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Oral Reading Rates of Second-Grade Students

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The importance of reading fluently is widely recognized in school effectiveness, reform, and improvement efforts of the educational community, yet there are few large-scale, structured assessments of the progression of students' reading rates over time. This study documented 2nd-grade students' oral reading rates on the basis of fall, winter, and spring assessments. Using growth curve analysis, we identified models for a sample (n = 5,796) of students in 79 schools in a large urban school district in the United States. We found that, although school characteristics were significant predictors of the children's initial oral reading status, they were mostly not significant predictors of their reading rate over time. At the individual level, girls had a better performance than did boys in reading achievement testing, and no statistically significant difference was noted between boys and girls in their growth rates during the 2nd grade. On the other hand, special education children not only achieved less than did non-special education children in oral reading but also evidenced a significantly lower rate of increase. The trustworthiness of "at risk" and "low risk" instructional recommendations on the basis of oral reading rates was high. We discuss these findings in light of the existing research on reading fluency. Our findings have implications for research and instruction for fluency and literacy development of both fluent and nonfluent readers.

Keywords: oral reading rate, early literacy, individual differences

For many years reading rate and the benefits of fluent reading have been topics of research and school reform and improvement efforts (Alt & Samuels, 2011; LaBerge & Samuels, 1974; Rasinski, 2000, 2003, 2005; Samuels, 2006). According to Pikulski and Chard (2005), reading fluency refers to "efficient, effective word recognition skills that permit a reader to construct the meaning of text. Fluency is manifested in accurate, rapid, expressive oral reading and is applied during and makes possible, silent reading comprehension" (p. 510). Shanahan (2006) suggested that reading fluency means the ability "to read text aloud with sufficient speed, accuracy, and expression" (p. 31). Regardless of the definition of reading fluency, a fluent reader is not only able to quickly and accurately recognize words but also able to read them with attention to prosodic features of expression (i.e., pitch and intonation) and tempo and rhythmic patterns (i.e., pausing and sentence segmenting; Alt & Samuels, 2011).

Continuing research has documented a strong correlation between reading fluency and reading comprehension (Allington, 1983; Baker et al., 2008; Frankel, Pearson, & Nair, 2011; Walczyk & Griffith-Ross, 2007; Wise et al., 2010). Therefore, reading instruction for fluency development is recognized as an important stage of the reading process. The National Reading Panel suggested that it—together with phonemic awareness, word decoding, vocabulary, and comprehension—be taught as a critical component of effective literacy instruction to developing readers (U.S. Department of Health and Human Services, National Institutes of Health, National Institute of Child Health and Human Development [hereafter HHS], 2000a). With the federal government's efforts to support literacy and teaching children to read (No Child Left Behind Act of 2001), the educational community has renewed its interest in reading rates and their relationships with literacy development and reading comprehension.

Given all the research on reading fluency, it is surprising that there are few large-scale, structured assessments that have clearly described what young students' oral reading rates are, how they change over time, and what external variables impact changes in them. Our study begins to fill this gap by systematically investigating second-grade students' oral reading rates and addressing these four research questions:

1. To what extent do oral reading rates and the instructional recommendations based on them change over the second-grade school year?
2. To what extent are initial and subsequent oral reading rates in second grade predicted by gender?

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3. To what extent are initial and subsequent oral reading rates in second grade predicted by educational placement?

4. To what extent are initial and subsequent oral reading rates in second grade predicted by school characteristics?

We focused on second-grade oral reading rates because most professionals agree that (a) being able to read with accuracy, speed, and prosody plays a significant role in reading development; (b) by third grade early literacy skills should be developed to support the transition from learning to read to reading to learn; and (c) such performance is predictive of comprehension and overall achievement in later grades (cf. HHS, 2000a, 2000b; National Research Council, 1998; Wise et al., 2010). Our interest in the relationships between oral reading rate and gender, educational placement, and school characteristics was grounded in the following extant knowledge:

1. Although concerns for male deficits in overall reading achievement have been expressed for more than 100 years (cf. Ayers, 1909), few studies have focused on changes in or the development of reading skills in boys and girls (cf. Below, Skinner, Fearrington, & Sorrell, 2010).

2. Although the No Child Left Behind Act and other federal legislation (i.e., the Individuals With Disabilities Education Act of 2004 and its subsequent amendments) resulted in states' accounting for the overall achievement of students receiving special education in statewide assessment reports, little evidence illustrating trends in skill development or performance of students with disabilities or its relationship to other educational outcomes is available (Thurlow et al., 2008; Ysseldyke, 2009).

3. Although school-level characteristics have been shown to influence overall achievement and gaps in it associated with different student groups, few studies have focused on changes in or the development of academic skills in demographically different settings (cf. Hanushek, Kain, & Rivkin, 2009; Sirin, 2005; Wayne & Youngs, 2003; Wiggan, 2007).

A Brief History of Fluency and Learning to Read

Early researchers suggested that standards needed to be set and met at different grade levels for children to become successful readers (Starch, 1915). These first markers represented a series of sequential stages through which students must pass for successful reading development and revolved around three components of reading: correct pronunciation of words (i.e., accurate recognition and decoding), speed, and comprehension. LaBerge and Samuels (1974) argued that if children did not rapidly recognize words, comprehension was difficult. Their "theory on automaticity was readily accepted by the research and educational communities and has been viewed as one of the harbingers of what would become a new interest in reading fluency" (Samuels, 2006, p. 15). According to Samuels (2006), the reading process consists of two tasks: decoding (word identification) and comprehension. Beginning readers usually are preoccupied with the decoding process and cannot construct meaning. With more practice in word identification, readers become more fluent in the decoding process (this process has become automatic) and focus on the construction of meaning. The fluent reader can process these two tasks (decoding and comprehension) simultaneously and efficiently.

A fluent reader begins with accurate decoding, which leads to correct pronunciation of words, building a sight word vocabulary, and developing more automaticity in the recognition of words. According to the National Reading Panel, more practice with connected text leads to better accuracy and word recognition (HHS, 2000a). Although it appears that there is a linear relationship in fluency development (accuracy leading to automaticity), in actuality a bootstrapping relationship exists in fluency development (Stanovich, 1986). Children who accurately and automatically recognize words tend to continue to have successful encounters with words, which leads to enhanced accuracy and increased word recognition. The reverse relationship is evident for children who struggle with accuracy and word recognition; that is, fewer encounters prolong the struggle for successful reading development (Allington, 1983; Juel, 1988; Samuels & Farstrup, 2006; Stanovich, 1986). The National Reading Panel's meta-analysis showed that fluency practice was most effective when it was oral versus silent, involved repeated reading of text, and was guided by feedback from accomplished readers (HHS, 2000a).

