Response to intervention is an educational model that researchers have preliminarily found to be related to an increase in student outcomes, especially in the area of reading. However, few studies have examined the relationship between the implementation integrity of five RTI components (i.e., treatment integrity, assessment, data-based decision making, professional development, and evidence based instruction) and student outcomes. Utilizing a survey assessment called the RTI Implementation Scale for Reading (RTIS-R; Noltemeyer, Boone, & Sansosti, under review), the average implementation integrity of these five components across all three tiers was assessed in relation to two student outcome variables (i.e., promotions and Ohio Achievement Assessment scores in Reading). Hierarchical linear regression was used to analyze the data and to control for demographic variables. Results of this study indicated that both data-based decision making and evidence based instruction were related to student outcomes.
THE RELATIONSHIP BETWEEN RTI COMPONENT IMPLEMENTATION ACROSS TIERS AND ACADEMIC OUTCOMES

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Every child born in the United States is entitled to a free and appropriate education. These children represent an increasingly diverse group and have increasingly complex educational needs. This means schools today face the continually challenging task of identifying ways to ensure the success of all students. This pressure is intensified by federal laws mandating schools to continually progress towards improved academic outcomes for all students in U.S. schools. One example of such legislation is the No Child Left Behind act (NCLB, 2001), which is a piece of federal legislation that holds schools accountable for the academic outcomes of their students, and calls for prevention or intervention of academic problems and the use of scientifically-based educational practices. Another piece of legislation is the Individuals with Disabilities Education Act (IDEA), which specifically pertains to students with disabilities. The newest reauthorization in 2004 places greater emphasis on accountability and the use of research based interventions for students with suspected or identified disabilities (IDEA, 2004). These federal regulations, which have increased the emphasis on improving students’ academic outcomes, have resulted in schools exploring different models that may enhance student performance. One such model that has garnered much attention is Response to Intervention (RTI).

The RTI model is aligned with the requirements of federal legislation because it is seen as a form of early intervention, “catching” those struggling before they fall too far behind. It also meets some requirements of federal legislation because it calls for the use of evidence based or scientifically based interventions. Additionally, it has been viewed as a possible alternative to the IQ-Achievement discrepancy identification of students with learning disabilities. The RTI framework has been compared to that of the public health model which focuses on risk and protective factors as well as increasing levels of prevention or intervention (Walker & Horner, 1996). In the RTI model, practitioners are concerned about students’ difficulties that affect educational achievement, such as academic and behavior deficits.

The RTI model, when implemented, targets all students within the school, but not all students receive the same level of services (Glover & DiPerna, 2007). The amount of service a student receives is related to the amount of support they need in order to be successful. Most RTI models have three levels or tiers in their system; however the number of tiers may vary between RTI models. At the heart of all the models is the same basic premise: a school wide, multi-tier system, use of screening tools to identify at risk students, progress monitoring of students, and the use of data to make educational decisions for students. When looking at a three tier model, the first tier targets all students in a school system. This first level contains a research based core curriculum, along with differentiated learning strategies within the classroom to address individual learner needs, and a screening process to identify students that are potentially at-risk for academic difficulties (National Center on Response to Intervention, 2010). Students whose screening scores suggest risk are then moved to tier 2 and receive small group interventions that are evidence based in addition to the regular classroom instruction (National Center on Response to Intervention, 2010). Students receiving tier 2 interventions are monitored more frequently to assess their academic progress and to see if the interventions are working or if changes may need to be made. If a student’s progress is not adequate at tier 2 they may then move to tier 3. Within tier 3 the student receives an individualized curriculum based on their specific academic needs. At this level they are monitored more frequently to assess changes that occur and to determine if alterations need to be made.
Response to intervention has struck a chord with many practitioners who work in the schools because it seems logical to assume that if an intervention is provided early then a student will be more likely to “catch up” and stay on track with their peers. This intuitive feeling, although appealing, is not enough to help support RTI as a way to improve student outcomes. The research on an RTI model in schools has revealed that the model is associated with decreases in special education referrals (e.g., Burns, Appleton, & Stehouwer, 2005; VanDerHeyden, Witt, & Gilbert, 2007). RTI outcome research has also been found to support positive academic outcomes for students (e.g., Burns, Appleton & Stehouwer, 2005; Mcnamara & Hollinger, 2003; Speece, Case, & Molloy, 2003). Research has also specifically looked at reading outcomes for students and it has been found that an RTI model may also reduce the risk of reading failure (e.g., Fuchs, Compton, Fuchs, Bryant, & Davis, 2007; Vellutino, Scanlon, Small, & Fanuele, 2006).

RTI Implementation Integrity

Most research done to date on RTI has been focused on the outcomes for students, as well as implementation integrity on an instructional/student level. Implementation can be defined as the steps or activities that are needed to put into place a system or program (Fixsen, Naoom, Blasé, Friedman, and Wallace 2005). How well the actual steps are put into place can be seen as implementation integrity or fidelity. In a study by Wickstrom, Jones, LaFleur, and Witt (1998) it was found that none of the teachers involved implemented the intervention with greater than 10% treatment integrity, even after they had been trained. Bianco (2010) looked at the implementation integrity of evidence based instruction by teachers and even then many checks went into place to ensure that the interventions were being performed correctly. In this study, tracking forms, reading coaches and video clips were used to help increase the fidelity of which the interventions were being implemented by teachers. With these it was found that implementation integrity remained high, and the students made progress with the reading interventions that were used. Bianco noted that implementing RTI with fidelity and according to the best practice is a continuing concern for practitioners.

