Response to Intervention and Identifying Reading Disability

Thienhuong Hoang, Ph.D.

California State Polytechnic University

Abstract

The educational community is discussing response-to-intervention (RTI) as an alternative assessment method. This study investigates assessment elements (beginning text level, ending text level, and number of weeks' participation) of the Reading Recovery (RR) program as part of a future RTI model. By means of a discriminant function analysis, third to fifth grade students (N =155) who participated in RR during first grade formed the basis of the data for the analysis. The results indicated that RR assessment elements are significant predictors of first-grade students who are later identified as having a reading disability. Ending text level was consistently the largest predictor of students later classified as having a reading disability or not.

Background

In considering whether Reading Recovery (RR) would be a valuable component of response-to-intervention (RTI), it is important to understand its characteristics and the perspectives of the educational community.

The Reasons for RTI

A fundamental debate currently exists about the method of diagnosis for learning disabilities (LD). The focus of the discussion has centered on two issues. First, there are conceptual problems with the use of intelligence tests in the assessment process (discrepancy between IQ and academic achievement) for special education services eligibility. Research found no difference between the reading, spelling, phonological skills, and reading comprehension of individuals with reading disabilities with high IQ scores versus low IQ scores (Tal & Siegel, 1996). IQ tests do not help predict those students who would benefit from remediation (Kershner, 1990). Other research indicates that difficulties with reading may impede the development of language, knowledge, and vocabulary skills (Stanovich, 1988). This further complicates the relationship between reading and IQ and, therefore, the justification for using IQ in the identification of LD. Second, the practice of waiting until third grade to assess if a student has succeeded in grasping the academic content (the "wait-to-fail" model) is considered to be contributing to the increased severity of academic difficulties for students in older grades (Lyon, Fletcher, Shaywitz, Shaywitz, Jorgensen, Wood, Schulte, & Olson, 2001).

The alternative being proposed is response-to-intervention (RTI) (Gresham, 2002). A student considered to be struggling with literacy skills can be considered for identification as having an LD by being dually discrepant: low achievement and little or no progress in a three-tiered intervention program. In the first tier, students participate in presumably research-based reading instruction activities in the regular education classroom which represent those used with students generally across the nation. Each student's rate of reading growth is evaluated. A student who is dually discrepant is designated as at risk for poor reading outcomes, and possibly having a reading disability (RD). This student moves to the second tier in the RTI process. Progress monitoring is

conducted again this time in a small-group or individually instructional format referred to as tier two. A student in this level of RTI would receive intensive instruction, hopefully with improvement in reading development. If progress does occur, the student returns to the regular classroom program and is no longer viewed as dually discrepant. If the student does not make good progress in the second tier, an intrinsic deficit is probable, and a need for the third and final RTI tier is evident; a condensed special education evaluation would determine a possible disability classification and placement (Fuchs, Mock, Morgan, & Young, 2003).

Reading Recovery as a RTI Method

This study investigates Reading Recovery (RR) (Clay, 2002b) as a standard protocol RTI format for LD in reading identification. Eighty percent of students identified as LD have the disability in the area of reading (Roush, 1995). The standard protocol approach of RTI uses a standard set of procedures for students with similar characteristics of academic difficulty (Fuchs et al., 2003). For example, one teacher and one student work together on a set of activities for a portion of the school day over a set time period (i.e., 20 weeks) with the aim of improving the student's academic performance. The RR program closely parallels this format of RTI (Clay, 2002a). With its consistent implementation and instructional methods for students, the RR program offers the educational community a practical, already in-use component for RTI. RR, a first-grade remedial literacy program, is implemented annually in over 10,000 US schools as well as in Canada, the United Kingdom, Australia, and New Zealand (Reading Recovery, 2006). RR's daily programming includes students reading texts which require a working knowledge of phonemic awareness, oral fluency, and comprehension. Students who achieve 90% mastery of a text by orally decoding the words would advance to the next book level in the series (A, B, 1-30). When students do not make progress through the daily 30-minutes literacy lessons tailored for each student per day during this twenty-week RR program, impaired reading skills and a need for further special education services is indicated.

