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Labels Needn't Stick: "At-Risk" First Graders Rescued With Appropriate Intervention

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Abstract

The Orton-Gillingham and TouchMath systems of instruction were implemented to improve language and mathematics skill development for 6- and 7-year-olds in a first-grade classroom. After 2 years of intervention, the participants were found to be no longer in need of special education services. All the participants showed marked improvement in reading scores on the WRAT-III. The students who had been considered to be at risk for reading and mathematics difficulties at the beginning of their first grade year were no longer in need of special education services at the end of second grade.

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Introduction

Practitioners, researchers, administrators, parents, and policymakers have been concerned about the reading and mathematics skill development of students in schools all over the world for more than a century. Teachers often cite reading difficulties as the main reason for referring students to special education services. Failure to learn to read in the first grade can have serious and long-term consequences on an individual's literacy development (see, e.g., Stein, Johnson, & Gutlohn, 1999). Early detection and intervention is widely accepted as the most beneficial route to take for the children concerned. One of the better known causes of difficulties with reading is developmental weaknesses at the phonological level (Ball, 1997; Ball & Blachman, 1988; Shaywitz, 1996).

Difficulties with understanding and retaining basic mathematics concepts is likely to lead to lack of success with more complex operations, for example, word problems. However, with appropriate instruction, students with mild disabilities and those at-risk for mathematics difficulties have improved their performance, even on complex skills like word problem solving (e.g., Xin & Jitendra, 1999). Multisensory methods of instruction have been found to be beneficial for reading (Moats & Farrell, 1999) as well as mathematics achievement (Bullock & Walentas, 1989; Sawada, 1982; Scott, 1993; Stern, 1999).

Phonological Awareness

Researchers have long studied the effects of training students in the early grades in phonology, that is, awareness of the sounds of letters and the various combinations of these sounds as used in a language. Development of phonological awareness has been found to be strongly linked to learning to read (Ball & Blachman, 1991). Children who may be at risk for reading difficulties are the ones who find it most difficult to acquire the decoding skills required for early reading achievement. For more extensive information on issues regarding reading skill development, see Snow, Burns and Griffin (1998).

Multisensory Mathematics

There is a paucity of research on issues related to the achievement of students at risk for mathematics difficulties. However, practitioners and researchers generally agree that basic mathematical concepts must be acquired before students can be expected to learn complex operations. Failure to understand and recall basic math facts (e.g., counting and number sense) is a possible cause of math difficulties (Garnett, 1987; Schoen, Fey, Hirsch, & Coxford, 1999). Counting and number sense are the most important skills used for success with basic mathematical computations in the early grades. Practitioners and researchers have observed that like phonics awareness, some children acquire number sense without any formal instruction. However, there are others who need formal instruction to help them learn these basic concepts.

Lack of achievement in mathematics in the early grades can be especially detrimental to students with disabilities and those at risk for math difficulties (Jitendra & Xin, 1997; Woodward & Baxter, 1997; Xin & Jitendra, 1999; Zentall, 1990). These students are said to benefit from a multisensory approach to math instruction. One such system, TouchMath®, is a touch-point system of mathematics calculation (Bullock, Pierce, & McClelland, 1989; Bullock & Walentas, 1989; Winebrenner, 1996). In this system, each numeral is accompanied by dots placed on the numeric symbol, with the number of dots corresponding to the number and its shape. Higher numbers use a combination of dots and circles. The TouchMath program does not rely on memorizing facts for success, and is designed to enhance logical thinking skills (Bullock & Walentas, 1989). This system can be used for all four basic mathematical operations: addition, subtraction, multiplication, and division.[1]

Method

Participants

Participants for this study were selected from a rural elementary school near Omaha, Nebraska. The initial

pool consisted of 13 students, but two students moved before the study was completed. The students were referred by their teachers for evaluation in their kindergarten year, in 1993-1994. This group of 6-7 year olds was assessed on the Wide Range Achievement Test-III (WRAT-III), and obtained scores below average in the basic areas of reading, spelling, and mathematics.

Procedure

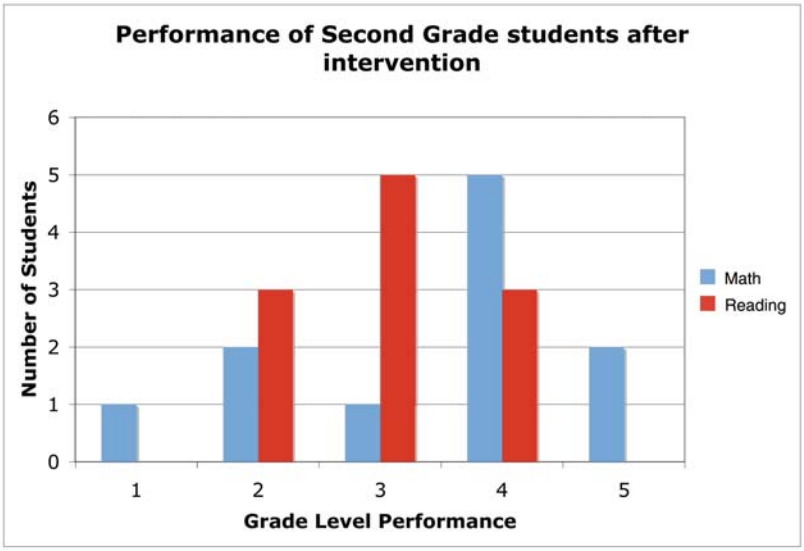
The special and general education teachers and the speech and language pathologist worked together to plan strategies for the students identified as at risk for reading and mathematics difficulties. They decided to use multisensory approaches for both areas, for all 11 children. Students received instruction in the general education classroom and in the resource room in the first and second grades.