Few argue with the need or importance of rapid word recognition and attention to the prosodic features (e.g., rhythm, intonation, and phrasing) when reading and "since the beginning of the 21st century, reading fluency has taken its place with phonemic awareness, word decoding, vocabulary, and comprehension as critical components of effective reading instruction" (Rasinski, Blachowicz, & Lems, 2006b, p. 1). Although the knowledge base on the what, why, and how of fluency is broad and deep (cf. National Research Council, 1998; Rasinski et al., 2006b; HHS, 2000a, 2000b), evidence and expectations of reading rates of young children are sparse (Hasbrouck & Tindal, 1992; Hasbrouck & Tindal, 2005; Reutzel, 2006; Samuels, 2006).

Studies of Children With Academic Risks

Although previous research has investigated the impact of both individual- and school-level risk factors on young children's academic success (Apiwattanalunggarn & Luster, 2005; Hanushek, Kain, & Rivkin, 2009; Powell, Peet, & Peet, 2002; Speece & Ritchey, 2005), there is a lack of empirical evidence on how reading rates and the instructional recommendations based on them change over time (Dunn & Eckert, 2002; Kame'enui & Simmons, 2001; Rasinski, Blachowicz, & Lems, 2006a, 2006b; Samuels, 2006). The school risk factors were mostly characterized by the percentage of children qualified for a free or reduced-price lunch program (Plewis, 2000), whereas the individual risk factor was usually low performance at the beginning of the school year (Stage, Sheppard, Davidson, & Browning, 2001). Students with academic risks usually make less progress (have consistently lower reading rates) compared with students without academic risks (Speece & Ritchey, 2005; Stage et al., 2001). In a study of the developmental trend in reading skills among Finnish preschool and first-grade children, Leppänen, Nieme, Aunola, and Nurmi (2006) found that children with initially more advanced reading skills became increasingly better readers compared with lower achieving peers; however, the more reading skills improved during the preschool year, the less they improved during first grade.

Reading research about students' ethnicity background produced mixed results. Although differences in reading fluency were noted between African American and Caucasian students in some studies (Hixson & McGlinchey, 2004; Kranzler, Miller, & Jordan, 1999), these differences were not noted in other studies (Hintze, Callahan, Matthews, Williams, & Tobin, 2002). Klein and Jimerson (2005)—who conducted a comprehensive study of the effects of ethnicity, gender, home language, and socioeconomic status on the reading fluency of three groups of students in first through third grade—noted that, in general, Caucasian students, students whose home language was English, and students who paid for school lunch at the regular price had significantly higher scores in reading fluency than did Hispanic students, students whose home language was Spanish, and students who paid for school lunch at a reduced/free price. Female students in one group had higher reading fluency than did male students in that group, but this difference was not noticed in the other two groups of participants. Other studies have also identified that students from families with limited resources and students from minority backgrounds were more likely to be at risk for reading fluency development in comparison to their peers (National Research Council, 1998; Spear-Swerling & Sternberg, 1998). In addition, levels of parent education were reported to impact children's achievement (Bowman, Donovan, & Burns, 2001; National Research Council, 1998; Shonkoff & Philips, 2000).

Using hierarchical linear modeling (HLM), this study sought to systematically examine what the second graders' reading rates were, how these rates changed over time, and how these rates were related to gender, academic status, or socioeconomic status classified by qualification to participate in a free or reduced-price lunch program. We also assessed changes in instructional recommendations across second grade on the basis of oral reading rates. We believe such a large-scale investigation is not only useful to gain empirical evidence about second graders' reading rates but also useful to provide valuable benchmarks for assessing the reading development of young children. In so doing, our study not only extends the research base to a little-explored area but also helps to inform the educational community with effective reading instruction for less fluent and at-risk readers in all schools.

Method

We were interested in oral reading rates. Our multilayered analyses focused on how second-grade students' reading rates and the instructional recommendations based on them changed over time; whether gender, special education status, and school conditions impacted reading rates; and what variables were useful predictors for reading development.

Participants

We obtained data from 79 schools and 5,796 second-grade students in a large urban public school system in North Carolina. The student enrollment of each school ranged from 226 to 1,372. Of the students, about 51% were female. Typical of other schools in the nation (Snyder, Tan, & Hoffman, 2006; U.S. Department of Education, 2002), more than 90% of the children were in general education classrooms with special assistance, and the rest (8.6%) were in the special education program. The student ethnic distribution was mostly African American (43.1%), White (37.6%), or Hispanic (12%), although Asian (4.2%) and American Indian/Multiracial (3.2%) children also participated. Students in the district schools spoke 94 native languages and represented 130 countries, and 43% received a free or reduced-price lunch. These levels of minority enrollment, poverty status, and English-language learning are typical of those in schools enrolling large numbers of students at risk for school failure and were not addressed in our comparative analyses (cf. Jenner & Jenner, 2007; Scott-Little, Hamann, & Jurs, 2002).

Procedure

The district's reading model provided comprehensive literacy instruction that incorporated the deliberate and explicit teaching of skills and strategies that enable students to read with understanding and to write effectively. In the early grades, teachers provided instruction in skills such as letter–sound correspondence (phonics), word analysis, and comprehension strategies during a district-mandated literacy block (90 min of structured lessons and 30 min of independent work time). At every grade level and in every subject, students were taught strategic and independent communication by applying reading and writing skills to increasingly difficult material. Teaching all students to read and write was central among the district's goals.

For its core reading program, the district adopted the Open Court Reading Program (SRA/McGraw Hill, 2000). From materials developed in the 1960s, Adams (1990) revised the first- and second-grade content in the early 1990s on the basis of the findings of a then recently completed synthesis of research on learning to read. The program received considerable support after the publication of a large-scale research study by Foorman, Francis, Fletcher, Schatschneider, and Mehta (1998) conducted in the Houston schools. At that time, Open Court was one of a small number of reading series that emphasized explicit phonics and phonemic awareness instruction.