In another study examining teacher implementation integrity of an intervention for problem behaviors, researchers saw an increase in integrity when teachers were given daily feedback, were monitored on accuracy, and received practice with a coach if they missed a step (Digennaro, Martens, & Kleinmann, 2007). They also found that when intervention integrity was high, the teachers saw a decrease in student problem behavior. How well an intervention is being implemented can affect the overall outcomes of the students. The studies by Digennaro, Martens & Kleinmann (2007) and Bianco (2010) suggest that implementation integrity can be improved by putting systems into place that allow for checking of the processes.

Although research has documented the importance of maintaining implementation quality when it comes to following the procedures of a specific intervention, it has not looked at the overall implementation quality of the components of the entire RTI model. For schools that wish to put an RTI system in place it is important that the components of the model are being implemented as designed. Some schools discuss wishing to implement RTI or have a model of RTI in place, when in reality they may only be implementing a fraction of the RTI process or not implementing them well. If a school is haphazardly putting these components into place then it could potentially jeopardize the effectiveness of the model, but if they are implementing
components with fidelity then a school system could potentially maximize their outcomes (e.g., Foorman & Moats, 2004; Telzrow, McNamara, & Hollinger, 2000).

In a comprehensive literature review reported by Noltemeyer, Boone, and Sansosti (under review) six core components of RTI were identified. One component is professional development. Many educators do not receive the necessary training in the skills they would need when working within an RTI model. Danielson, Doolittle and Bradley (2007) suggest that many educators would need training in interventions for both tier one and tier two, along with assessments used for screening and progress monitoring. They also suggest that special educators would need to be trained in the delivery of intensive individualized interventions for students. If professionals working within the RTI system do not receive the training necessary to implement RTI then it is not unreasonable to assume the implementation may falter.

Administrative leadership and support for school staff is also a consideration that should be made. It is important that staff understand the model, know what their roles are, and most importantly are willing to perform these roles. If teachers do not feel supported then it may be likely that they will not implement important components. Some researchers suggest that by identifying the supports needed by those involved in the process it may help improve the integrity (Glover & DiPerna, 2007).

Assessment is also a critical component of RTI. Assessing students includes screening of students and progress monitoring them. There are plenty of programs, especially in relation in to reading achievement, to help educators identify and progress monitor students that are at risk using brief measures. These include the use of Curriculum Based Measurement (CBM), AIMSWEB (see Shinn & Shinn, 2002), and Dynamic Indicators of Basic Early Literacy (DIBELS; see Good, Gruba, & Kaminski, 2001), which all have research supporting their use to make educational decisions in relation to reading (Deno, 1985; Fuchs, Deno, & Mirkin, 1984).

Assessment is important; however educators also need to use data from assessments to make decisions, along with rules about what to do. If they assess and then do nothing, there is not really a point in doing the assessment. When educators are assessing they must also remember what skills the assessments are measuring and then use that information to select appropriate interventions. Educators also need guidelines to determine when an intervention may not be working and if it should be discontinued or modified in some way. By using the data that is obtained from the measures used, educators are able to better make decisions for students, such as if they are at risk and what kinds of interventions to use, which helps to assist in meeting student needs more appropriately (e.g., Glover & DiPerna, 2007).

In addition, educators need to be sure that evidence based instruction is being provided. This includes the core curriculum, and interventions used on all tiers. The core curriculum is considered evidence based if it works for at least 80% of the students. For an intervention to be evidence based it has to have undergone research and been shown to improve students’ outcomes in a particular academic area(s) (e.g. Brown-Chidsey & Steege, 2005; Gersten et al., 2009; Foorman & Torgeson, 2001; Bursuck & Blanks, 2010; Glover & DiPerna, 2007).

Treatment integrity is also important when implementing an RTI model. This means that students are receiving the interventions in the manner they were intended to be delivered. It is important that everyone involved is doing their part so that the best outcomes for students can be achieved. Treatment integrity can be achieved through various means, such as checklists or observations (e.g., Goss, Noltemeyer, & Devore, 2007; Glover, 2010).
It is important that these components are implemented with fidelity because it could potentially relate to student outcomes. Burns and Ysseldyke (2005) conducted a review of existing large-scale RTI models (e.g. Heartland, Intervention Based Assessment, Instructional Support Teams, and the Problem-Solving Model). They noted that RTI implementation integrity was important in the success of the intervention, and in the reviewed study on the Instructional Support Team model implementation, those schools that implemented it with greater fidelity saw greater student time on task, task completion and comprehension. They noted that none of the studies they reviewed had a process to assess implementation fidelity and that at that time it was yet to be seen how it would be assessed in the field.

As discussed earlier, studies have investigated the importance of implementation integrity of teachers using specific interventions, but not as many have looked at the implementation of RTI at the systems level and what components may be important to the outcomes for students. Some researchers have seen that there is a missing link and that systems level outcomes should be assessed. Kovaleski (2007) mused that one line of research that needs to be assessed is the extent to which the entire RTI model produces positive outcomes for students when individual components are implemented with fidelity and it is operating at an efficient level. Along those same lines Gansle and Noell (2007) noted that as integrity of implementation increases so do the student outcomes. They also discuss that schools do not have the time or resources to assess every step of the RTI process and it would be helpful to determine which components are critical to outcomes for students.