The Orton-Gillingham technique, which is a multisensory approach to reading instruction (Orton, 1966; Sheffield, 1991), was used for the participants in this study. This approach incorporates the visual, auditory, and kinesthetic modalities, and teaches letter sounds as well as sound blends. The phonetic aspect of language is emphasized. The speech and language pathologist pulled students out of the general education classroom for 25-30 minutes, 2-3 times a week, for individual instruction. They also received phonics instruction on a daily basis in small groups in the general education classroom for 25-55 minutes (i.e., 1-2 periods) a day. Language instruction was provided by the speech and language pathologist, in collaboration with the general and special education teachers.

The TouchMath system is also a multisensory approach (Scott, 1993). This approach incorporates visual, kinesthetic, and tactile modalities. Number concepts are learned with the help of dots and circles on numerical symbols (Bullock, Pierce, & McClelland, 1989; Bullock & Walentas, 1989). Students learn basic math facts and mathematical operations using this system. For example, when they see the numeral three, they are taught to touch the three points and say the number. Once concepts have been grasped and students are able to retain them, they are gradually taught to solve mathematical problems without depending on the dots and circles.

The students in this study were taught according to the TouchMath system in the general education classroom for 25-55 minutes (i.e., 1-2 periods) every day while they were in first grade. Instructions of the TouchMath system were followed as outlined in the manual that came with the kit (Bullock & Walentas, 1989). **Those who needed a reminder were helped to review TouchMath strategies in the second grade, but none of the students required reteaching.**

Figure 1.



Interpretation of Graph

1 second grade student tested at the first grade level in math.
2 second grade students tested at the second grade level in math.
1 second grade student tested at the third grade level in math.
5 second grade students tested at the fourth grade level in math.
2 second grade students tested at the fifth grade level in math.

11 total number of at-risk students tested.

Results

The 11 participants were administered the WRAT-III at the end of Grade 2 in 1996. Before implementing the multisensory programs for reading and mathematics, all 11 participants were performing at the pre-first-grade level in reading and spelling.

Seven of the students were also at the pre-first-grade level in arithmetic, three were at the early first grade level, and one was at the intermediate first grade level. After the intervention, all of them showed marked improvement in reading. All except one student achieved above grade level in spelling, and **75% of the participants scored above grade level in arithmetic** (see Figure 1). One student scored below grade level in arithmetic on the WRAT-III. The students were able to maintain the gains made in reading, spelling, and mathematics achievement. When last checked in Spring 1998, none of the participants were in special education.

Discussion

Results demonstrate the benefits of multisensory methods of instruction for enhancing reading and mathematics achievement of students at risk for difficulties in both areas. Many students at risk for reading difficulties have been helped by multisensory methods like the Orton-Gillingham approach. Children's acquisition of literacy has been found to be strongly related to their awareness of the phonological structure of the words in their language, be it English or another language (Snow et al., 1998). Instruction in phonemic awareness in the early grades has helped children at risk for reading difficulties improve in reading.

Numerous professionals have espoused the benefits of providing a combination of intervention strategies to alleviate reading difficulties (e.g., Ball & Blachman, 1991; Snow et al., 1998). Intervention methods that combine the contributions of a speech and language pathologist with appropriate literacy instruction seem to be most beneficial for students with reading and language difficulties (e.g., Ball, 1997). Although our research yielded obvious benefits for the participants, we recommend a combination of training in word segmentation and phonemic awareness, as well as sight word and whole language approaches to reading and literacy development.

Students who have difficulty with the symbolic aspect of reading are also likely to have difficulties with the same aspect of mathematics (e.g., Winebrenner, 1996). Achievement of students at risk for mathematics difficulties can be greatly enhanced with multisensory methods[2] (Stern, 1999; Thornton, Jones, & Toohey, 1983; Winebrenner, 1996). Students using the TouchMath system are taught to touch specific points as they count or attempt basic math computations. As each skill develops, students are taught to gradually stop touching the points. However, as some researchers have cautioned, all students with disabilities may not be able to generalize skills learned across a variety of settings.

Footnotes

1. For more information, see http://www.touchmath.com.
2. The results of this research seem to support findings on phonemic awareness training present in the literature for at least 4 decades, and the scant information available on using multisensory methods to teach basic mathematics computation. However, the size of our sample prevents us from making definitive claims as to the efficacy of either the Orton-Gillingham method, or the TouchMath method, for significantly improving reading and mathematics abilities in children at-risk for difficulties in reading and mathematics respectively.

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