Abstract Title Page

Title: An Examination of Treatment Effects of a First Grade Literacy Intervention Using a Regression Discontinuity Design

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Background / Context:

Response to Intervention (RTI) is a tiered instructional delivery framework developed to meet the needs of all students and has the potential to improve reading achievement, prevent reading problems, and improve identification accuracy for learning disabilities (Fuchs, Mock, Morgan, & Young, 2003). Foundational assumptions of RTI include (a) all students receive high quality universal instruction in the main classroom setting, (b) students are screened throughout the year to determine the effectiveness of the universal instruction, and (c) students who are not meeting grade level markers are given access to a continuum of instructional supports in addition to universal instruction (Gersten et al, 2008). Tier 1 typically occurs in the context of the general education classroom and is characterized by evidence-based core instruction. Tier 2 support provides an additional instructional opportunity for students who need re-teaching of previously taught concepts, intensified explicit instruction, and added practice opportunities with high quality teacher feedback. Tier 3 is characterized by highly explicit and systematic instruction delivered in small group formats. When it comes to beginning reading instruction much of Tier 1 and Tier 2 instruction is delivered through a core reading curriculum and that implementation often varies between teachers. When the universal instruction is ineffective schools purchase supplemental materials for Tier 2 instruction. The curricular alignment between universal and supplemental curricula and instruction can be inconsistent with neither reaching optimal levels of effectiveness. We contend that an optimal system of support would include a Tier 2 program that is both systematic and explicit *and highly aligned* with Tier 1 instruction (Baker, Fien, & Baker, 2011). This contention is based on theories of learning to read that emphasize deep practice opportunities to facilitate high quality lexical representations (Bransford, Brown, & Cocking, 2000; Perfetti, 2007). The alignment and effectiveness of Tier 1 and Tier 2 instruction can be targeted to improve RTI outcomes.

Little rigorous research has been conducted on the effects of such prevention-oriented systems (Gersten et al., 2008; Gersten and Dimino, 2006; NRP, 2000). Rather, previous research has focused primarily on discrete interventions with little attempt to describe or manipulate multiple dimensions of the system. The purpose of our efficacy study funded by the *Institute for Education Sciences* was to implement and evaluate an RTI system that we've called Enhancing Core Reading Instruction (ECRI). The primary goal of the ECRI RTI system is to substantially increase the effectiveness of Tier 1 and Tier 2 instruction by (a) providing highly specified daily instructional protocols within the context of the universal reading program and by (b) increasing the alignment between Tier 1 and Tier 2 instruction. Our design makes it possible for an evaluation of students receiving instruction in Tier 2 compared to students receiving instruction in Tier 1 through a regression discontinuity design.

The ECRI system is a tiered approach to early reading instruction that includes data-based intervention placement. Student risk for reading problems is determined by a screening assessment at the beginning of the school year; students are assigned to a tier of instruction and remain in that instructional tier for the year based on a pre-determined cut point. Tier 1 consists of daily whole group enhanced instruction for 90 minutes. Tier 2 instruction is delivered daily for an additional 30 minutes to a small group of students. The ECRI system assigns students at low risk for reading disabilities to enhanced Tier 1 instruction only. Students at moderate risk for reading disabilities are assigned to enhanced Tier 1 instruction as well as Tier 2 instruction. A regression discontinuity design is a perfect research design match to answer questions about the effectiveness of instruction within a tiered model (Gersten & Dimino, 2006). The study directly answers the call for more rigorous studies of RTI systems.

Purpose / Objective / Research Question / Focus of Study:

The purpose of this poster is to evaluate the efficacy of the ECRI RTI system designed to prevent reading problems. Using regression discontinuity, we compare student reading data between students in Tier 1 and those students receiving Tier 1 and Tier 2 support. In each ECRI intervention school, a fall cut score was used to assign each student to Tier 1 or Tier 2 instructional support (or Tier 3, but this is not a focus in this study). Students in Tier 1 received Tier 1 instructional support and students in Tier 2 received Tiers 1 and 2 instructional supports.