The RR program is designed to address the needs of students experiencing difficulties with literacy (some of whom may later be classified as having RD). The characteristics of RD include difficulties with phonemic awareness (the ability to segment and manipulate the sounds of spoken words), speech perception (the ability to hear subtle differences between words—such as "mat" and "sat"), vocabulary skills, phonetic working memory (successfully repeating a sentence as heard), and syntax (i.e., use of a capital letter to start a sentence, combining sentences to make a paragraph) and semantics (i.e., social context of language, idioms) (Mann, 2003). Students experiencing difficulty with one or a combination of these characteristics could have a RD. Relative to these skills, the RR program includes the following activities: oral reading and writing of various genres of text, working with words using plastic letters, solving unknown words by breaking words into parts as well as relating the context of the text to the sentence and unknown word, developing reading fluency, and completing a daily Running Record oral reading assessment. This assessment involves an analysis of students' oral reading miscues and the required cut-off of 90% accuracy which determines if a student is ready to progress to the next book level in the RR program (Clay, 2002b).

RR meets the criteria of RTI with the pass/fail component of students' progressing to book level 15 during the 20 weeks of 30-minute, daily reading strategy intervention sessions. The number of sessions can be extended for students who need additional remediation. Owing to conceptual problems with the current method of diagnosis for LD used in the wait-to-fail model, assessment elements of the RR program could serve to predict students who need special education services and to provide them as soon as first grade. Cavanaugh, Kim, Wanzek, and Vaughn (2004) completed a

synthesis of twenty-seven intervention studies which indicated that early intervention for reading difficulties can be effective for students as young as kindergarten.

RR's effectiveness has been challenged in three areas. First, RR is not economical: one teacher per student for 30 minutes per day over 20 weeks (or more). However, since the aim of the RTI model is to provide intensive direct instruction to address a student's unique needs, an individual academic intervention has real merit because the teacher providing the intervention can tailor the level and progression of activities relative to the student's individual readiness level. Also, while classroom-based, problem-solving RTI models do exist, they are not the only acceptable research-based RTI models; standard protocol approaches have also been found to be effective (Vellutino, Scanlon, Sipay, Small, Pratt, & Chen, 1996). Furthermore, RR has a high degree of fidelity of treatment given its extensive training, practice, and ongoing feedback for teachers. This helps ensure that the student receives the intensive intervention (Clay, 2002b). A second criticism is that RR's learning levels may not be sustained in subsequent grades; and third, 10 to 30% of children receiving the program in first grade (ages six to seven) may not successfully complete it (Grossen, Coulter, & Ruggles, 2004; Hiebert, 1994). However, these two criticisms have been contradicted by research which affirms that RR is an effective intervention for students with low literacy skills (Agostino & Murphy, 2004; Brown, Denton, Kelly, Outhred, & McNaught, 1999; Pinnell, 1989; Schwartz, 2005). For example, Agostino and Murphy (2004) conducted a meta-analysis of thirty-six RR studies and found that the program offered positive outcomes for discontinued and non-discontinued students on assessments tailored for the program as well as standardized achievement measures. The meta-analysis indicated a lasting program effect by the end of second grade and beyond.

RR's beginning/ending text levels and number of weeks could offer educators a means to determine which students would be later identified as RD. Beginning reading skills are an indicator of future reading ability. Bishop (2003) and Catts, Fey, Zhang, and Tomblin (2001) indicate that assessing a student's reading skills as early as kindergarten is a good predictor of students who need assistance with reading skills. Beginning text level relates to RTI's dual discrepancy component in two ways: 1) it helps determine the degree of the student's low performance with reading skills, and 2) it provides a baseline to measure reading growth over time. In the RR program, book level 15 represents the end of first-grade reading ability. If a student does not reach this ending text level of ability, the student could be defined as having a RD by the end of first grade. Number of weeks' participation in the program relates to a student's ability to make adequate progress with literacy skills during the intervention period. The longer a student "continues" in the program (especially after 20 weeks), the higher the likelihood of an underlying language processing problem (i.e. RD) for the student (Rhodes-Kline, 1996).

