____
2. *t* -oe _____
3. *f* --ace _____
4. *g* -oose_____
5. *s*--ad _____
6. *p* -- ig _____
7. *f* --at _____
8. *d* --ad _____
9. *b* --us _____
10. *m* -- ask _____

6. **SYLLABLE SEGMENTATION** (O'Connor, 1992)

Task: "I'll say a word and you tell me the parts in the word. My turn *Tiger.* I'll say the parts in *tiger*. Ti---ger. Say the parts in *tiger.*"

Practice: apple
telephone

Test (no pictures)

1. winter _____
2. cracker _____
3. Barney _____
4. cucumber _____
5. butterfly _____
6. crocodile _____

7. **MULTISYLLABLE WORD REPETITION**

Task: "Can you repeat these words?"

1. baseball _____
2. dinosaur _____
3. television _____
4. elephant _____
5. November _____
6. geography _____

8. **SOUND REPETITION** (O'Connor, 1992)

Task: "Let's play Copycat. You say everything I say. This is a stop sign (tester holds up hand). I go first. When the stop sign goes down, it's your turn.
Practice: **teddybear** (1 sec pause) **kindergarten** (2 sec. pause)

(2 sec pause)
1./a/_____
2./m/_____
3. /t/ _____
4. s--k _____

(1 sec pause)
5. m --a _____
6. t -- e _____
7. a --k _____
8. k--a--f _____

(1 sec pause)
9 m--a--s _____
10.t--a--t _____
11. p--ee--k _____
12. p--a--s--t _____

9. **DETECTION OF ALLITERATION** (Maclean, Bryant & Bradley, 1988; Stuart & Colheart, 1988)

Materials: PICTURES

Task: "Let's play another game with the pictures. First, we put some cards down." Tester names pictures. "Now you get to keep two pictures that belong together and I get to keep picture that doesn't belong with the others, and that's the one we have to find. . **Ball, bell, tree.**..Can you hear the one that's a bit different at the beginning? Ball begins with /b/. and bell begins with /b/...but tree begins with /t/. So? I get the tree, because it doesn't begin with /b/. (Remove card). Let's do these:

Practice: cat car house
moon foot fish

Test
1. dog doll sun
2. man fish mouse
3. book hand hat
4. tree girl train
5. boat bus sock
6. leaf pig pen

10. **PRODUCTION OF ALLITERATION** (Maclean, Bryant, & Bradley, 1988)

Materials: TROLL

Task: "The troll wants to play another guessing game." The troll asks: "Can you guess a word that starts the same as: **boat**? The tester gives the child examples, if necessary (e.g., boy, ball).

Practice
dog (doll, dad)
girl (get, gate),

Test "Tell a word that starts the same as:

1. bat _____
2. fox _____
3. sail _____
4. cook _____
5. tap _____

(Nonsense or real words)

11. **FIRST SOUND**

Task: "Can you say just a little bit of a word? If I say **sow,** can you tell me the very first sound? Tester models, if necessary.
food.
cat

1. sick_____
2. fat _____
3. ball _____
4. dog _____
5. mow _____
6. soup _____
7. cut _____
8. pig _____
9. face_____
10. tap _____

12. **ONSET-RIME SEGMENTATION** (O"Connor, 1992)

Task: " I'll say a word and you tell me two sounds in the word. I can say the sounds in *Mike*. M---ike. Your turn. Say the sounds in *Mike*.

Practice shop
cat

Test (no pictures)

1. soap_____
2. food _____
3. gum_____
4. ten _____
7. pet _____
8. mom _____

General Comments

General procedures

For each subtest, stop testing after 3 consecutive errors.
Provide correct model,if child does not answer correctly.
Write child's complete utterances and indicate pauses (not just + or -).
Change order of subtest administration if necessart to keep the child's attention.
Administer in two sessions if necessary.

Appendix B

Teacher and Parent Questionnaires

QUESTIONNAIRE ON LITERACY BEHAVIORS

Teacher's Name: _____ School: _____
Classroom: _____ Date: _____

Child
Name: _____ Date of Birth: _____
Gender: _____ Male _____ Female
Ethnicity: ____ Caucasian _____ African American _____
____Asian ____ Hispanic _____Pacific Islander
____Native American ____ Other

Primary Disability:

____ Developmental Delay
____ Hearing Impairment
____ Speech or Language Delay
____ Visual Impairment
____ Serious socio-emotional disturbance (e.g., PDD, Autism)
____ Motor impairment
____ Other (please describe)_____

Level of Impairment :

Check one:

___At-Risk: ___Mild Disability ___Moderate Disability ____Severe Disability

Definitions (Adapted from Slentz, 1988).