Open Court is a comprehensive elementary reading program for Grades K through 6. In the primary grades, the program makes no assumptions about students' prior knowledge. With scripted lessons, teachers emphasize phonemic and print awareness as well as an understanding of the alphabetic principle. The program provides systematic instruction in the areas of decoding, comprehension, inquiry, investigation, writing, spelling, vocabulary, grammar, usage, mechanics, penmanship, listening, and speaking (SRA/McGraw Hill, 2000). In the current study, teachers in participating schools used the Open Court materials during a daily districtwide 90-min literacy block of whole-class instruction followed by 30 min of small-group instruction and/or independent work.

Children using Open Court are systematically and explicitly introduced to sounds and spellings. This includes teaching letter shapes, sounds, and spellings with sufficient opportunities for students to practice and apply their phonics knowledge. They also receive explicit blending instruction that gives them a strategy for accessing words they have never encountered while reading (Adams, 1990). Consequently, once children know how to blend, they apply those skills to reading words fluently and effortlessly so they can direct all of their cognitive energies to the true purpose of reading: making sense of the text. In the early stages of fluency development in Open Court, students read manageable text that allows them to practice their growing knowledge of sound–symbol relationships. Typically, this means reading decodable text (i.e., stories that contain a high number of words that can be "sounded out" on the basis of what the student has been taught). Although reading rate is not an instructional target of Open Court, repeated practice reading words that use newly learned sounds and spellings in connected text helps solidify phonics knowledge and build fluency, and, supporting the development of fluency over time, Open Court has decodable texts at multiple grade levels.

Evidence available from the publisher supports the effectiveness of Open Court. For example, McRae (2002) reported that Open Court schools out-gained comparison schools by 50%–75% on the basis of 3-year gain scores involving about 300 schools and noted that "*the results of the study provide clear and convincing evidence that students attending schools using Open Court materials acquire basic reading skills faster than students attending demographically similar schools not using Open Court materials*" (p. 1, emphasis in original). We did not evaluate the district's implementation of Open Court but used it to define the context for our study of oral reading rates in young children.

Independent variables. In framing our analyses, we chose to include two types of independent variables representing student- and school-level characteristics. Simultaneous investigation of relationships between these markers and the progression of oral reading rates was largely unexplored in previous research. We acknowledge that other variables (e.g., teacher characteristics) related to student performance were not included in our analyses.

At the student level, we coded whether individual students received special education services (SPEC; 1 = Yes, 0 = No). Information about gender (1 = Male, 0 = Female) was also available.

At the school level, we assigned values to each student to represent several End-of-Grade Tests required by General Statute 115C-174.10 as a component of the North Carolina annual Statewide Testing Program (1977) for Grades 3–5 students. Reading comprehension is assessed by having students read authentic selections and then answer questions directly related to the selections. Knowledge of vocabulary is assessed indirectly through application and understanding of terms within the context of selections and questions. The authentic selections selected for the tests reflect reading for various purposes such as literary experience, gaining information, and performing a task. The average percentage of students at or above grade level across Grades 3–5 was used as an indicator of the *overall reading level* in each student's school (TotalR). Although this variable does not represent the participants' actual academic achievement, it serves as a school-level variable to represent the overall quality of the school. It is a common practice in North Carolina to use the average percentage of students at or above grade level across Grades 3–5 in End-of-Grade Tests as a significant indicator of the quality of schools. We also included *ethnicity*, as documented by district-reported percentage of European American student (WP) enrollment; *size* (SZ), as reflected in district-reported total student enrollment numbers; *paid lunch percentage* (PP), as reported in district documents; and *academic potential* (AP), operationalized as the percentage of children with a "gifted" classification, whose scores we reasoned would enhance the composite achievement, plus the percentage of children with a recognized disability (e.g., mental retardation, speech impairment, learning disability, behavioral disability, and other disabilities), whose scores we reasoned would not enhance the composite achievement in a school. We also included an empirically derived latent construct, through a principal component analysis, community capital (CC) composite to reflect the financial, human, social, and overall quality of life capital available to students in the neighborhood served by their elementary school. Financial capital was indicated by the percentage of children receiving free or reduced-price lunch and the percentage of parents earning less than $25,000 a year; human capital was indicated by the percentage of mothers with some college education; social capital was reflected in the percentage of parents attending parent–teacher conferences and volunteering in the school, the percentage of children residing with at least one of their parents (as opposed to children residing with neither parent), and the percentage of parents with limited English proficiency; and quality of life capital was reflective of combined scores, ranging from "fragile" to "threatened" to "stable," for social, physical, criminal, and economic dimensions of the neighborhood in which each student attended school (Metropolitan Studies Group, 2004). We combined the quality of life data with the financial, human, and social CC data and conducted a principal component analysis with a varimax rotation. The first component explained 69.5% of the variance, and all of the variable loadings were greater than 0.60 and in the expected directions. There was no clear distinction between loadings for financial, human, and social variables; therefore, we used composite scores for this factor as a latent construct for CC to represent the quality of the neighborhoods in which the schools were located.

Dependent variable. As part of its comprehensive reading model and as recommended by the test developers, the district used the Dynamic Indicators of Basic Early Literacy Skills (DIBELS; Good & Kaminski, 2002b) for benchmark (fall), progress monitoring (winter), and end-of-year (spring) assessments in its K–2 classes. Teachers in all participating schools administered DIBELS subtests during the same 1-week intervals established by district administrators. We used Oral Reading Fluency (ORF), a subtest of DIBELS, as our indicator of oral reading rate. The ORF is a standardized, individually administered test of accuracy and fluency with connected text. The passages and procedures are designed to (a) identify children who may need additional instructional support and (b) monitor progress toward instructional goals. The passages are calibrated for the goal level of reading for each grade. Performance is measured by having students read a passage aloud for 1 min. Words omitted or substituted and hesitations of more than 3 s are scored as errors. Words self-corrected within 3 s are scored as accurate. The number of correct words per minute from the passage is the oral reading fluency rate.

In general, despite concern regarding the DIBELS tests (cf. Goodman, 2006; Pearson, 2006; Pressley, Hilden, & Shankland, 2005; Samuels, 2007), they are widely used and have documented technical adequacy (cf. Dynamic Measurement Group, 2008; Good & Kaminski, 2002a, 2003; Good et al., 2004; Good, Kaminski, Simmons, & Kame'enui, 2001; Kame'enui et al., 2006; Riedel, 2007). The ORF measure's sensitivity to change was considered a strength supporting its use in our research.

