Introduction

Several problems arise when students are not able to complete basic math facts automatically, including anxiety (Cato & Rhymer, 2003), increased use of instruction time (Billingham, Skinner, & Crayton, 2004), and the need to complete assigned work (Skinner, Poppe, & Davis, 2005). Various strategies have been shown to be effective for enhancing automaticity or fluency (Skinner & Shapiro, 1989; Belfiore, & Watson, 2002). A common element of these procedures is that they occasion high rates of correct, accurate, academic (AAA) responding (Skinner, Fletcher, & Hearington, 1996), which can increase math fluency (Skinner, Bellville, Maze, Williams, & John, 1997).

The taped-problems intervention (TP; McCallum, Skinner, & Hartsell, 2004), a variation of the taped-words intervention (Freeman & McLaughlin, 1984) was designed to occasion AAA responding and enhance math fluency. Various researchers have shown the efficacy of the TP intervention to increase the division fact fluency of a 3rd grade general education student (McCallum et al., 2004), a general education elementary student (Poncy, Skinner, & Jaspers, 2007), and an intact third-grade urban classroom (McCallum, Skinner, Turner, & Swanker, 2006).

Participants

- Six students from a 3rd grade math class
- Three males, three females
- Three Caucasian, two African American, one Hispanic

Students were the lowest mathematically performing in their grade, as determined by beginning-of-the-year tests.

Materials

- Three sets of 12 mutually exclusive one-digit by one-digit multiplication problems first developed by Skinner, Shapiro, Turco, Cole, and Brown (1992) were obtained.

Procedures

During baseline sessions, the students completed a 30-second assessment on each of the sets of problems. The sequence of the sets (Sets A, B, and C) was counterbalanced across session. During treatment sessions, the students completed three 30-second assessments in the same manner as baseline. Next they received either TP or TP + AIA. Treatment order was counterbalanced across days with TP given on the first day and TP + AIA on the second. The three sets were randomly assigned to conditions with set B assigned to TP, set C assigned to TP + AIA, and set A assigned to control.

For the TP condition, students were given a Set B worksheet. A tape player was placed on a desk with a tape matching the TP worksheet. The students were told that when the tape was turned on, the problems would be read in the same order as they were presented on the worksheet and to try to write each problem’s correct answer before they heard it on the tape. Students were told that if they wrote the wrong answer or did not answer before the tape, to cross it out and write the correct answer after they heard it on the tape.

For TP + AIA sessions, students were given a Set C worksheet and procedures were identical to those used for TP interventions. However, once the students completed the tape, they were immediately assessed on the Set C items using procedures identical to baseline.

Results

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Students indicated that the intervention enhanced their multiplication fact speed and accuracy. Both the teachers and students indicated that they would recommend the intervention to others.

Discussion

From an applied perspective, these results have clear implications. Skinner, Bellfire, and Watson (2002) showed evaluation of interventions that do not take into account intervention time could cause researchers to draw inaccurate conclusions regarding intervention effectiveness. In the current study, we found that adding a brief 30-second assessment more than doubled the strength of an intervention that required approximately 4-minutes to complete. These results suggest that future researchers should consider adding immediate post-intervention assessments to enhance student skill development levels and rates. If researchers find similar results across interventions, skills, and students, educators may be able to prevent and remedy learning and/or skill development deficits by merely including these additional brief assessments.

While the current results support TP and more clearly the TP + AIA, classroom teachers may be able to prevent and remedy learning and/or skill development deficits by merely including these additional brief assessments. Additionally, students did not indicate difficulties in their ability to respond to the tape or correctly write their answers. This suggests that future researchers should consider including these additional brief assessments in their future studies.

Results (continued)

Treatment Integrity was collected for 30% of the treatment sessions. A data sheet listing the steps of the intervention, was provided to the teaching assistant who would place a checkmark next to each step that she observed performed correctly. Data indicated that treatment integrity for the intervention ranged from 98% to 100% with an average of 98% of steps performed correctly.

Intervention Agreement was determined by a second experimenter independently scoring 20% of the assessment sheets. Percent intervention agreement ranged from 88% to 100%, with an average of 96% of steps correct per minute. Most disagreements were caused by difficulty discerning handwriting.

Acceptability of the intervention was determined through surveying both the teacher and students. Both the teacher and most students indicated that they liked the taped-problems intervention, with the exception of one student. The teacher indicated the intervention to be time-efficient and a positive experience for the students. Students indicated that the intervention enhanced their multiplication fact speed and accuracy. Both the teachers and students indicated that they would recommend the intervention to others.