Assessing RTI Component Implementation for Reading

As previously discussed it is important that schools are implementing RTI components with fidelity if they wish to maximize their student outcomes, and this holds true for reading. One group of researchers designed a case study to examine the key components needed in RTI implementation to close the reading gap. The researchers studied three elementary schools that were implementing RTI and found that in particular, the use of data, flexible grouping and additional interventions may help close the reading gap (Alonzo, Tindal, & Robinson, 2008).

Hamre et. al (2010) studied teachers implementation integrity of literacy curricula. The researchers examined the difference between teachers with regard to adherence to the curricula, dosage (length of session), quality (evidence-based), and student gains in reading. The researchers found that in classrooms where teachers implemented with greater dosage and higher quality, the children made greater gains in reading for the school year.

Noltemeyer and Sansosti (2012) studied implementation levels of Ohio’s Integrated Systems Model (ISM) which is an RTI model that addresses both academic and behavioral components, to examine whether implementation level is associated with student reading outcomes. In their analysis they found that implementation of the ISM components were approximately 55%, lower than the 80% expected implementation of what the model is based on. However, using hierarchical linear regression, they did find that higher implementation fidelity of the academic components of ISM experienced greater reading achievement when controlling for relevant school demographic variables. Noltemeyer and Sansosti (2012) suggest that although there was improvement in student outcomes at the low levels of implementation, it is beneficial to improve upon these levels. This is because higher levels of implementation have been linked to higher academic outcomes. However, this study used a small suburban sample
and an instrument that was not fully validated; consequently, replication and extension of the work is warranted.

Noltemeyer, Boone, and Sansosti (under review) devised a method to assess the implementation of RTI in relation to reading within the schools, called the RTI Implementation Scale for Reading (RTIS-R). In their initial pilot study the scale, which will be described more in the Methodology section, was a rigorous and reliable instrument for assessing RTI implementation in reading. However their study contained a small and homogeneous sample size, which can affect the generalizability of the findings.

Sanders (in preparation) used the scale developed by Noltemeyer, Boone, and Sansoti (under review) to help provide evidence that quality of implementation of RTI by tier is related to improved reading outcomes for students on a state standardized test when demographic variables were controlled for (e.g. economic disadvantage, disability status and minority status). Using hierarchical linear regression, she found that the implementation of tier 2 is related to reading achievement on the Ohio Academic Achievement Test (OAA) above and beyond the proportion of reading achievement scores explained by several school demographic variables.

**Rationale and Purpose**

Improving reading outcomes for students is perhaps the academic skill that is assessed and researched most within the RTI framework. There are many students who fail to adequately learn how to read. When a student struggles with reading other academic areas also suffer, since it permeates all aspects of learning. Students who struggle to learn to read have an increased risk of experiencing negative life outcomes, such as, delinquency, truancy, and substance abuse (McGill, 1997). Fortunately, the availability of reading research is abundant. Through different studies, researchers have learned how students read and have developed assessments that are used for screening and progress monitoring these foundational skills, along with empirically supported interventions. Screening, progress monitoring and evidence based interventions are all important components of an effective RTI model (Glover & DiPerna, 2007). There are several tools available, such as AIMSWeb and DIBELS, that provide schools with screeners and tools to progress monitor these foundational reading skills, along with ways to graph progress. This allows schools to identify and track the progress of students who are at risk for reading failure. There are a growing number of evidence-based interventions becoming available, such as corrective reading and phonemic awareness with letter knowledge training (e.g. What Works Clearinghouse). The amount of information about how students learn to read, the screening and monitoring tools available, and the amount of interventions available, leave reading primed to be one of the first things that educators may try to implement when beginning the RTI process in their building.

RTI is becoming an increasing presence within the schools. In one survey provided to state departments of education 44 out of 44 responders indicated that they were either currently implementing or planning to implement some form of RTI (Hoover, Baca, Wexler-Love & Saenz, 2008). Also, in a national IDEA implementation assessment study, 71% of school districts were found to be implementing RTI in a least one school (Bradley et al. 2011). There is initial evidence supporting its use to improve student outcomes, decrease special education referrals and to close the reading gap. There have been numerous studies examining implementation of interventions but very few that have looked at implementation of the different components of the comprehensive RTI system. Researchers such as Kovaleski (2007) have
called for the need to look at the components of an RTI model and to assess how well the outcomes for students are when they are implemented. Sanders (in preparation) found that tier 2 interventions are related to higher reading scores on the OAA, helping support that tier 2 is an important component of RTI implementation. However, Gansle and Noell (2007) also have noted the need to address which components of an RTI model may be most beneficial to student outcomes.

This study expands upon the studies of Noltemeyer and Sansosti (2012) and Sanders (in preparation). Specifically it will examine the relationship between five components of RTI implementation (professional development, data-based decision making, assessment, research based interventions and treatment integrity) and promotions to the next grade level, as well as student reading scores on a statewide achievement test. Assessing which components may be most beneficial to implement within an RTI system is important because it may be able to help schools determine where their limited amount of resources should be allocated to help support student outcomes in reading. The specific question that the study examines is: Which components of RTI implementation are related to reading scores on the Ohio Academic Achievement Test (OAA) and promotions to the next grade level, when controlling for certain demographic variables, and how much variability in the reading scores do these components explain? This study builds upon the work of Sanders (in preparation) by adding an additional outcome variable (i.e., promotions), including additional demographic control variables, and examining the components of RTI implementation.