Design and Data Analysis

Students' oral reading rate was measured three times (fall, winter, and spring) during the second grade. Growth curve analysis was completed using Hierarchical Linear Model 6 (Raudenbush, Bryk, Cheong, Congdon, & Toit, 2004). Measurement intervals were recoded so that the intercept at Level 1 represented the initial reading proficiency of individual students at the beginning of the second grade and the slope at Level 1 represented the half-year growth rate of individual students during the second grade (Raudenbush & Bryk, 2002). We performed three sets of analyses based on the aforementioned specifications after providing descriptive statistics and Pearson correlation coefficients for the variables of interest.

First, repeated-measures analysis of variance (ANOVA) was used to identify statistically significant differences between children in special education programs and in non-special education programs and between male and female students across the three measurement times. We also computed independent sample *t* tests following a statistically significant interaction between independent variables. Inflation of Type I errors was controlled by using a stringent confidence level ($\alpha = .001$) and the report of effect sizes of group differences. Afterward, we calculated intraclass correlations (ICCs) to see whether a significant amount of variance existed between schools for the dependent variable. The ICC was calculated with Stapleton's (2006) formula,

$$ICC = \frac{MS_B - MS_W}{MS_B + (n. - 1)MS_W},$$

in which MS_B stands for "mean square between" and MS_W stands for "mean square within" from ANOVA by treating school as the independent variable. In that formula, *n.* is the estimated sample size per school if the sample size were balanced across schools, and *n.* was calculated with the following formula:

$$n. = \frac{N^2 - \sum_{g=1}^{G} n_g^2}{N(G - 1)}$$

In this formula, N is the total sample size, G is the number of schools, and n_g is the actual sample size for each school.

Second, unconditional models (without predictors) for the students' reading fluency and its increase rates were used to examine the mean and variance of the within-subject parameters. Unconditional models were fitted first in order to provide useful empirical evidence for determining a proper specification of the individual growth equation and baseline statistics for evaluating subsequent conditional models (Raudenbush & Bryk, 2002). Two parameters were of interest in describing the unconditional modes: intercept and slope (see upper panel of Figure 1). The intercept represented the initial status of a student's reading proficiency, and the slope represented the child's half-year increase rate during the second grade. Model parameters were tested sequentially (intercept then slope), first examining the fixed effect and then the random effect. If the fixed effect for a parameter was significant, then the effect of allowing that parameter to vary across students and schools was examined. The significance level ($p < .05$) was used for fixed effects.

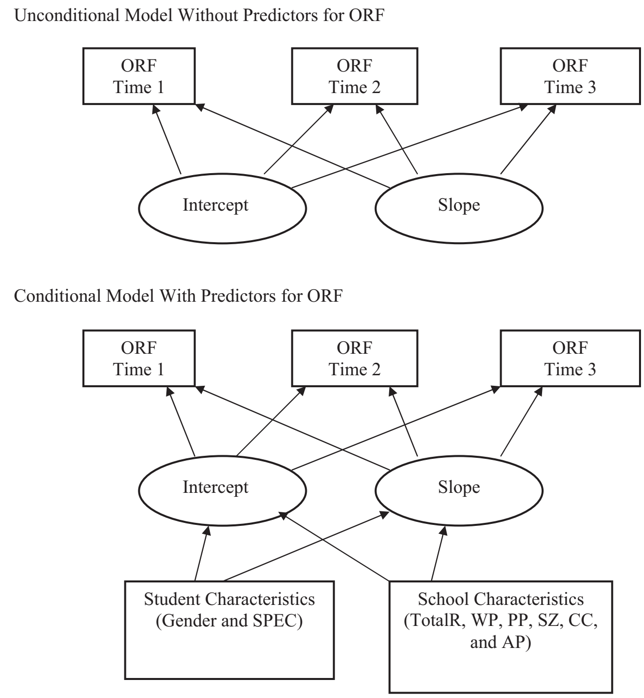

Figure 1. The three-level growth curve model for Oral Reading Fluency (ORF). SPEC = special education status; TotalR = total school reading average; WP = White percentage; PP = paid lunch percentage; SZ = student enrollment; CC = community capital; AP = academic potential.

In the third set of analyses, we were interested in examining significant predictors of children's initial reading fluency status and its increase rates. A three-level conditional model (with predictors) was tested for this investigation. The first level estimated the overall change of all students' oral reading rate with time, the second level assessed the impact of the children's gender and their special education status on their initial oral reading rate and the change in it, and the third level assessed how school characteristics (TotalR, WP, PP, SZ, CC, and AP) affect students' initial oral reading rate and the change in it (see lower panel of Figure 1). All these variables were converted to *z* scores prior to analyses. Conditional models were used to estimate the cause of the variance of the within-subject parameters. In this way, we could examine differences in children's reading fluency and its increase rate between individual students and schools of different characteristics to address our research questions. We followed the two-step strategy for the conditional model because we suspected that the school-level predictors of the students' initial status in reading fluency and its increase rates might be redundant (Compton, 2000). First, simple conditional models were run to examine each variable individually. Then, the variables significant at the first step were examined simultaneously (complete conditional model) at a significance level of $p < .05$. This procedure is like the stepwise linear regression in single-level analysis. The complete conditional model would be parsimonious if variables not significant in the simple conditional model were excluded from the final complete conditional model. The magnitude of effect, or effect size, for the complete conditional model was calculated by 1 minus the ratio between the residual of the complete conditional model and that of the unconditional model. The Appendix contains descriptions of the three-level unconditional and conditional models.

After completing a comprehensive review to support the use of early reading assessments in the development of effective educational programs and policies, Kame'enui et al. (2006) argued that the "technical features [e.g., hit rates, sensitivity, specificity] necessary for considering trustworthiness [of these measures] were relatively uncontroversial" and that the "cut-points on those features for distinguishing trustworthiness from untrustworthiness were necessarily arbitrary" (p. 8). We documented, as an additional indicator of the usefulness and "trustworthiness" of oral reading rates in second-grade students, changes in fall and spring instructional recommendations based on cutoff scores and guidance provided by the developers of the DIBELS measures (i.e., Fall: At Risk = ORF 0–25, Some Risk = ORF 26–43, Low Risk = ORF 44 and above; Spring: At Risk = ORF 0–69, Some Risk = ORF 70–89, Low Risk = ORF 90 and above.). We used cross-tabulations and measures of associations between these categorical groups in analyzing and reporting these outcomes.