AT-RISK
Child does not have any specific disability, but has an increased probability of experiencing problems in the future. May need intervention to ensure optimal development. Child is suspect for developmental delay because of environmental or biological reasons.

MILDLY IMPAIRED
Child has a disability or condition that sets him/her apart from a normally developing age peer, but is still able to function well in the environment. A child with a mild impairment could probably manage in a regular classroom environment with extra assistance from the teaching staff. Mild problems include: articulation problems or language difficulties that do not make the child inintelligible; motor problems that do not inhibit a child's independent particpation in gross motor activities; mild hearing loss or mild visual impairments that do not interfere significantly with the child's functioning.

MODERATELY IMPAIRED
Child has a disability or condition that obviously sets him/her apart from other children. A child with a moderate impairment needs fairly consistent monitoring by the teaching staff. The child acn function effectively when given supervision and direction. Moderate problems include: serious articulation or language problems that interfere with communication; motor problems that inhibit regular participation in activities; and sensory problems that demand considerable adjustments in teaching strategies and interactions.

SEVERELY IMPAIRED
Child has a major disability or diabilities that prohibit independent functioning. Severe problems include: seriously involved cerebral palsy of all limbs and trunk; two or more major problems (e.g., deaf and blind); extremely limited behavioral repertoire (e.g., child only mouths toys after 12 months of age); limited attention and bizarre behaviors.

Literacy Behaviors

1. Are there books in your classroom for children to look at during free time?

   Yes No.

2. Where are they located?

3. Does _____ volontarily look at books on his/her own?

   Frequently _____ Sometimes _____ Rarely _____ Never ____

4. Does _____ ask to be read to?

   Frequently _____ Sometimes _____ Rarely _____ Never ____

5. Does _____know what a book is for?

   Turns pages _____ Comments on pictures _____
   Attends to print _____ Recognizes letters _____
   Recognizes words _____
   Other, please describe behavior:

6. Do you read books to children during group activities? Yes No
   if yes, how often?
   3-4 times a week _____ 1-2 times a week_____ 1-2 times a month___

7. Do you read books with rhymes (e.g., Mother Goose Nursery Rhymes, Dr. Seuss)? Yes No.

8. During book reading activities does _____
   listen actively? _____
   participate actively by responding with comments and questions? _____
   show interest in other ways? (please describe behavior):

9. Overall, would you say that _____ enjoys book related activities:

A lot _____ Somewhat _____ Not at all _____

10. Does _____ recognize:

printed words? _____ How many? _____

printed letters? _____ How many? _____

environmental print (e.g., road, restaurant and store signs)? _____

11. Does _____

scribble? _____ draw pictures? _____
pretend to write? _____ write letters? _____
write name? _____ write common words?_____

12. Do you conduct activities which involve the recitation of nursery rhymes and/or rhyming songs? Yes No.

If yes, which activities?

13. Can _____ recite any nursery rhymes or songs? Yes No.

If yes, which ones?

14. Can _____ produce a rhyming word to a target word? Yes No

If yes, please give an example

15. Can _____ identify the first sound in words? Yes No

If yes, please give an example

16. Can _____ segment words into syllables? Yes No

If yes, please give an example

FIRST GRADE LITERACY CURRICULUM QUESTIONNAIRE

Teacher's Name: _____ School: _____
Classroom: _____ Date: _____

CLASSROOM ENVIRONMENT

1. Do you have a book area in your classroom? Yes ____ No ____

If yes, how is it used ?

What kinds of print are children exposed to in your classroom?

Books ____ Magazines _____ Words on posters _____
Letters of the alphabet posters _____ Children's names _____
Classroom charts(e.g., calendars, weather charts) (please describe)

Display of science or art projects with script: _____

Other (please describe)

Please describe other printed materials or literacy related activities (e.g., going to public library) that children participate in:

READING

What approach do you use to teach reading (e.g., Whole language, Phonics, combination)?

What materials do you use to teach reading (titles of basal reading series, other materials)?

Describe a typical reading lesson

QUESTIONNAIRE ON LITERACY BEHAVIORS

Parent's Name: _____ Date: _____
Child's Name: _____ Child's Age: _____

1a. Do you read to your child? Yes No

if yes:

1b. At what age did you begin reading to your child?
1c. How many times per week do you read with your child?
1d. Does your child ask to be read to?
If so, how often?