**Methodology**

**Instrumentation**

The RTI Implementation Scale for Reading (RTIS-R), developed by Noltemeyer, Boone, and Sansosti (under review), measures schools’ quality of systems level RTI implementation quality in relation to reading (contact primary author at anoltemeyer@muohio.edu for the instrument). The scale was designed to be filled out by professionals in a school-setting with knowledge of the RTI system at their building. The scale allows the rater to rate their perception of the 6 components of RTI on a 5-pt likert scale, from 0-5, within each tier of RTI implementation. For each item it provides examples of what a 0 point, 1 point, 2 point response and so on would be.

According to Noltemeyer, Boone, and Sansosti (under review), the scale was initially developed based on Rasch psychometric theory (Wright & Masters, 1982) and the questions were designed to assess the six key components of RTI discussed in the review of literature (i.e., assessment, data-based decision making, high quality research-based instruction and intervention, treatment integrity, professional development, and administrative leadership/schoolwide supports). The instrument underwent expert review to help ensure that all relevant items were included and irrelevant items were not. Cognitive interviewing was also conducted to help ensure that items on the scale would be fully understood and would not be misinterpreted by respondents.

Following these procedures, reliability data were obtained through a Rasch analysis validation study of 53 school psychologists and building principals (Noltemeyer, Boone, & Sansosti, under review). This study revealed the RTIS-R as a rigorous instrument, it found that the scale measured the construct and the trend was approximating what would be expected. However, three items did not function as would be expected, and were consequently removed.
(these items assessed the amount of time schools spent implementing instruction at each of the three tiers). In addition, the validation study revealed that two scales within the RTIS-R actually existed; one which assessed five of the components of RTI across three tiers, and the other which assessed the final component of RTI (administrative leadership) at the school wide level. Because the technical characteristics of the former scale revealed a higher quality instrument, this study will focus only on the five components of RTI assessed via this scale.

**Participants**

The participants in this study were principals and school psychologists from schools who filled out the RTIS-R. These are the same participants used to validate the RTIS-R in Noltemeyer, Boone, and Sansosti’s (under review) study, plus additional participants. They represented urban, suburban and rural elementary (preschool-6th grade) schools from across Ohio. They were selected based on information that they were implementing RTI at some level within their school. Student demographic data that was obtained from Ohio Department of Education’s Data Warehouse were also analyzed. Please see Tables 1 and 2 for characteristics of the participants in the study.

**Variables**

**outcome variables.** One outcome measure variable is the Ohio Academic Achievement (OAA) test results. The OAA is a state standardized achievement test that is given to 3rd-8th graders. This test is aligned to the Ohio academic content standards and tests student knowledge in various subject areas. The test results that are of particular interest in this study are the reading achievement scores on the OAA. Students can obtain scores between 257-503. Students who score below 385 fall within the limited range; between 385-399 fall within the basic range; between 400-414 fall within the proficient range; 415-431 fall within the proficient range; and if they score above 432 they are advanced (Family Interpretive Guide, 2011).

This study examines a second outcome variable: student promotions. Promotions are the percentage of students that are moved into the next grade; this is the opposite of grade retention. One longitudinal grade retention study found that adolescents that had been retained had lower achievement levels, increased aggression and higher dropout rates than those students who were promoted (Jimerson & Ferguson, 2007). Studies have found that retention is linked to decreased oral reading fluency, and certain problem behaviors, but that when RTI is put into place it can be decreased, therefore increasing the number of students promoted (Murray, Woodruff, & Vaughn, 2010). Promotion is not always the best answer either since students may be missing key skills they need, but when students who are struggling have access to research based interventions that meet their needs then promotions are increased (Jimerson, Pletcher, Graydon, Schnurr, Nickerson, & Kundert, 2006). It seems safe to assume that if retentions were to decrease then the promotion of students within an RTI model would increase. The data on percentage of student promotions within the schools was obtained from the Data Warehouse on the Ohio Department of Education’s website.

**predictor variables.** The self-reported scores from the RTIS-R that was completed by either a school psychologist or principal were entered as predictor variables. The scores for each of the five RTIS-R predictor variables were the total raw score for the items associated with each of those five components.

Several predictor variables were also controlled for in the analyses. The first two were economic disadvantage and percentage of non-white students in the school. Research has
consistently shown that students who come from an economically disadvantaged background and those who are of minority status tend to be disproportionally represented in special education, and may be more likely to drop out or be retained (Artiles & Trent, 2004; McCloyd, 1998; Gutman, Sameroff, & Cole, 2003). The number of discipline referrals per 100 students in the schools was also used as a predictor variable. High rates of discipline referral have been found to be related to the overall academic success of students. Studies have found that as rates of discipline referral decreases, students’ academic success increases (Luiselli, Putnam, Handler, & Feinberg, 2005). Students may fall behind due to missing class time and therefore find school increasingly difficult. The percentage of students with disabilities was another predictor variable that was used. Students with disabilities tend to have lower classroom performance than their peers (Cullinan, Evans, Epstein, & Ryser, 2003; Fuchs, Fuchs, Mathes, & Lipsey, 2000; Ysseldyke, Thurlow, Langenfeld, Nelson, Teelucksingh, & Seyfarth, 1998). Percentage of students who scored in the intense instruction band on the Kindergarten Readiness Assessment Test (KRAL) was also used as a predictor variable. Upon entry to kindergarten students are at varying levels of reading readiness, it has been found that those who score lower on entry exams typically score lower on academic measures given at later points in time (Konold & Pianta, 2005; Zill & West, 2001). The KRAL is required by Ohio for all children entering kindergarten; it is an individually-administered assessment of early literacy skills that are important for becoming a proficient reader. The percentage of highly qualified teachers per building as defined by the state and federal guidelines was also controlled for. Highly qualified teachers have a bachelor’s degree in their teaching area, full certification, and prove they know their subject; some research has shown that these teachers’ students obtain higher academic achievement (Goldhaber & Brewer, 2000; Darling-Hammond & Young, 2010). By controlling for all of these demographic differences, the chance that they would confound the results was minimized.