Results

Descriptive statistics for measures of school characteristics and intercorrelations between these measures are presented in Table 1. The distributional properties of these variables were examined to ascertain whether the correlations were affected by extreme values. Skewness was within ±1 for all variables and thus was not considered to have an impact on the correlations. No influential outliers were found. The correlations between the school characteristics variables and average school-level ORF scores in the fall, winter, and spring are presented in Table 2. High (i.e., greater than .70) correlations were evident between oral reading fluency and all school characteristics except size. The means and standard deviations of ORF for the special education and non-special education students nested within gender are presented in Table 3. Statistically significant two-way interactions were noticed in the repeated-measures ANOVA for the interaction between time and gender, $F(1, 5792) = 12.41$, and for the interaction between time and special education status, $F(1, 5792) = 12.64$. As a result, we used multiple t tests to identify statistically significant differences between children in special education programs and those in non-special education programs and between male and female students across the three measurement times. Inflation of Type I errors was controlled by using a stringent confidence level ($\alpha = .001$) and the report of effect sizes of group differences. Non-special education children consistently performed better than did special education children during the three tests for oral reading fluency, and girls consistently performed better than did boys. Independent sample t tests for participants' ORF scores showed statistically significant differences between non-special education children and special education children in the fall, $t(5795) = 10.16$, $d = 0.47$; in the winter, $t(5795) = 11.81$, $d = 0.54$; and in the spring, $t(5795) = 11.82$, $d = 0.52$. When participants' performance on ORF were compared across gender, statistical significant differences were also found in the fall, $t(5795) = 9.71$, $d = 0.26$; in the winter, $t(5795) = 10.19$, $d = 0.27$; and in the spring, $t(5795) = 8.89$, $d = 0.23$. Effect sizes (Cohen's d) for these differences ranged from 0.23 to 0.54, all considered medium (Cohen, 1988). The interpretation of ICC values suggested that the variance of ORF between schools was 15% in the fall, 16% in the winter, and 16% in the spring, justifying the need for multilevel analysis. Unconditional models were fitted before student-level and school-level characteristics were included in the conditional three-level HLM (see Figure 1).

The unconditional model was a random intercept and random slope model, suggesting that the intercept and slope values vary across students and across schools. The correlation between the initial status of ORF and the true half-year increase rate during the second grade was estimated to be .238 for children in the same school. The reliability for child-level parameters (π_{0ij} and π_{1ij}) was .899 and .253, respectively, and the reliability for school-level parameters (β_{00j} and β_{10j}) was .909 and .844, respectively. The estimated correlation between true school mean initial status and true school-mean half-year increase rate was .01. On average, the predicted second-grade students' fall oral reading fluency was 61.92, whereas the average half-year increase rate during the second grade was significantly positive at 20.84, $t(78) = 57.95$, $p < .05$ (see Table 4 for final estimates of the fixed effects and random effects). The random effects of Level 3 indicate significant variability among schools in terms of mean status at the beginning of the second grade, $\chi^2(78) = 1{,}078.67$, and school-mean half-year increase rate, $\chi^2(78) = 574.21$. The magnitude of effects of the complete conditional model suggested that the model explained 87% of the variance of the mean status between schools and 18% of the variance of the school-mean half-year increase rate.

The results of the simple and complete conditional models are presented in Table 5. In the simple conditional models, all variables were significant correlates of the intercept, but only SPEC at the student level and TotalR at the school level were significant correlates of the slope. In the complete conditional model, all variables except CC were significant correlates of the intercept, explaining 89.97% of the explainable variance in second-grade students' oral reading fluency, and both SPEC and TotalR were significant correlates of the slope, explaining 5.21% of the explainable variance in second-grade students' half-year learning rate in oral reading fluency.

Table 1
Descriptive Summary and Intercorrelations for Selected Sample Characteristics

Variable	1	2	3	4	5	6
Characteristic						
1. Average total reading	—	.42	.83	.85	.72	.84
2. School size		—	.48	.55	.42	.52
3. European American %			—	.94	.65	.89
4. Paid lunch %				—	.76	.97
5. Academic potential					—	.75
6. Community capital						—
M	83.52	615.65	31.83	43.19	−0.06	0.00
SD	8.80	230.33	26.38	28.25	1.02	1.01

Note. $N = 79$. For Characteristics 1–4, raw scores are given, and for Characteristics 5–6, factor scores are transformed to z values. All correlation coefficients are significant at $p < .01$.

Table 2
Descriptive Summary and Correlations Between Oral Reading Fluency and Sample Characteristics

			Correlation					
ORF	*M*	*SD*	Total reading	School size	European American %	Paid lunch %	Community capital	Academic potential
Fall	58.57	14.38	.80	.35	.83	.87	.84	.76
Winter	84.52	16.23	.84	.34	.86	.88	.85	.73
Spring	99.69	15.58	.82	.31	.82	.82	.78	.74

Note. $N = 79$. All correlation coefficients are significant at $p < .01$.

Furthermore, student characteristics (such as gender and special education status) as well as school characteristics (TotalR, WP, SZ, PP, and AP) all affected the initial status of second-grade students' oral reading fluency (see Table 5). On average, female students achieved a mean ORF score 8.20 higher than did male students, and non-special education children achieved a mean ORF score 15.84 higher than did special education children. A unit increase of TotalR would result in an increase of 2.79 on the mean ORF scores, a unit increase of the percentage of WP students would result in an increase of 4.32 on the mean ORF scores, a unit increase of student enrollment would result in a decrease of 2.64 on the mean ORF scores, a unit increase of the PP students would result in an increase of 7.21 on the mean ORF scores, and a unit increase of AP would result in an increase of 3.19 on the mean ORF scores.

In terms of the growth rate during the second grade, gender did not have a statistically significant impact on the increase rate, but special education children's increase rate was 2.03 per half-year lower than that of non-special education children, $t(4461) = -3.93$, $p < .05$. TotalR impacted the growth rate, and the influence was significant, $t(78) = 2.38$, $p < .05$. With a unit increase of TotalR, the growth rate increased by 0.65 per half-year.

Approximately one third of second graders were classified as at risk or as at some risk on the basis of fall (31%) and spring (32%) reading rates. On the basis of this finding, in a typical second-grade classroom, seven–nine students would be eligible for targeted (small group) or intensive (individual) instructional support. The stability of oral reading rate is also evident in the statistically significant relationship between fall and spring instructional recommendations, $\chi^2(4) = 3{,}858.78$, $p < .05$, as illustrated in Table 6. Of the 648 students considered at risk on the basis of assessments completed early in the school year, 532 (82%) remained at risk near the end of the school year. Alternatively, of the 3,960 students at low risk on fall assessments, 3,519 (89%) remained at low risk after spring assessments.