Research Hypothesis. We hypothesized that Tier 2 support significantly improves reading. Using a regression discontinuity design (RDD) students in Tier 2 should deviate from the regression line predicted by students in Tier 1.

Setting:

This study includes a regression discontinuity design embedded within a randomized control trial. 18 schools were randomly assigned to ECRI treatment or to a wait-list comparison condition. 2 schools, 1 treatment and 1 comparison school, left the project at the beginning of the school year, leaving 16 schools in the study, 8 control and 8 intervention schools. All schools in the treatment and comparison groups agreed to use a published, comprehensive core program (identified and adopted by standard district procedures) during a 90-minute reading block for Tier 1 and provide students identified for Tier 2 with additional time (30 minutes) in small group instruction. The RDD sample included all 8 intervention schools from 3 districts in Western Oregon.

Population / Participants / Subjects:

Criteria for inclusion into the Tier 1 and Tier 2 intervention was a score above the 15th percentile on the SAT 10 in the fall of first grade. Students who scored above the 40^{th} percentile on the SAT 10 in the fall of first grade were placed in Tier 1 support. Students who scored between the 39^{th} and 16^{th} percentiles received Tier 2 support. Students who scored at the 15%ile or below were placed in Tier 3 support, which is not a focus of this study. Of these, 287 students met the intervention inclusion criteria. Fifty three percent of students (n = 167) were assigned to Tier 1 and fifty six percent (n = 120) were assigned to Tier 2 instruction based on the cutting point.

Intervention / Program / Practice:

There are two major components in the ECRI RTI system: (a) protocols that enhance tiered instruction (Tier 1 and Tier 2) and (b) intensive coaching and professional development to help teachers implement the protocols at a high level of fidelity. The PD infrastructure used to support the effective implementation of the ECRI RTI system will focus on implementing the multi-Tier 1nstruction. A major focus of this PD is on the science of beginning reading and effective instruction, and enhancing core reading instruction through the use of enhancement instructional templates and enhancement lesson maps.

Materials. ECRI protocols were used to enhance the content, design and delivery of Tier 1 and Tier 2 instruction. *Lesson maps* and *instruction templates* were used daily during reading instruction in both whole group and small group formats. Lesson maps that are individualized for each core program are used to outline for teachers the components of reading instruction that are a priority in the core reading block. *Lesson maps* were designed to a) ensure that instructional time is spent teaching essential components of reading instruction, b) increase practice

opportunities, c) activate background knowledge, d) systematically review previously taught skills and integrate connections between new and previously taught material. *Instruction templates* are designed to increase the quality of instructional interactions between teachers and students by providing a) explicit teacher models of tasks, b) consistent error corrections by the teacher, and c) multiple student response opportunities. The careful integration of lesson maps and templates resulted in a highly specified teaching routine and high rates of student engagement in instructional tasks.

Instruction. The ECRI intervention consisted of tiered support through Tier 1 and Tier 2 instruction. All ECRI students participated in Tier 1 instruction. ECRI Tier 2 students received an additional Tier 2 instruction treatment. Tier 1 consisted of at least 90 minutes instruction using the enhanced core reading program (e.g., using lesson maps and instruction templates). Tier 2 instruction consisted of an additional 30 minutes of small group instruction that was highly aligned with the enhanced core reading program using lesson maps and instructional templates.

Professional Development. The five-day PD sequence for classroom teachers begins with three days of in-service prior to the beginning of the school year and 2 days of follow-up in the fall. Instructional aids were also trained to deliver the Tier 2 small group instruction over a one-day training in the fall and follow-up coaching in the classroom. This PD is extended throughout the year, primarily through expert coaches who work with first grade teachers and instructional assistants in the classroom on the effective delivery of reading instruction following the ECRI intervention procedures. The ECRI coaches provide modeling and specific corrective feedback to both teachers and instructional aids. Fidelity to the standardized use of both the lesson maps and the instruction templates is a primary focus of on-site in the classroom coaching.