**Procedures**

Data were collected and most were entered before this study was initiated. Data were collected by sending out the RTIS-R, a consent form, and envelope to all potential participants. Potential participants were chosen based on if the researchers (Noltemeyer, Boone, & Sansosti, under review) had heard if the school was in any stage of RTI implementation attempt. If the form and consent were returned and completed participants received a gift card; if it was partially completed then participants received a reduced amount gift card.

**Data Analysis**

The data that were collected were then entered into SPSS by a trained graduate assistant and were spot checked by a faculty member (Sanders, in preparation). More data were obtained since Sanders’s (in preparation) study and was entered in a similar fashion.

Hierarchical linear regression was used in this study, similar to the way it was used by Noltemeyer and Sansosti (under review) and Sanders (in preparation). This technique allowed for an analysis of the relationship between the predictor and criterion variables. The criterion variables that were used were the OAA reading scores and percentage of students who are promoted to the next grade level. The predictor variables were divided into two blocks. One block was a set of six demographic variables that were controlled for: (1) percentage of economically disadvantaged students, (2) percentage of students with minority status, (3) disciplinary referrals per 100 students, (4) percentage of students with a disability, (5) percentage of highly qualified teachers per building, and (6) percentage of KRAL scores in the intensive
instructional range. The second block included raw scores on the five RTI components that were measured by the RTIS-R: (1) professional development, (2) treatment integrity, (3) data-based decision making/rules, (4) high assessment (progress monitoring, screening, and trained collectors), (5) high quality instruction. Two regression analyses were conducted, one on each outcome variable (i.e. OAA performance and grade promotion).

Entering the predictor variables in two blocks allowed us to determine if adding in the RTI components would improve the proportion of variance in the criterion variables significantly, beyond what is explained in the demographic variables. Each block was analyzed using stepwise procedures. This means that each variable in the block was entered in sequence and was retained only if it contributes significantly to the model. The other variables in the model were then re-tested to determine whether they continued to contribute to the model, and were removed if they did not (Brace, Kemp, & Snelgar, 2006). This approach results in the keeping only the smallest number of variables that are significant contributors to the model (Brace et al., 2006).

Results

Descriptive Statistics

The mean implementation integrity scores across the participants for the five RTI variables were: professional development, 2.13; data-based decision making, 2.38; assessment, 2.94; treatment integrity, 1.86; and instruction, 2.54 (see Table 3). These implementation scores are out of a scale based from 0-4. Implementation scores from the RTIS-R in districts where multiple participants completed the scale were found to be significantly correlated to one another, $r = .316$, $p < .01$. The schools within this study had a mean promotion rate of 99.07% and average Ohio Achievement Assessment passing rate of 89.2%. For the participating schools the mean percentage of nonwhite students was 17.66%; economically disadvantaged students was 42.33%; students with disabilities was 13.28%; students scoring in the intensive instruction band of the KRAL was 17.05%; discipline referrals per 100 students was 4.53; and percentage of highly qualified teachers was 99.97% (see Table 3).

Regression Analysis

The regression analysis that was conducted on the outcome variable of OAA scores revealed four significant models (see Table 4). Model one revealed economic disadvantage as a significant predictor of students with passing scores on the OAA, explaining 30.6% of the variability in scores. The second model revealed that KRAL scores in the intensive instruction range were a significant predictor of students with passing scores on the OAA, explaining 6.1% of the variability in scores above and beyond what economic disadvantage explained. The third model revealed that the percentage of students with disabilities was a predictor of students with passing scores on the OAA, explaining 6.8% of variability above and beyond what was explained by the previous models. In total, these first three models accounted for 43.5% of the variability in OAA scores. The final model, that which is most relevant to the research question in this study, revealed that the implementation of data-based decision making contributed significantly to OAA achievement above and beyond what was explained by the first three predictor variables. Specifically, this variable explained an additional 7.5% of the variability in OAA scores, beyond what was explained by the demographic variables.

A second regression analysis was run on the outcome variable of promotions (see Table 5). This revealed four significant models as well. The first model revealed that KRAL scores in
the intensive instruction range were significant predictors of the amount of students who were promoted to the next grade level and accounted for 37.9% of the variability. The second model revealed that students with disabilities was a significant predictor of the number of students promoted to the next grade level accounting for 7.8% of the variability above and beyond the first model. The third model revealed that discipline referrals per 100 students was a significant predictor of the number of students promoted to the next grade level accounting for 11.7% of the variability beyond the first two models. Together these variables explained 57.5% of the variability in percentage of students promoted. The final model, which is most directly related to this study’s purpose, revealed that instruction contributed significantly to promotions above and beyond what was explained by the first three predictor variables. The instruction variable explained an additional 5.6% of variability in promotions, beyond what was explained by the demographic variables.