Socioeconomic Status and RD

Social class has been identified as a determinant of a student's behavior and performance in school (Grundmann, 1997; O'Connor & Spreen, 1988). Students from lower income families often experience fewer literacy activities within the home and little opportunity for out-of-school educational experiences. This results in students' having less background knowledge and skills which schools demand as a precursor for academic learning. In this study, socioeconomic status is based on students' eligibility for the free/reduced lunch program in first grade.

Research Questions

This study is designed to address the following questions:

1. Which, if any, of the elements (beginning text level, ending text level, and number of weeks of participation in the RR program) are good predictors of students who are later identified as having a RD by third through fifth grade?

2. Do alternative definitions of reading disability (IQ/achievement discrepancy, reading composite scores <30, 23, and 15) indicate RR assessment elements which would be useful in determining RD status under an RTI format?

3. As a covariate to RR assessment components, how does socioeconomic status compare in terms of RD/non-RD status?

Contribution of this Study to RTI Research

This study expands previous research in four ways. First, it adds to the body of RTI research in that no other retrospective studies are known to have been completed. Other researchers (i.e., Vaughn, Mathes, Linan-Thompson, & Francis, 2005) have investigated experimental RTI methods or programs using the principles of RTI that only in certain cases aim to actually identify students. Second, this is the first retrospective study of students who received a reading skills intervention in first grade some of whom were later identified as having a RD. Third, this is the first known analysis of RR in a RTI context. Fourth, the results of this study provide a means to see how characteristics of RR's book levels and students' number of weeks' participation in the program are related to students later being identified as having an LD in reading.

Method

Description of the Sample

Third to fifth grade students (N =155) who participated in RR during first grade formed the basis of the data for the analysis (see Table 1). The sample consisted mostly of Caucasian (61%) and African-American students (30%). Thirty-seven percent of the students represented in the sample were female. Twenty-three percent (35 students) were officially identified as having a LD as defined by school districts.

Table 1
Descriptive Statistics (N=155)

Gender	
Gender Ratio[1]	M=97/F=58
Age	
Age	
M(SD)	9.97 (.764)
Race/Ethnicity	
Asian	
African-American	0.6%
Hispanic	30.3%
Multiracial	0.6%
Caucasian	2.6%

Other	4.5%
	Grade during 2005-2006 school year
Grade 3	13%
Grade 4	43%
Grade 5	45%
	Receiving special education services during 2005-2006 school year
No	77%
Yes	29%
	Retained in a grade[2]
Yes (1 year)	23%
No	65%
	Number of weeks in Reading Recovery during first grade
Mean	16.54
Median	17.00
Mode	20.00
Range	4 to 26
	Free/Reduced lunch status in first grade
Free/Reduced	85 (55%)
No Subsidy	70 (45%)

[1]M=63% F=37%

[2]One school district did not provide data for 25 students' retained-in-grade status.

Procedure

Special education personnel (Special Education Directors, Title I Directors, and RR Teacher Leaders) of school districts (A, B, and C) in a western state agreed to participate and provide the required data for the sample (N=155) in this study. Of the 35 students having a LD in the sample, School district A had 4 students, school district B had 20, and school district C had 11 students. The three school districts identified students as having an LD based on the "wait-to- fail'' model of an IQ/achievement discrepancy of twenty-two points. For other students in the sample who were not identified by their districts and had not completed the Weschler Intelligence Scales for Children III (WISC III) (1991), results from the InView (CTB/McGraw Hill, 2001) cognitive abilities test were used to factor out students with possible characteristics of other disabilities (i.e., mental retardation). As a retrospective study, reading composite achievement data on students defined as RD or non-RD in third to fifth grade was analyzed relative to their first-grade RR scores and free/reduced lunch status. School districts A and B provided Terra Nova (TN) reading achievement data (CTB/McGraw Hill, 2001); school district C included reading achievement results from the Woodcock-Johnson (WJ) III-Tests of Achievement (Woodcock & Johnson, 2001).