2a. Does anyone else ever read to your child? Yes No

if yes:

2b. Who?
2c. How often?

3. Does your child enjoy looking at books and magazines with adults?

A lot A little Not at all

4. Does your child enjoy looking at books and magazines alone?

A lot A little Not at all

5. Does your child go to the library? Yes No

If yes, how often?

With whom?

6. What does your child enjoy looking at?

children's books ____ cereal boxes _____ catalogs _____
magazines _____ newspapers _____ road, restaurant, store signs ____
other printed material _____

7. How many different children's books and magazines does your child see at home? _____

8a. When you have time to be with your child, what activities do you do together? (e.g., playing with toys, going to the park, etc.).

8b. How often do you do these activities together?

9. Does your child know any nursery rhymes? Yes Some parts No

If yes, which ones?

10. Do you read books with rhymes (e.g., Mother Goose Nursery Rhymes, Dr. Seuss) to your child? Yes No.

11a. Do you watch TV with your child? Yes No

If yes:

11b. How often?
11c. What are your child's favorite shows?

11d. Do you talk about the shows you watch together? Yes No.

12. How many children do you have in your family? _____

Ages:

Gender:

13. Is any language other than English spoken with your child? Yes No

If yes, which one(s)?

14a. Mother's years of schooling? _____

14b. Father's years of schooling? _____

15. Do you read for pleasure?

A lot A little Not at all.

Appendix C

Decentration Tasks

DECENTRATION TASKS

AN 11/92

Child's name: _____ Date of Birth:: _____

School and class: _____

Date of Test :_____ Tester: _____

1. PICTURE IDENTIFICATION TASK (Masangkay et al., 1974)

Experimenter shows both sides of a card to the child, has the child name the pictures (or names the pictures for the child if the child does not know the correct names) and then holds card vertically between child and self.

	Child	Exp.		Child response
1.	dog	cat	What do you see?	_____
			{if no response, prompt: Do you see a dog or a cat?}	_____
			What do I see?	_____
			{if no response, prompt: Do I see a dog or do I see a cat?}	_____
2.	cat	dog	What do you see?	_____
			{if no response, prompt: Do you see a dog or a cat?}	_____
			What do I see?	_____
			{if no response, prompt: Do I see a dog or do I see a cat?}	_____
3.	apple	apple	What do you see?	_____
			{if no response, prompt: Do you see an apple?}	_____
			{Exp. reverses card}What do I see?	_____
			{if no response, prompt: Do I see an apple?}	_____
4.	apple	---	{Exp. shows apple to child, then reverses card}	
			What do I see?	_____
			{if no response, prompt: Do I see an apple?}	_____
5.	duck	duck	{Exp. shows duck to child, then reverses card}	
			What do I see?	_____
			{if no response, prompt: Do I see a duck?}	_____
6.	bird	---	{Exp. shows bird to child, then reverses card}	
			What do I see?	_____
			{if no response, prompt: Do I see a bird?}	_____

2. TURTLE (Masangkay et al., 1974)

Experimenter lays the picture of the turtle on the table horizontally between self and the child so that the child sees the turtle "right side up"and has the child describe the direction of the turtle "right side up--on his feet" The exp. then turns the picture 180 and has the child describe the direction "Upside down--on his back." The exp. corrects and models as much as necessary.

Task

Experimenter lays the picture of the turtle on the table horizontally between self and the child so that the child sees the turtle right side up.

Child response

" Do you see the turtle right side up --on his feet?" _____

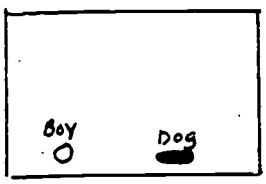
"How do I see the turtle? _____

3. HIDDEN TOY TASK (Hughes & Donaldson, 1979)

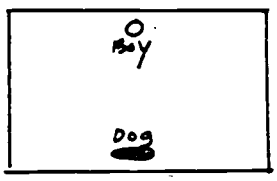
a) One boy and one dog

The dog (Barney) has taken the boy's frisbee and wants to hide from the boy. Can you help him? Put the wall so that the boy cannot see the dog.

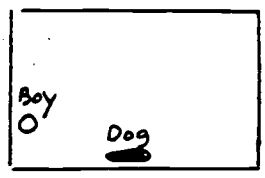
1. 2. 3.