The remaining three RTI component variables (i.e., assessment, treatment integrity, and professional development) that were assessed by the RTIS-R survey and the demographic predictor variable of percentage of nonwhite students were found to have no significant relation to either outcome variable (OAA reading scores or promotions).

**Discussion**

The purpose of this study was to examine the impact that implementation integrity of five components of RTI had on two student outcomes: (1) Ohio Achievement Assessment scores in reading and (2) percentage of students promoted to the next grade level. Participants were school psychologists and principals from rural, urban, and suburban school districts from around Ohio. Data were collected by sending out the RTIS-R survey to districts who were implementing RTI on some level within their buildings. Two regression analyses were performed to assess which components of RTI predict each of the two outcome variables, when controlling for certain demographic variables, and how much variability in outcomes these components explain.

The results indicated that the RTI component of data-based decision making was significantly related to improved outcomes above and beyond the predictor variables of percentage of economic disadvantage, percentage of intensive instruction KRAL scores, and the percentage of students with disabilities. This indicates that it may be important for school personnel to analyze their assessment data using a systematic process to inform instruction. More specifically, based on the content of the items on that scale, it reveals that school staff should consider analyzing data on all levels using a systematic process to inform intervention and tier placement, collecting sufficient data points (e.g. a range of 6-8 Fuchs, Hamlet, & Fuchs, 1997) at Tier 2 and 3 to inform decisions, and using documented cutoff scores to guide placement decisions; this supports findings from other researchers. In one study, Alonzo, Tindal, and Robinson (2009) found that when data are used as part of the RTI model to make instructional changes for students, gaps between them and their peers may close in reading. In addition, Stecker, Fuchs, and Fuchs (2005) conducted a review of the literature and they concluded that student growth improved in studies where educators were making instructional changes based on assessment data. They also concluded that in studies where educators didn’t use the data from CBM assessments, students made little progress (Stecker, Fuchs, & Fuchs, 2005). Data from assessments can help guide educators on what a student may need for instruction. It can support
the “gut feelings” some educators may have about struggling students, and bolster the reasons why they wish to make an instructional change.

The results for the second regression analysis, performed with the outcome variable of promotions, indicated that the RTI component of instruction was significantly related to improved outcomes above and beyond the predictor variables of percentage of students with KRAL scores in the intensive instruction range, percentage of students with disabilities, and discipline referrals per 100 students. This reveals the importance of using research based instruction, both in the core curriculum and when selecting interventions, to help support the needs of students. Specifically, school staff should consider conducting a thorough review of possible curriculum and interventions utilizing multiple and reputable sources as a reference. Additionally staff should ensure that appropriate groupings are utilized on all Tiers; at Tier 1 student skills should be mixed and groupings should be flexible depending on skill, at Tier 2 students should be grouped with others with similar skill deficits and at Tier 3 one on one attention should be provided. Lastly, school staff should strive to implement these practices throughout the building and not at only a few grade levels. Previous research suggests that instruction that is deemed evidence-based has been shown to improve student outcomes in academic areas. For example, Vaughn, Linan-Thompson, and Hickman (2003) found that 45 at-risk students were provided with 90 minutes of research-based instruction at Tier 1 with supplemental Tier 2 instruction targeted to their needs for 20-30 minutes a day, 20 of those students met benchmark within 20 weeks. If educators use instructional techniques that do not have evidence supporting their use for improving student outcomes in specific areas, then it may not be far off to suspect that students may not be getting instruction that is adequate enough to meet their needs.

Surprisingly, data-based decision making was not related to promotions and instruction was not related to an increase in OAA scores. It is assumed that the two outcome variables, OAA reading scores and promotions, would be related to the same important RTI component variables since they both seemingly are measures of how well students are doing; however, this was not the case. Supplementary follow-up analyses revealed that these two outcome variables have a moderate relationship, $r(55)=.437$, $p<.01$ to one another. Therefore, although similar, these two constructs are different; they do not perfectly align with one another. Also, state standardized tests do not 100% accurately reflect the curriculum (Mehrens, 1984). Recent laws (e.g. No Child Left Behind and Race to the Top) have encouraged educators to promote students based upon passing of a state standardized test; however, committees made up of parents, teachers, and other school staff can review the overall achievement of a student who has failed the standardized test and based upon that promote the student to the next grade if it is determined they can perform at grade level with differentiated or additional instruction the following year (Wakefield, 2012). This could potentially help explain why the two constructs did not reveal the same predictors. It may also be possible that percentage of promotions was not a good outcome variable since there was not enough variability among the schools and a very high percentage of students were promoted; this may have made it difficult to determine what the differences are between schools with high and low promotions rates, thereby not fully uncovering the effects of the RTI components related to promotions.

The other RTI variables (i.e., assessment, treatment integrity, and professional development) were found to not be significantly related to either outcome variable. Treatment
integrity had mean implementation level of 1.87 out of 4 in this study. Although treatment integrity has been linked to positive outcomes on an intervention level (e.g. Bianco, 2010; Digennaro, Martens & Kleinmann, 2007); this study’s findings do not support an association between treatment integrity at the level it was being implemented and the student outcomes that were measured. Professional development had a mean implementation level of 2.14 out of 4 in this study. Scholars have reasoned that professionals need training in both tier 1 and 2 interventions along with the tools used for screenings and progress monitoring (Danielson, Doolittle, & Bradley, 2007); however, this study’s findings do not support that the level at which professional development is being implemented in this sample impacts the student outcomes measured. For both treatment integrity and professional development, these results do not suggest abandoning about them completely, but reveal that further research with additional samples is warranted. It could be possible that the levels at which the sample schools were implementing these components were not high enough to make a substantial impact.