Rationale for Analyses

Analysis 1 used the school districts' definition of LD for defining group membership.
Analysis 2 defined RD/non-RD status by using TN (2001) reading composite scores lower than the thirtieth percentile. In a similar study, Vellutino et al. (1996) provided an intensive intervention to first and second grade students', those who remained below the thirtieth percentile on the Woodcock Reading Mastery Test-Revised (WRMT-R) following the intervention were defined as "difficult to remediate." Analysis 3 used TN scores of less than twenty-three (twenty-three to forty represent the slightly below average range). Analysis 4 even further refined the definition of RD by using a cut-off reading composite score of fifteen (scores of eleven to twenty-two represent the well below average range of the TN Test).

Variables Used in this Study

RD/non-RD status. The grouping variable (GV) of the four analyses of the sample (N=155) was students' identification as RD or non-RD. Standard procedure for discriminant function analysis requires that the comparison-group size (RD group) be five times the number of variables in the equation (4 variables [beginning text level, ending text level, number of weeks, and free/reduced lunch status] x 5 = 20) (Tabachnick & Fidell, 2001). For this purpose, the RD group size was at least twenty students for each analysis.

Beginning/ending text levels. These predicting variables (PVs) were continuous variables; book levels were coded A, B (pre-kindergarten) and 1-30. Book levels "A" and "B" contain one word per page indicating an object that changes color as the pages progress. Book level 5 is considered as representative of the beginning of first grade. Book level 15 (end of first grade) represents a more varied and challenging form of text. For example, the place of text varies throughout the story (top, middle, bottom of page), some pages have one sentence, other pages have three, and there are changes in verb tenses as well as types of sentences (interrogative, imperative). Book level 30 would be similar to an early third-grade chapter book series (Clay, 2002b).

Number of weeks. Number of weeks in the RR program can vary from one jurisdiction to another. For the school districts who participated in this study, 20 weeks were considered standard. Students who attained book level 15 before or at week 20th were considered as "discontinued" (successful). Students who did not reach book level 15 were considered "continued" (unsuccessful). These students may have been provided with additional sessions to improve reading skills. This PV was a continuous variable (1-20 or more).

Free/reduced lunch status. Free/reduced lunch status was used as a means to categorize the socioeconomic status of students in the sample. This categorical PV was coded as either "0" (not eligible for any subsidy) or "1" (reduced or free lunch). The free/reduced lunch data was based on family income of the student during their participation in the RR program in first grade. Children participate in the free lunch program in two ways. First, the household is a participant in Food Stamps, Temporary Assistance for Needy Families, or the Food Distribution Program on Indian Reservations. Second, the student's household income must fall below 130% of the federal poverty level. For reduced-priced meals, household income must be between 130 and 185% of the federal poverty level (National School Lunch Program, 2005).

Methods of Analysis

The aim of this study was to examine whether a relationship exists between RR assessment scores and a student's subsequent identification as RD. A discriminant function analysis was completed using SPSS (Nie, Hull, Jenkins, Steinbrenner, & Bent, 1975). Beginning text level, ending text level, number of weeks in the RR program, and free/reduced lunch status (as a covariate) represented the predictive variables (PVs) of the function. Group membership (RD or non-RD) was the grouping variable (GV). Student cases that contained missing data for the GV and PVs were deleted from the sample. In the resulting analyses, coefficients above +/-.500 were interpreted (Tabachnick & Fidell, 2001). Independent samples *t* tests were conducted to evaluate if there were statistically significant differences between the two groups in each analysis of this study (RD and non-RD) based on beginning text level, ending text level, number of weeks, reading composite, and IQ variables.

Results

Results of Discriminant Functions

Tables 2-4 indicate the results of the analyses. The correlational matrix indicated that no correlations resulted in a value beyond +/-0.900. This indicates that multicollinearity was not an issue in the discriminant function. The correlation between IQ and reading composite was moderate ($r = .494$, $p < .01$). Number of weeks was negatively correlated with beginning text level ($r = -.428$, $p < .05$). The Wilks' Lambda for each of the four analyses were significant (Analysis 1: $\Lambda = .828$, $X^2[4, N = 155] = 28.58$, $p < .001$; Analysis 2: $\Lambda = .854$, $X^2[4, N = 155] = 23.82$, $p < .001$; Analysis 3: $\Lambda = .907$, $X^2(4, N = 155) = 14.69$, $p < .005$; Analysis 4: $\Lambda = .930$, $X^2[4, N = 155] = 10.88$, $p < .028$) indicating that the predictors differentiated among the two student groups (RD/non-RD).