Table 3
Descriptive Statistics of Oral Reading Fluency During the Second Grade by Gender and Group

		Benchmark assessment		
Gender and group	*n*	Fall	Winter	Spring
Male	2,944			
Special education	319	47.18 (32.85)	68.61 (38.21)	84.75 (41.24)
General education	2,625	61.08 (32.92)	87.87 (37.44)	103.27 (36.73)
Female	2,852			
Special education	180	51.87 (39.66)	76.28 (45.67)	89.34 (46.77)
General education	2,672	69.53 (35.57)	97.49 (38.65)	111.60 (37.89)

Note. Values in parentheses represent standard deviations.

Discussion

The findings from this study suggest that young children's reading fluency development is a dynamic and multilayered process. Outcomes of independent sample *t* tests showed significant differences between boys and girls and between special education children and non-special education children in the fall, winter, and spring of the second grade. The use of three-level HLM with individual growth curve analyses helped us identify that the children's gender and special education status, along with the total school reading average in the fall, had a statistically significant impact on their initial status as well as the increased rate of oral reading. Other school characteristics (the percentage of European American students, the student enrollment, the percentage of students who paid the regular price for lunch, and the academic potential) had a statistically significant impact on the children's initial oral reading rate but not on the change in it.

Of the 5,796 second-grade participants in our study, girls (2,852) had a better performance than did boys (2,944) in the reading achievement test measured by oral reading rate. As for the changes in rate during the second grade, no statistically significant difference was noted between boys and girls. On the other hand, special education children not only achieved less than did non-special education children in reading but also evidenced a statistically significant lower rate of increase. This suggests that differences between non-special education children and special education children grow over the course of the second grade. Considering that the education of special-needs students has received more and more attention in the United States, and active and extensive efforts (e.g., special education programs) have been made by the educational community, the gap in oral reading progress of different subgroups in our study was a disheartening finding.

One of the important findings is that students' gender and special education status appear to be reliable predictors of their oral reading rates. Other reliable predictors include the school characteristics, such as the total school reading average in the fall, the percentage of children who paid the regular price for lunch, the size of the school represented by the student enrollment, the

Table 4
Three-Level Analyses of Second-Grade Oral Reading Fluency

Effect	Coefficient	*SE*	*t*	*p*
	Fixed			
Average initial status (intercept)	61.92	1.67	37.14	<.001
Average half-year learning rate (slope)	20.84	0.36	57.95	<.001
	Variance	*df*	χ^2	
	Random			
Level 1				
Temporary variation	124.93			
Level 2[a] (students within schools)				
Individual initial status (intercept)	936.93	4,901	48,593.21	<.001
Individual half-year learning rate (slope)	21.16	4,901	6,547.49	<.001
Level 3[a] (students between schools)				
School mean status (intercept)	199.66	78	1,078.67	<.001
School mean half-year learning rate (slope)	8.63	78	574.21	<.001

[a] Unconditional model.

school's academic potential, and the percentage of European American students in the school. Specifically, a second-grade student is expected to achieve a better rate of oral reading if the child is female, not identified as a special education student, and is from a school with a high total school reading average, a high academic potential, a small student enrollment, a high percentage of European American children, and a high percentage of students who pay the regular price for lunch in the school.

As for the growth in oral reading rate, only the student status of special education and the total school reading average were best predictors. A student who is identified as being in special education and who is from a school that has a low total school reading average is expected to experience a low increase rate in reading as well during the second grade.

On the basis of our data, the following variables appear to be closely related to a school's overall oral reading rate: the total school reading average in the fall, the percentage of children who paid the regular price for lunch, the size of the school represented by the student enrollment, the school's academic potential, and the percentage of European American students in the school. In other words, a school that has a high reading average in the fall, a high percentage of children who pay the regular price for lunch, a high percentage of European American children, and a high community capital and academic potential but low student enrollment is a "good" school on the basis of its students' oral reading development.

As reflected by our literature review, although definitions of fluency vary, most professionals agree that the ability to read smoothly, accurately, and with expression is a critical building block for literacy (cf. Schwanenflugel et al., 2006). Our investigation provides concrete data about second-grade students' reading fluency development, which has both theoretical and pedagogical implications for the educational community.

Theoretically, measures used in reading research and evaluations of progress in schools in the United States often use annual

Table 5
Effects of Gender, SPEC, and School Characteristic on Oral Reading Fluency

	Simple conditional model				Complete conditional model			
Variable	Estimate	*SE*	*t*	*p*	Estimate	*SE*	*t*	*p*
Intercept								
Gender	−8.99	0.83	−10.88	<.001	−8.20	0.85	−9.64	<.001
SPEC	−17.31	1.99	−8.69	<.001	−15.84	2.02	−7.86	<.001
TotalR	12.21	0.81	15.00	<.001	2.79	1.28	2.17	.033
WP	12.52	0.79	15.92	<.001	4.32	1.88	2.30	.025
SZ	4.85	1.40	3.45	.001	−2.64	0.74	−3.57	.001
PP	13.14	0.77	17.02	<.001	7.21	3.41	2.12	.038
AP	11.04	1.07	10.32	<.001	3.19	1.16	2.75	.008
CC	12.80	0.82	15.53	<.001	−1.91	2.74	−0.70	.487
Slope								
Gender	−0.06	0.30	−0.19	.853				
SPEC	−2.04	0.52	−3.94	<.001	−2.03	0.52	−3.93	<.001
TotalR	0.66	0.27	2.43	.018	0.65	0.27	2.38	.020
WP	0.42	0.32	1.31	.196				
SZ	−0.12	0.34	−0.34	.733				
PP	0.13	0.33	0.40	.687				
AP	0.29	0.30	0.96	.341				
CC	0.05	0.33	0.14	.892				

Note. SPEC = special education status; TotalR = total school reading average; WP = White percentage; SZ = student enrollment; PP = paid lunch percentage; AP = academic potential; CC = community capital.