Interestingly, the assessment implementation level, although being implemented on average at the highest level out of all the components ($M=2.97$), was related to neither OAA reading scores nor promotions. It appears many schools in this sample were implementing high quality assessment measures (e.g. psychometrically sound, universal screenings, trained assessment givers), so it could be possible that there were not enough low implementers in the sample to determine if high quality assessment impacts outcomes. However, when high quality assessments are being used, it may be that what is done with the data becomes a more important indicator of student outcomes. Assessment becomes only as important as the data that are obtained from it, so if it is not being used to make decisions it loses some of its utility. The RTI component of data-based decision making was found to be related to an outcomes variable, this supports using assessment to inform instructional decisions for students (e.g. Glover & DiPerna, 2007). Essentially it appears that high quality assessments may become hollow if nothing constructive is being done with the data.

**Limitations and Future Directions**

This study has a number of limitations that may have impacted the results, and should be considered when planning future research in this area. First, this study relied on a measure of self-report, which means that participants may not have always reported accurately. There was no observational check to see if participants were accurate in their assessment of their reading RTI implementation. Future studies of RTI implementation integrity may want to incorporate implementation integrity checks conducted by an external observer to assess how well participants report.

The participants who filled out the RTIS-R survey in this study were either school psychologists or principals. It is possible that the participants who filled out the survey were not the ones in “charge” of RTI at their school, which could mean that they did not have the needed knowledge to fill out the survey accurately. As a suggestion for the future use of this survey, a question could be added about who in the school has responsibility for the RTI system. This question could help researchers determine who would be the best participants for obtaining information about the RTI system in place at that building.

This study also used a sample of schools that were convenient to researchers in one state. Although there are surveys from across the state they may not represent the proportion of urban, rural and suburban schools across the United States. The sample of schools were also chosen
based upon some level of implementation of RTI, meaning that the participating schools had some degree of investment in the process that could have impacted the results. Therefore, caution should be used to not overgeneralize too many conclusions onto a broader sample based upon a small sample of schools from Ohio. Future studies may want to include larger, more representative samples from schools across the United States.

It should also be noted that these results of implementation integrity and related outcomes should not be generalized beyond the area of RTI reading implementation. The survey was designed to specifically assess the implementation quality of reading-related RTI services. Although the basic model and core components of RTI identified by Noltemeyer, Boone, & Sansosti (under review) would be essentially the same for all subjects, the survey itself was designed to assess reading implementation of RTI. Future researchers may want to design other surveys or adapt this survey to assess the implementation of RTI in other subjects or as a school model.

This study examined the mean implementation integrity of the RTI components across tiers. It could be possible that different components affect outcomes differently at different levels of RTI implementation. A future study may examine if the implementation level of the components is related to outcomes based on the each tier. Some components may become less or more important as the needs of students intensify. Also, although schools are implementing the components of the model to some extent, they may not be implementing them to the point where they impact student outcomes. A possible future study may want to address what the optimal mean level of implementation is for each component so that it impacts student outcomes. This would both allow educators to make better decisions about how to allocate resources.

The limitations of one of the outcome measures used, OAA reading scores, should be noted as well. This type of high stakes state standardized test, although important for school administrators, may not necessarily be the best indicator of academic achievement. There is much controversy surrounding these state standardized tests, such as the narrow focus of the tests and teaching specific skills to pass the test (Goldberg, 2004). So although RTI has been related to an increase in scores, it would be problematic to base the value of RTI on only these measures. Measures that more directly assess curricula progress (e.g. curriculum based measures) may be more beneficial to look at when looking at how RTI impacts students, since these measures directly assess what students are expected to learn and know. Also, as new common core standards are implemented it is difficult to know what tests may be developed out of them, if they will be better measures, and if the RTI system will result in increased scores on these as well. As these are developed researchers may again want to assess if RTI implementation is related to student outcomes on these future assessment measures. This will be especially important since RTI often focuses on the important, but narrow foundational skills of reading and the new common core standards have a much broader scope of learning objectives. Because of this RTI may need to be expanded to include a greater range of assessments and interventions that will target the more expansive range of skills students are expected to learn.

Implications for practice

As schools continue to look for ways to improve student outcomes, the RTI framework is becoming increasingly popular in implementation, and has been found to be related to an increase in student outcomes (e.g., Burns, Appleton & Stehouwer, 2005; McNamara & Hollinger, 2003; Speece, Case, & Molloy, 2003). However if school districts and administrators look to
RTI to help improve the outcomes of their students they must keep in mind that the implementation quality of the model may affect their student outcomes (e.g. Burns & Ysseldyke, 2005). The world of education is one that is short on time and money, so administrators are always looking for the most effective and efficient ways to improve their students’ outcomes and this study may help shed some light on what components of RTI may be most important to focus on implementing with integrity in an RTI model.

One important surmise of this study was that educators should use the data they gather. Data are able to provide details about how well an intervention may be going, if it needs to be changed or if it should be stopped. For data-based decisions, educators may want to strive to analyze data in a systematic process, let it guide instruction and put decision rules in place that are documented to help guide student placement.