Research Design:

A regression discontinuity design is used to compare the results from a group of first grade students across 8 schools and 3 school districts. The regression discontinuity analysis makes use of standard regression procedures. The analysis looks for a discontinuity, due to condition, in the relationship between the assignment and outcome variables. For example, without intervention, we would expect a continuous, linear relationship between SAT 10 measured in the fall and again in the spring for first grade. If Tier 2 supports significantly improved reading performance, students in Tier 2 should deviate from the regression line predicted by students in Tier 1: at the point that separates the tiers, we should detect a discontinuity in the regression. This poster will present the ECRI RTI system as well as results demonstrating the added value of Tier 2 instruction for students assigned to that instructional recommendation.

Data Collection and Analysis:

SAT 10. The SAT 10 (Harcourt Educational Measurement, 2002) is a group administered, norm-referenced test of overall reading proficiency. The total scaled score, based on grade, was used in all analyses. The subtests administered in the fall of first grade were Sounds and Letters, Word Reading, and Sentence Reading. In the spring of first grade students were administered Word Study Skills, Word Reading, Sentence Reading, and Reading Comprehension.

ECRI data collection teams received a two hour training before each test period. A fidelity of administration checklist was used during administration and standardized procedures were followed. At the end of the administration each student's booklet was double scored and also entered twice to ensure accurate scores. Data entry agreement of 99% was achieved in both the fall and the spring.

Data Analysis. The assignment variable is performance on the SAT 10 pre-test. The outcome is performance on the SAT 10 post-test and the treatment is our ECRI Tier 2 small group intervention. By examining a plot of our data, we have a curvilinear relationship between pretest and posttest SAT 10. Because we know the relationship between our cutting point *Z* and our dichotomous treatment variable *X* is quadratic we have specified a quadratic term (Judd & Kenney, 2001) and used the following regression equation:

$$Y = \beta_0 + \beta_1 Z + \beta_2 Z^2 + \beta_3 X + e$$

Findings / Results:

Based on our specified quadratic regression model SAS provided the following values:

$$Y = -678 + 4.17 \times Z - 0.00335 \times Z^2 + 15.8 \times X + e$$

Here are our predicted scores for the cutting point for both Tier 1 and Tier 2 students:

Tier 1: $\beta_0 + \beta_1 Z + \beta_2 Z^2$

$= -678 + (4.17 \times 490) - (0.00335 \times 240{,}100) = 561.0$

Tier 2: $\beta_0 + \beta_1 Z + \beta_2 Z^2 + \beta_3$

$= -678 + (4.17 \times 490) - (0.00335 \times 240{,}100) + 15.8 = 576.8$

The effect for Tier 2 is not quite statistically significant ($t = 1.88$, $p = .0617$). We had a difference of 14 points at the point of continuity.

Conclusions:

The purpose of the current study is to test the efficacy of our enhanced version of tiered instruction that supports the unification of a system of support for students at moderate risk for reading problems (i.e., students identified as needing Tier 2 support). Using RTI for special education eligibility related specific learning disabilities is only valid in the context of robust, effective Tier 1 and Tier 2 programs. The multi-tiered instruction model implemented in Project ECRI standardizes many of the practices summarized by the RTI practice guide (Gersten et al 2008). It's important to know whether the enhancements were used in the classroom, the degree to which the enhancements were being implemented as intended by design, the proportion of the relevant lesson map that was delivered, and the degree to which instruction in each of the foundational concepts of reading was explicit. By using a regression discontinuity design to examine the effectiveness of RTI instructional delivery models we found that while our Tier 2 instruction did not produce statistically significant findings a difference at the point of continuity was observed. Treatment integrity is critical to consider when examining our findings. Taken together, these results indicate that enhanced instruction may mitigate student risk factors associated with reading difficulty.

Appendix

Appendix A. References

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