Table 6
Relationship Between Instructional Needs for Second-Grade Students

	Spring status		
Fall status	At risk	Some risk	Low risk
At risk (*N* = 648)	532 (82.1)	81 (12.5)	35 (5.4)
Some risk (*N* = 1,172)	352 (30.0)	476 (40.6)	344 (29.4)
Low risk (*N* = 3,960)	46 (1.2)	395 (10.0)	3,519 (88.9)

Note. Spring status data in parentheses are percentages. Fall status: At risk = ORF 0–25; some risk = ORF 26–43; and low risk = ORF 44 and above. Spring status: At risk = ORF 0–69; some risk = ORF 70–89; and low risk = ORF 90 and above. ORF = Oral Reading Fluency.

or infrequent general performance markers as evidence of progress, outcomes, and achievement. When more sensitive (e.g., 1-min samples of reading behaviors) and frequent indicators are used, they usually frame a process of early identification for readers at risk of reading failure. Another advantage of fluency measures over general performance markers is the additional information provided (i.e., indication of development and levels of automaticity). They also address the continuing problem of the inability to identify markers that are sensitive to short- and long-term instruction and remediation in the areas of reading and learning disabilities.

Moreover, there exists little information describing the naturally occurring development of these indicators in typical schools' environments in the field of reading research (cf. Nelson, 2008; Ritchey, 2002). In this article, we provided descriptive data on the development of oral reading rates of second graders. We observed steady increases in rates across three benchmark assessments (fall, winter, and spring) and noted considerable variation in performance, with patterns reflective of those often cited as Matthew effects (i.e., the rich get richer and the poor get poorer; cf. Stanovich, 1986). As such, our study offers useful foundational information on the development of a subcomponent of fluency in young children and suggests important directions for further research and practice. In addition, the use of HLM offered indicators of students' oral reading rate and its development at different levels: student characteristics nested within school characteristics.

Pedagogically, as Reutzel (2006) pointed out, effective fluency instruction for elementary students requires explicit, systematic explanation and instruction about the elements of reading fluency, rich and varied modeling and demonstrations of fluent reading, guided oral reading practice with appropriately challenging and varied texts on a regular basis, guided repeated or multiple rereading of the same text, assessment and self-monitoring of oral reading fluency progress, information on how to "fix up" faltering reading fluency, and genuine audiences and opportunities for oral reading performance. Although there are many strategies that can help "dysfluent or non-fluent" readers to improve oral reading competency, most are of limited value if children do not "engage and control" them (Oakley, 2005, pp. 13, 18) or do not "receive guidance or feedback from teachers, parents, volunteers, or peers" (Reutzel, 2006, p. 66). The possibility of large numbers of faltering second graders needing fluency-assisted instruction is daunting. Equally unnerving is the finding that differences in development of oral reading rates become sustained or heightened over time for some groups of children. Even with evidence-based core-literacy instruction, considerable numbers of at-risk children point to the continuing need for attention to repeated reading of accessible text "from the first" (Hiebert & Fisher, 2006, p. 279).

With the latest revision of the Individuals With Disabilities Education Act of 2004, classroom teachers have been encouraged to use Response to Intervention (RTI) as "means of providing early intervention to all children at risk for school failure" (Fuchs & Fuchs, 2006, p. 93). Due to financial considerations (i.e., it is expensive for school districts to provide services to skyrocketing numbers of students identified with learning disabilities), proponents of the approach see its promise as a structure that can be "implemented in the early grades to strengthen the intensity and effectiveness of reading instruction for at-risk students" (Fuchs & Fuchs, 2006, p. 98). To put RTI into practice, school professionals may choose among several strategies. For example, "they can look at all students' performance on last year's high-stakes test and choose a criterion such as scores below the 25th percentile to designate risk" or, "from a measurement perspective, perhaps the best strategy is to assess every student in the grade on a screening tool with a benchmark that demonstrates utility for predicting end-of-year performance on high-stakes tests" (Fuchs & Fuchs, 2006, p. 93). Oral reading fluency is widely accepted as a gateway to comprehension and overall success in reading (cf. National Research Council, 1998; HHS, 2000a, 2000b); norms (Good, Wallin, Simmons, Kame'enui, & Kaminski, 2002) and benchmark goals and risk indicators are readily available (Good & Kaminski, 2003). In our schools, almost 1,500 students scored at or below the 25th percentile and almost 40% were at risk or at some risk, using the benchmark goals and indicators of risk the recommended three assessment periods per year. Again, this outcome is alarming. More important, the economics of providing assistance to all children at risk for school failure (whatever the criteria) is unresolved and potentially exacerbated by RTI in its current, unproven level of implementation and use. Interestingly, assessing the oral reading rate three times (i.e., fall, winter, and spring) did not provide evidence of improvements in levels of risk of continued failure for students at risk at the beginning of the year.

Although this study provides important data about second-grade students' reading development, some limitations must be acknowledged. First, it is not clear how first-grade and third-grade students' reading figure in the picture. Second, young children's reading rates are often impacted by the textual features. How familiar they are with the reading material and whether the text is narrative or exposition may both significantly affect their reading rates. Third, how children's reading rates correspond to their reading comprehension still needs to be better understood. After all, accurate and quick reading is meaningful only when it leads to clear understanding and interpretation of texts.

Our data described a key component of reading development for a large group of children. Replication is clearly warranted, both in terms of similar and comparable core reading programs and geographic and district characteristics. Reutzel (2006, p. 67) noted that recent research on fluency suggests that first graders "ought to be able to read about 53" correct words per minute. Almost half (43.8%) of our sample of 5,796 children entered second grade reading below this level. As a marker of the oral reading fluency in our district, this fact is alarming.

Finally, the findings also point to the directions for future research. To date, research on oral reading rates is sparse, and it is imperative that the educational community address this important topic to better support local policy decision making and students' reading development (cf. Hanushek et al., 2009; Kame'enui et al., 2006; Nelson, 2008; Rasinski et al., 2006a, 2006b). There is a need for similar research across local, state, and national boundaries on multiple measures of reading rates. Similarly, continued study of relationships between core reading program features, teacher characteristics, and reading rates will provide important information in efforts to better understand the development of key features of early literacy. Regular large-scale monitoring of students' reading development and adjusting instruction at different levels will bring continuing support to efforts to identify and document technically adequate tools for assessing reading competence and will offer a more realistic promise to the goal of preventing chronic reading and school failure.