X
Child



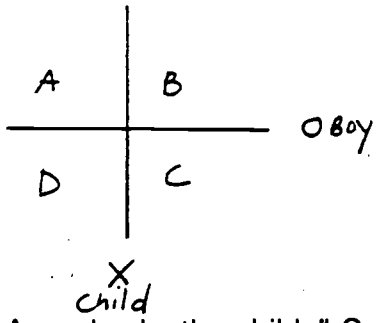
X
Child



X
Child

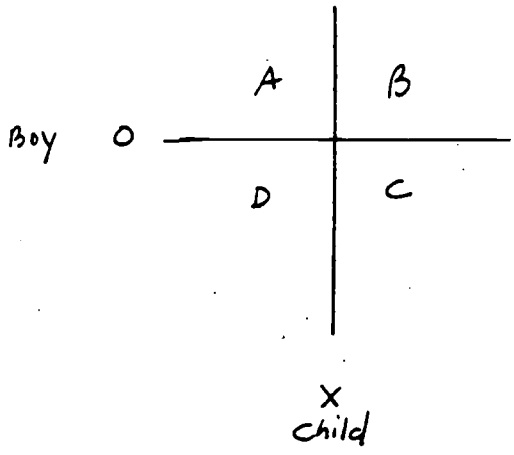
b) boy, girl, and dog

Training



Exp. places the dog in A, and asks the child: " Can the boy see the dog?" Corrects as necessary. The exp. then places the dog in B, C, and D.

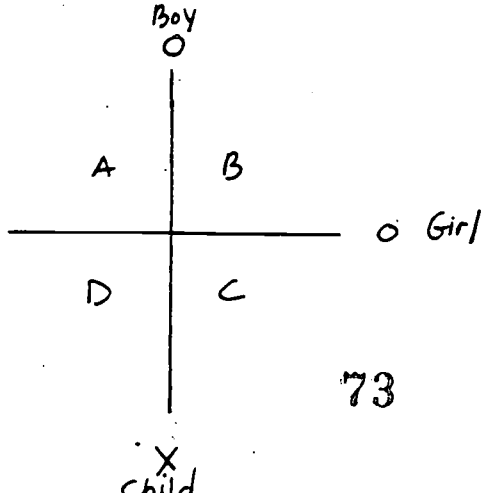
Exp. asks the child: "Hide the dog so that the boy can't see him."



Administer the following task only if the child was successful on the former task.

Task

"Here's a girl. She is going to help the boy look for the dog. The dog now must hide from both the boy and the girl. Hide the dog so that both the girl and the boy can't see him."



Appendix D

Operativity Tasks

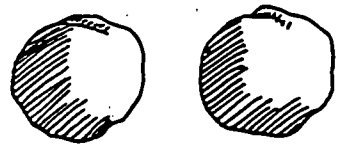
OPERATIVITY TESTS (ANS-10/94)

Child's name: _____ Age: _____

Date of test: _____

Conservation of substance

Materials: Clay
Instructions: Place two equal balls of clay in front of the child.



Adult: *Do both balls have the same amount of clay?*

The child must agree that the amounts are equal. Let the child make adjustments by adding or subtracting clay if necessary.

Transformation A

Adult: *Now I'm going to flatten this ball into a pancake (do so).*

Which has more ("to eat") clay, the ball or the pancake? Or do they both have the same amount?

Child response:

Adult: *Why did you say that?*

Child response (circle one or describe with words):

You didn't add any or take any away.
You can roll it back into a ball, and it will be the same.
It doesn't matter what shape it is, it's still the same amount.

Other:

Transformation B

Adult: *Now I'm going to flatten this ball into a hotdog (do so).*

Which has more clay (more "to eat"), the ball or the hotdog? Or are they the same?

Child response:

Adult: *Why did you say that?*

Child response (circle one or describe with words):

You didn't add any or take any away.
You can roll it back into a ball, and it will be the same.
It doesn't matter what shape it is, it's still the same amount.

Other:

Adult: *The other day, a boy told me that there was more ("to eat") in the hotdog. Was he right or wrong? How would you prove it?*

Child response (circle one or describe with words)::

Return the clay to its original state.

Transformation C

Adult: *Now I'm going to break one ball up into little pieces.*

Which has more ("to eat") clay, the ball, or the pieces? Or are they the same?

Child response:

Adult: *Why did you say that?*

Child response (circle one or describe with words):

You didn't add any or take any away.
You can roll it back into a ball, and it will be the same.
It doesn't matter what shape it is, it's still the same amount.

Other:

Seriation

Sticks

Materials: Ten small sticks of graduated length.

Present sticks in random array.
Tell the child to arrange the sticks in order, going from the "smallest to the largest" or from the "littlest to the biggest."