Table 2
Intercorrelational Matrix (N = 155)

	1	2	3	4	5	6	7	8
1. Age	___	-.215**	-.019	.000	-.301*	-.073	.020	.191*
2. IQ[1]		___	.494**	-.022	.075	.247*	-.135	.007
3. Reading Composite[2]			___	-.035	.007	.241*	.050	.256**
4. RR Number of Weeks				___	-.428*	-.214*	.076	.149
5. Beginning Text Level[3]					___	.150	-.043	-.061
6. Ending Text Level[4]						___	-.250*	-.342**
7. Free/Reduced Lunch[5]							___	.274**
8. RD Status[6]								___

**Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).
[1]InView/WISC III IQ Test scores.
[2]Terra Nova Academic Achievement Test/Woodcock-Johnson III Tests of Achievement scores.
[3]Reading Recovery instruction and assessment book series.
[4]Reading Recovery instruction and assessment book series.
[5]Students free/reduced lunch status during first grade.
[6]Student's RD or non-RD status as of the 2005-2006 school year.

The standardized discriminant function coefficients and structure coefficients are presented in Table 3. Ending text level was consistently the largest PV in the four functions and was the most representative of the functions as defined by the structure matrix; free/reduced lunch status was well represented in the function of Analysis 1. Number of weeks became a significant PV only in Analysis 4 (reading composite <15). Each successive Analysis (1-4) resulted in explaining less and less of the variance in the function of the four variables.

Table 3
Discriminant Function Results

	Wilks's Lambda	Standardized Discriminant Function Coefficients[1]		Structure Coefficients[1]	
Analysis 1 – School District Definition of LD	.828	ETL[2]	.783[6]	ETL	.890
RD (N=35) and Non-RD group (N=120)	(p<.001)	F/RL[3]	-.404	F/RL	-.547

		Weeks[4]	-.239	Weeks	-.394
		BTL[5]	-.079	BTL	.146
Analysis 2 – Reading Composite < 30	.854	ETL	1.017	ETL	.921
RD (N=50) and Non-RD group (N=105)	(*p*<.001)	F/RL	.380	Weeks	-.262
		BTL	-.152	BTL	.049
		Weeks	-.130	F/RL	.095
Analysis 3 – Reading Composite < 23	.907	ETL	1.054	ETL	.967
RD (N=35) and Non-RD group (N=120)	(*p*<.005)	F/RL	.163	Weeks	-.102
		BTL	-.144	F/RL	-.078
		Weeks	.092	BTL	-.024
Analysis 4 – Reading Composite < 15	.930	ETL	.957	ETL	.855
RD (N=50) and Non-RD group (N=105)	(*p*<.028)	Weeks	.531	F/RL	-.346
		F/RL	.186	Weeks	.255
		BTL	.033	BTL	-.053

[1]Values for each analysis are listed in descending order
[2]Ending Text Level in the Reading Recovery program
[3]Free/Reduced Lunch Status during First Grade
[4]Number of Weeks in the Reading Recovery Program
[5]Beginning Text Level in the Reading Recovery program
[6]The higher the ending text level, the less likely to be identified as having a RD

Table 4 indicates that in Analysis 1 (school districts' definition), reading composite was higher for the RD group relative to the non-RD group. In Analyses 2-4, students categorized as RD demonstrated lower levels of functioning as indicated by their reading composite and ending text level scores. Beginning text level followed this pattern except in Analyses 3 and 4 where the RD group had a marginally higher value. With the exception of Analysis 2, the RD group had comparatively larger number of students who participated in free/reduced lunch programs. The number of weeks was relatively constant across RD/non-RD groups in all four analyses.