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Appendix

Three-Level Hierarchical Linear Models

Unconditional Models

Level 1 is an individual growth model of oral reading fluency (ORF) at time *t* of student *i* in school *j* that is expressed in the following equation:

$$Y_{tij} = \pi_{0ij} + \pi_{1ij}t_{tij} + e_{tij},$$

where

Y_{tij} is the ORF at time *t* for child *i* in school *j*;

π_{0ij} is the initial status of child *i* in school *j*, which is the ORF for that child in the beginning of the second grade;

π_{1ij} is the half-year increase rate for child *i* in school *j* during the second grade;

t_{tij} takes on a value of 0 in fall, a value of 1 in winter, and a value of 2 in spring; and

e_{tij} is the Level 1 residual or random effect that represents the deviation of child *i*'s score in school *j* at time *t* from the predicted value. These residuals are assumed to be normally distributed, with a mean of zero and a variance of σ^2.

At Level 2 (child level), each of the parameters at Level 1 became the outcome variable, as seen in the following equations:

$$\pi_{0ij} = \beta_{00j} + r_{0ij} \text{ and}$$

$$\pi_{1ij} = \beta_{10j} + r_{1ij},$$

where

β_{00j} represents the mean initial status within school *j*;

β_{10j} represents the mean half-year increase rate within school *j*; and

r_{0ij} and r_{1ij} are the Level 2 residuals or random effects that represent the deviation of child *i*'s score and slope, respectively, in school *j* from the predicted values.

At Level 3 (school level), each of the parameters at Level 2 became the outcome variable, as seen in the following equations:

$$\beta_{00j} = \gamma_{000} + u_{00j} \text{ and}$$

$$\beta_{10j} = \gamma_{100} + u_{10j},$$

where

γ_{000} is the overall mean initial status of ORF;

γ_{100} is the overall mean half-year increase rate; and

u_{00j} and u_{10j} are the Level 3 residuals or random effects that represent the deviation of school *j*'s score and slope, respectively, from the predicted values.

Conditional Models

The conditional model at Level 1 is the same as that of the unconditional model, which had the following equation:

$$Y_{tij} = \pi_{0ij} + \pi_{1ij}t_{tij} + e_{tij}.$$

At Level 2 (child level), each of the parameters at Level 1 became the outcome variable, as seen in the following equations:

$$\pi_{0ij} = \beta_{00j} + \beta_{01j}(Gender) + \beta_{02j}(SPEC) + r_{0ij} \text{ and}$$

$$\pi_{1ij} = \beta_{10j} + \beta_{11j}(Gender) + \beta_{12j}(SPEC) + r_{1ij}.$$

The variables gender and special education services (SPEC) were entered into the model uncentered. Because gender was a dummy variable, the corresponding regression coefficients could be interpreted as reading-gap effects. That is, β_{01j} is the effect of gender on initial status (i.e., the extent that a male child starts behind a female child within school *j*). β_{11j} represents the reading gap on the half-year increase rates with respect to gender within school *j* (i.e., the difference between the male and female groups in subsequent increase rates). Similarly, β_{02j} is the effect of SPEC on initial status (i.e., the extent that a special education child starts

(*Appendix continues*)

behind a non-special education child within school j). β_{12j} represents the reading gap on the half-year increase rates with respect to SPEC within school j (i.e., the difference between the special education children and non-special education children in subsequent increase rates).

The Level 3 model represents the variability in the six beta coefficients among the schools. We performed the simple conditional model first and then the complete conditional model. Only variables significant ($p < .05$) by themselves as a correlate with the outcome variable were included (grand-mean centered) in the complete conditional model. As a result, the Level 3 model is as follows:

β_{00j} = mean status for a female non-special education child in school $j = \gamma_{000} + \gamma_{001}(TotalR)_j + \gamma_{002}(WP)_j + \gamma_{003}(PP)_j + \gamma_{004}(Size)_j + \gamma_{005}(CC)_j + \gamma_{006}(AP)_j + u_{00j}$, where TotalR is the overall reading level in a student's school; WP is the percentage of European American students; Size is the student enrollment; PP is the paid lunch percentage; CC is the community capital composite reflecting the financial, human, social, and overall quality of life capital available to students in the neighborhood served by their elementary school; and AP is the academic potential, operationalized as the percentage of children classified as gifted;

β_{01j} = reading gap on initial status for gender $= \gamma_{010}$;

β_{02j} = reading gap on initial status for SPEC $= \gamma_{020}$;

β_{10j} = half-year increase rate for a female non-special education child in school $j = \gamma_{100} + \gamma_{101}(TotalR)_j + u_{10j}$;

β_{11j} = reading gap on the increase rate with respect to gender in school $j = \gamma_{110}$; and

β_{12j} = reading gap on the increase rate with respect to SPEC in school $j = \gamma_{120}$.

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Correction to Hodis et al. (2011)

In the article "A Longitudinal Investigation of Motivation and Secondary School Achievement Using Growth Mixture Modeling," by Flaviu Hodis, Luanna Meyer, John McClure, Kirsty Weir, and Frank Walkey (*Journal of Educational Psychology*, Advance online publication. March 14, 2011. doi: 10.1037/a0022547), in Figure 5, the eight curves, corresponding to the 8 different subsamples, are represented with the same symbol (i.e., empty squares). The original figure, as included in the accepted manuscript, represents each subsample with a different symbol. These changes are only needed to make reading and interpretation of Figure 5 easier. The changes are very small and do not in any way affect the findings of the research.

The correct figure is presented below.

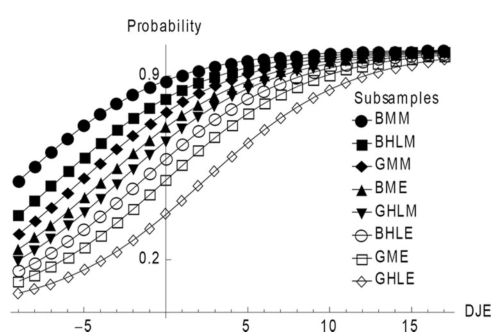

Figure 5. Probability of being in the low steep latent trajectory class as a function of mean-centered Doing Just Enough (DJE) scores, type of school, and gender for students of European/Ma"ori ethnicity. BMM _ boy, middle decile school, Ma"ori ethnicity; BHLM _ boy, high/low decile school, Ma"ori ethnicity; GMM _ girl, middle decile school, Ma"ori ethnicity; BME _ boy, middle decile school, European ethnicity; GHLM _girl, high/low decile school, Ma"ori ethnicity; BHLE _ boy, high/low decile school, European ethnicity; GME _ girl, middle decile school, European ethnicity; GHLE _ girl, high/low decile school, European ethnicity.

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