Child response (circle one below, draw picture or describe with words):

Divides sticks into two groups, large and small.

Divides sticks into three groups, large, medium and small.

Partial seriation for a few sticks.

Seriates ten sticks correctly using trial and error.

Seriates ten sticks correctly using a systematic method (always picks largest or smallest).

Other:

Stacking cubes

Materials: Ten stacking cubes.
Present cubes in random array.
Tell the child to arrange the cubes in order, in a row, going from the "smallest to the largest" or from the "littlest to the biggest."

Child response (circle one below, draw picture or describe with words):

Divides cubes into two groups, large and small.

Divides cubes into three groups, large, medium and small.

Partial seriation for a few cubes.

Seriates ten cubes correctly. using trial and error.

Seriates ten cubes correctly using a systematic method (always picks largest or smallest).

Other:

Simple classification

Geometrical shapes

Materials: 15 blocks that can be sorted on the basis of size, color or shape.

Instructions; Present shapes in random array.
Tell the child to put together the things that go together, put together the things that are the same or put the things in order.

Child response (circle one below, draw picture or describe with words):

Puts together objects according to own criteria (e.g., builds tower).
Starts with one criteria (e.g., color), then shifts to another (e.g., shape).
Classifies all shapes according to size, color or shape.

Other:

Class inclusion

Flowers
Materials: Six white "daisies" and two red roses.

Instructions: Make sure child knows names of flowers (Change names to suit child).
Adult: *Are all the daisies white?*

Child response:

Adult: *Are all the roses red?*

Child response:

Adult: *Are all the flowers white?*

Child response:

Adult: *Why?*

Child response:

Adult: *Are there more daisies or more flowers?*

Child response:

Adult: Why?

Child response:

Animals:
Materials: Animals: Five of one kind (e.g., monkeys), two of another kind (e.g., dinosaurs) and two of a third kind.

Instructions: Present the animals in random array. Make sure child knows names of animals.
Tell the child to put together the animals that go together, put together the animals that are the same or alike, or put the animals in order.

Child response:

Adult: *Can a ---- (e.g., monkey) be put into the ----- (e.g., dinosaur) pile?*

Child response:

Adult: *Are there more dinosaurs or more monkeys?*

Child response:

Adult: *Are all the monkeys animals?*

Child response:

Adult: *Are there more monkeys or more animals?*

Child response:

Adult: *Why?*

Child response:

Conservation of number

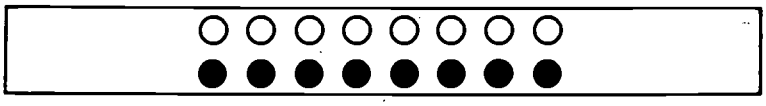
Materials : 8 black checkers and 10 red checkers.

Instructions: Place eight black checkers in a row and give the child a pile of ten red checkers.

Adult: *Will you please fix your checkers so you are sure that you have just as many as I have?*

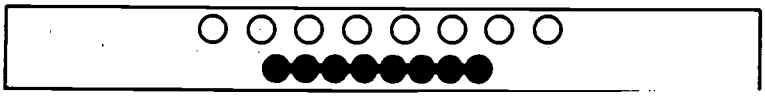
Child response:

If the child does not lay out an equal number of checkers in a matching row (one-to-one correspondence), suggest or lay out the row and have the child confirm that the two rows contain the same number(eight) of checkers.



Transformation A

Adult: *Now we have the same number of checkers. Watch carefully what I'm going to do* (Shorten the red row by decreasing the distance between checkers).



Now who has more checkers?

Child response:

Adult: *Why?*

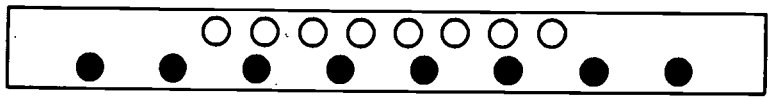
You've only moved them around; its still the same.
You didn't add anything or take anything away.
It's still the same number.

Other:

Transformation B

Return the checkers to two matching rows of equal length. Make sure the child agrees that both rows have the same amount of checkers.

Adult: *Now we have the same number of checkers.again Watch carefully what I'm going to do* (Lengthen the red row by speading out the checkers).



Now who has more checkers?

Child response:

Adult: *Why?*

Child response:

You've only moved them around; its still the same.
You didn't add anything or take anything away.
It's still the same number.

Other:

Appendix E

Phonemic Awareness Curriculum

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
National Library of Education (NLE)
Educational Resources Information Center (ERIC)

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