Table 4

Descriptive Statistics of Reading Composite, Number of Weeks in RR, Beginning Text Level, Ending Text Level, and Free/Reduced Lunch Status in First Grade

	Analysis 1 School Districts' Definition		Analysis 2 Reading Composite<30		Analysis 3 Reading Composite<23		Analysis 4 Reading Composite<15	
	RD *(N=35)*	Non-RD *(N=120)*	RD *(N=50)*	Non-RD *(N=105)*	RD *(N=35)*	Non-RD *(N=120)*	RD *(N=21)*	Non-RD *(N=134)*
Reading Composite Mean[1] (SD)	54.40 (28.891)	42.71 (22.767)	16.36 (8.086)	59.15 (16.566)	12.23 (5.806)	55.01 (19.016)	8.62 (4.341)	51.10 (21.349)
Number of Weeks in RR Mean[2] (SD)	17.97 (3.97)	16.12 (4.44)	17.22 (4.097)	16.21 (4.510)	16.80 (4.276)	16.46 (4.442)	15.86 (4.127)	16.64 (4.439)
Beginning Text Level Mean (SD)	0.89 (1.83)	1.28 (2.67)	1.12 (2.076)	1.23 (2.694)	1.23 (2.211)	1.18 (2.593)	1.29 (2.194)	1.18 (2.557)
Ending Text Level Mean[1] (SD)	8.40 (4.97)	14.57 (6.74)	9.64 (6.009)	14.86 (6.640)	9.43 (5.700)	14.27 (6.822)	9.24 (6.625)	13.79 (6.729)
Free/Reduced Lunch Frequency (%)	27 (77%)[3]	58 (48%)	26 (52%)	59 (56%)	20 (57%)	65 (54%)	14 (67%)	71 (53%)

[1]Independent Samples t Tests indicated significant differences for RD and non-Rd groups in all four Analyses

[2]Independent Samples t Tests indicated significant differences for RD and non-Rd groups in Analyses 1 and 2

[3]For example, in Analysis 1, 27 of 35 students classified as RD were on Free/Reduced Lunch programs in first grade (77% of the RD group)

Discussion

By means of a discriminant function analysis, this study examined whether beginning text level, ending text level, number of weeks in the RR program, and free/reduced lunch status (as a covariate) would be good predictors of students identified as having a RD by third through fifth grade. The results indicated that higher ending text level was the largest PV of each of the four analyses. There was also a small but significant negative correlation with ending text level—the higher the ending text level, the less likely to be identified as having a RD.

Number of weeks was a good PV in Analysis 4 (reading composite <15). The negative correlation with beginning text level would be expected; the lower the initial text level, the more likely a student would need to complete a relatively higher number of weeks in the RR program. Analyses 3 and 4's slightly higher beginning text level mean value would still round to book level one. The mean number of weeks did not vary much between groups across the four analyses. This can be attributed to some students' parents possibly requesting a withdrawal from the program, students may have been absent from school, or they may have relocated to another school district. With 55% of the students in this study on free/reduced lunches, a large portion of the sample would be from low-income families who may be transient or truant (Stronge, 1992).

Research (Grundman, 1997; O'Connor & Spreen, 1988) discusses a link between socioeconomic status and LD. In terms of descriptive statistics, the sample in this study associates a RD/low socioeconomic relationship given that 55% of the sample was on free/reduced lunch programs. Although free/reduced lunch status was well represented in the discriminant function of Analysis 1 (traditional IQ/achievement discrepancy method), it was not a significant predictor in any of the four analyses. With an assessment of intelligence not being part of the assessment models of Analyses 2-4, socioeconomic as well as racial and cultural biases inherent in IQ testing would be avoided (Coutinho, Oswald, & Best, 2002).

Many researchers argue against the continued use of IQ in the identification of RD (Peterson & Shinn, 2002; Warner, Dede, Garvan, & Conway, 2002). The results of this study supported this argument in that IQ and RD were not highly correlated. Although the IQ/achievement identification model in Analysis 1 accounted for relatively more variance than the more refined definitions of RD based on reading achievement scores, the difference between them was negligible. This could be attributed to the successively smaller RD group sizes in Analyses 2-4; as the size of the comparison group declines, the power of the analysis is impacted. Furthermore, IQ's moderate correlation with reading composite helps support the use of reading composite as a replacement for IQ in classifying students as RD/non-RD in the analyses. Also, the school districts' definition resulted in a higher mean reading composite score for the RD group relative to the non-RD group; Analysis 2-4 resulted in the more rational result.

