

Individualizing Early Math Intervention: Employing a Self-Monitoring Component

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BACKGROUND

Self-monitoring procedures help students complete complex tasks by providing instructional cues to monitor their own work. Teaching students how to monitor their own behaviors promote their development of self-regulation (Uberti, Mastropieri, & Scruggs, 2004). Strong self-regulation skills are associated with positive student self-perceptions of academic efficacy for learning and academic achievement (Lichtinger & Kaplan, 2015). In addition, mathematics self-beliefs, or self-efficacy, self-concept, and anxiety for math, have an effect on learning and performance and determine how well students motivate themselves in the face of difficulties (OECD, 2013). Despite ample research on the effectiveness of self-regulation interventions on improving academic performance, little research has studied whether self-regulation interventions have an impact on students' self-beliefs for math. The goals of this investigation were to examine the impacts of adding a self-monitoring component to an existing math intervention on students' accuracy with math work and students' self-efficacy, self-concept and anxiety for math.

METHOD

PARTICIPANTS AND SETTING

- ❖ Two 2nd graders participating in a summer math program
- ❖ Parents sought tutoring for children due to math delays
- ❖ 1:1 math tutoring was provided by graduate students
- ❖ Tutoring occurred in private clinic rooms
- ❖ A third participant was originally included in the study, however behavioral challenges prevented data collection

MEASURES

- ❖ Math calculation worksheet with 26 double digit problems
- ❖ Problem included addition and subtraction with regrouping
- ❖ Assessments were not timed

PROCEDURE

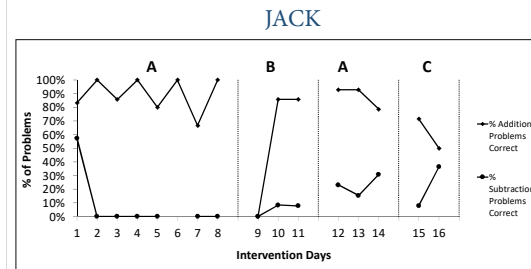
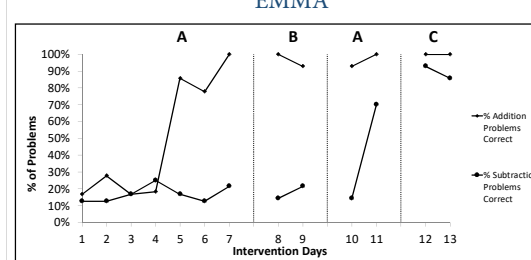
- ❖ Single-Case ABAC design was used. Participants completed math calculation worksheets at the beginning of each session.
- ❖ Pre and post intervention assessments of self-efficacy, self-concept, and anxiety for math were completed.

Baseline (A Phase): Standard tutoring occurred for 45 minutes daily following the MathWise tutoring program, which addressed double digit addition and subtraction with and without regrouping.

Self Monitoring I (B Phase): In addition to MathWise tutoring, a visual checklist was provided. Students were taught to use the checklist to check their accuracy in completing double digit addition problems with regrouping.

Self Monitoring II (C Phase): In addition to MathWise tutoring, a visual checklist was provided. Students were taught to self check academic behaviors or common errors in their work. Emma's checklist targeted number formation and task completion. Jack's checklist targeted task completion and effort.

RESULTS



MATH BELIEFS

	1	2	3	4
Emma				
Self-Concept	16	19	20	20
Self-Efficacy	24	24	24	24
Anxiety	5	5	5	5
Jack				
Self-Concept	16	11	12	14
Self-Efficacy	20	15	18	13
Anxiety	8	15	15	15

Emma

In baseline, subtraction scores were consistently low while addition scores increased. No change in addition accuracy occurred after either self monitoring phase or during the second baseline phase. A change in subtraction accuracy was noted for the second self monitoring phase, however subtraction accuracy showed an upward trend in the prior baseline phase. There was variability among Emma's scores for math beliefs. While there was an increase for self-concept, self-efficacy and anxiety remained the same.

Jack

In baseline, there was variability for both addition and subtraction accuracy. Addition was consistently over 80% for baseline. On day 9, Jack attempted only one problem and was incorrect. No change in accuracy was noted after the first self monitoring condition. Contrary to hypothesized effects, additional accuracy decreased to levels below baseline after the second self monitoring phase. Subtraction accuracy did not change. Jack's math beliefs scores showed variability. Self-concept decreased and anxiety appeared to increase.

DISCUSSION

- ❖ All students demonstrated academic growth over the course of MathWise tutoring. However, we cannot say that there was a specific added effect on math computation accuracy following self-monitoring.
- ❖ Self-monitoring appeared to support Emma's accuracy with work (C), but lack of a stable baseline and lack of a second replication with the self-monitoring checklist targeting academic behaviors, does not allow us to assume causality.
- ❖ After specific instruction for addition and subtraction was provided, Jack and Emma's scores reached between 80-100% which made it difficult to see any additional growth following self-monitoring.
- ❖ Off-task behaviors and a lack of motivation may have influenced scores, especially for Jack.
- ❖ On the last day of intervention, special treats and awards were given to students. Attention was especially low on this day for both Emma and Jack.
- ❖ When it came to the math beliefs assessment, students showed a general lack of understanding of how to answer. In addition, students sometimes select a response prior to being read the question. Other times, students selected the same response for all questions.

LIMITATIONS

Design

Implementation Fidelity: Checklists needed to be changed during the study. Change in directions to prompt students to try all problems.

Schedule: Student absences limited self-monitoring phases.

Measures

Ceiling Effect: Difficult to see any additional growth.

Math Beliefs: Participants showed a lack of understanding of how to use math beliefs measure, making data difficult to interpret.

FUTURE RESEARCH

Background information: It also would have been more efficient to know skill deficits prior to the study.

Math Beliefs: Future researchers may consider refining measures of self-efficacy, self-concept, and anxiety for math to better suit second grade students.

SELECTED REFERENCES

- Lichtinger, E., & Kaplan, A. (2015). Employing a case study approach to capture motivation and self-regulation of young students with learning disabilities in authentic educational contexts. *Metacognition and Learning*, 10(1), 119-149.
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