As administrators examine their own RTI system or begin to think of implementing one, it may also be important for them to look at the type of instruction they offer. This study also supported the importance that evidence based instruction is related to student outcomes. It indicates that educators should use instruction at the core curriculum is supported by research and that the interventions they use are as well. Quality instruction means that students are receiving a curriculum experience that has research backing it and that it meets their needs. Educators may wish to strive for instructional curricula with support for evidence, heterogeneous classes that are flexible, based on specific skills, quality instruction that is explicit, increases responses required and focuses on the 5 big ideas of reading.

Finally, although not all components were linked to the measured student outcomes in this study, it would not be wise to abandon them completely. These components, although conceptualized as part of the RTI model, may not be the heart of model. RTI has been viewed as a way to help improve student outcomes and perhaps the best way to help improve student outcomes is to ensure that students are receiving appropriate instruction that is evidence based and that it is modified based on student(s) outcomes. These may be the areas of importance that educators may wish to focus on to improve their RTI model and student outcomes.
References


Table 1
Characteristics of participating schools

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>n</th>
<th>M</th>
<th>SD</th>
<th>State Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>% OAA pass*</td>
<td>57</td>
<td>88.58</td>
<td>7.11</td>
<td>89.16**</td>
</tr>
<tr>
<td>% of students promoted</td>
<td>65</td>
<td>98.16</td>
<td>1.54</td>
<td></td>
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<tr>
<td>Enrollment</td>
<td>65</td>
<td>486.11</td>
<td>207.29</td>
<td>1,749,252</td>
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<tr>
<td>% Non-White students</td>
<td>65</td>
<td>17.67</td>
<td>15.45</td>
<td>26</td>
</tr>
<tr>
<td>% Economically disadvantaged students</td>
<td>61</td>
<td>42.34</td>
<td>25.94</td>
<td>45.1</td>
</tr>
<tr>
<td>% Students with disabilities</td>
<td>65</td>
<td>13.28</td>
<td>4.38</td>
<td>14.6</td>
</tr>
<tr>
<td>% of students in KRAL intensive instruction band</td>
<td>64</td>
<td>17.04</td>
<td>6.86</td>
<td>19.4</td>
</tr>
<tr>
<td>% of highly qualified teachers</td>
<td>59</td>
<td>99.97</td>
<td>.18</td>
<td>99.1</td>
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<tr>
<td>Discipline Referrals</td>
<td>65</td>
<td>4.53</td>
<td>6.64</td>
<td>23.1</td>
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<tr>
<td>Number of years implementing RTI</td>
<td>60</td>
<td>3.75</td>
<td>2.29</td>
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</tbody>
</table>

*percentage of students who scored at or above the Proficient range on the Ohio Achievement Assessment reading test

**obtained by averaging the pass rates for each of the participating grade levels
Table 2

Characteristics of participating individuals

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
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<tr>
<td>Principal</td>
<td>33</td>
<td>50.8</td>
<td>51.6</td>
<td>51.6</td>
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<td>School Psychologist</td>
<td>31</td>
<td>47.7</td>
<td>48.4</td>
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<table>
<thead>
<tr>
<th>n</th>
<th>M</th>
<th>SD</th>
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<tbody>
<tr>
<td></td>
<td>4.8</td>
<td>4.3</td>
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</table>

Table 3

RTI average component implementation

<table>
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<th>Component</th>
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<th>M</th>
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<tr>
<td>Prof. Development</td>
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<td>DBDM</td>
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<td>.60</td>
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<tr>
<td>Treatment Integrity</td>
<td>65</td>
<td>1.95</td>
<td>1.17</td>
</tr>
<tr>
<td>Instruction</td>
<td>65</td>
<td>2.61</td>
<td>.67</td>
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Table 4

OAA Outcome Variable Regression Results

<table>
<thead>
<tr>
<th>Model</th>
<th>Variable</th>
<th>$B$</th>
<th>SE $B$</th>
<th>$\beta$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Economically Disadvantage</td>
<td>-1.51</td>
<td>.034</td>
<td>-.55</td>
<td>0.00</td>
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<td>2</td>
<td>KRAL scores</td>
<td>.410</td>
<td>.199</td>
<td>.445</td>
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<tr>
<td>3</td>
<td>Students with Disabilities</td>
<td>.474</td>
<td>.208</td>
<td>.317</td>
<td>0.28</td>
</tr>
<tr>
<td>4</td>
<td>Data-based decision making</td>
<td>3.022</td>
<td>1.19</td>
<td>.285</td>
<td>0.015</td>
</tr>
</tbody>
</table>

Table 5

% of Students Promoted Regression Results

<table>
<thead>
<tr>
<th>Model</th>
<th>Variable</th>
<th>$B$</th>
<th>SE $B$</th>
<th>$\beta$</th>
<th>$p$</th>
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<tbody>
<tr>
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<td>-.121</td>
<td>.021</td>
<td>-.615</td>
<td>.000</td>
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<tr>
<td>2</td>
<td>Students with Disabilities</td>
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<td>.035</td>
<td>.305</td>
<td>.009</td>
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<tr>
<td>3</td>
<td>Discipline Referrals</td>
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<td>.021</td>
<td>-.361</td>
<td>.001</td>
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<tr>
<td>4</td>
<td>Instruction</td>
<td>.529</td>
<td>.194</td>
<td>.242</td>
<td>.009</td>
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