Findings relative to other RTI research

The RR program meets the criteria used in RTI research (Fuchs & Fuchs, 1998) with its dually discrepant method of assessment (progress through leveled texts during the 20 weeks of remediation) as well as the pass/fail component of reaching book 15 (representative of first- grade level of reading ability) after 20 weeks of participation in the intervention. This model reflects the objectives of RTI's Level 2: 1) to prevent reading difficulty by delivering an intensive and presumably effective intervention that improves reading development, and 2) to assess the level of responsiveness to an instructional intensity from which most students should improve.

The results of this study indicate that ending text level is a significant indicator of students who would later be identified as having a LD—80% of which have a RD (Roush, 1995). School districts which use RR should incorporate ending text level into their identification practices when considering RD status. It would not explain the entire concept of having a RD, but it would be an indicator of the need for further assessment. In addition, the students with low reading skills could be referred by the end of first grade as opposed to the traditional format of waiting until third or fourth grade.

Although the increasingly refined definitions of RD in this study rendered significant functions and consistently rated ending text level as the largest discriminating variable, the declining amount of variance explained would suggest the presence of other factors in determining LD status. RR's ending text level alone would not be sufficient as a RTI model. Kavale, Holdnack, & Mostert (2006) also comment that a RTI model cannot stand alone as the primary means of identifying for LD. The results of this study would support this given that ending text level only explains 7 to 17% of the variance in the construct of LD identification. Other aspects related to assessment for LD need to be considered.

More explicit assessments of the characteristics of RD (phonemic awareness, speech perception, vocabulary skills, phonetic working memory, and syntax, and semantics) during an intervention program such as RR could better predict students to be considered for RD classification. Other research (Lovett, Steinbach, & Fritjers, 2000) has found explicit assessments of rapid automatic naming (RAN) and phonemic awareness to be good predictors of students having difficulty with reading skills. Periodic evaluations of these aspects of reading skills in addition to daily RR programming could help provide a more comprehensive picture of students' progress based on the dual discrepant model.

Limitations

There was no measure of the type and quality of general education classroom instruction that these students received before, during, and after their participation in the RR program. Students may or may not progress with RR activities due to the type or depth of literacy instruction that occurs within the classroom.

Although research (Roush, 1995) has found that about 80% of students with a LD have low skills in the area of reading, access to individual students' files was not included for the data set used in this study. However, students' participation in the RR program due to difficulty with literacy tasks would suggest that at least 80% had difficulties in the area of reading.

Generalization to the larger national student population is hindered due to regional and demographic factors. The sample for this study was composed of students from three school districts in a western state. The proportion of racial groups in the sample is not representative of students across the nation. This study was composed of 30% African-American students whereas they represent 14.8% of the national student population. One percent of this sample was Hispanic as opposed to 14.2% of the American school population (Lawson, Humphrey, Wood-Garnett, Fearn, Welch, Greene-Bryant, & Avoke, 2002).

Furthermore, RR has been funded through government programs and legislation (i.e., No Child Left Behind Act of 2001) which aim to address the needs of students of low socioeconomic status. These students represented 55% of the sample in this study whereas about 18% of US children were living in poverty as of 2004 (Douglas-Hall & Koball, 2006).

Future Research

As a conceptual model of identification for students with LD generally, RTI needs to define not only the cut-off score to be used but also other elements of the assessment-for- identification process. For RD, this study highlighted the aspect of ending text level being a significant predictor in all four analyses; however, only 7 to 17% of the variance in RD/non-RD group membership was explained by ending text level, beginning text level, number of weeks in RR, and free/reduced lunch status. This indicates that there are other components to be considered in the identification of RD. Future research could investigate whether combining RR with the model of Flanagan, Ortiz, Alfonso, and Mascolo (2002) would provide a more comprehensive RTI assessment process. Flanagan et al.'s model is a comprehensive assessment which includes quantitative knowledge (math calculation and reasoning), reading and writing (oral reading, comprehension, written expression), and crystallized intelligence (general information, oral expression, lexical knowledge, and listening comprehension). Combining these two models (splitting level two of the RTI format into two steps) could help define the factors which could account for the remaining variance not explained in the discriminant functions of this study and help schools' multidisciplinary teams decide possible classification for long-term special education services: level three of RTI.

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