



Relations among intrinsic and extrinsic reading motivation, reading amount, and comprehension: a conceptual replication

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Abstract

Children’s motivation to read is a strong predictor of their reading comprehension. However, some recent research has suggested that the relationship between reading motivation and reading comprehension may be mediated through the amount that students read. This study attempts a conceptual replication of several existing models that explore the relationship among children’s reading motivations, out-of-school reading amount, and reading comprehension, using a large sample of over 4000 third- through fifth-graders in 59 U.S. elementary schools. Consistent with prior research, several control variables, including children’s prior reading comprehension ability, gender, and socioeconomic status, directly contributed to later reading comprehension. Results also replicated positive associations between intrinsic reading motivation, reading amount and reading comprehension, and negative associations between extrinsic reading motivation, reading amount and reading comprehension. Using structural equation models, our analyses found no evidence that the relationship between children’s intrinsic and extrinsic reading motivation and later reading comprehension was either partially or fully mediated by reading amount. This suggests that it is critical to attend to context-specific determinants of motivation and reading amount, including students’ background characteristics and quality of texts read. Furthermore, this study underscores the importance of replicating methods used by original researchers to confirm and disconfirm hypotheses, and of conducting research with large and diverse samples that enhance the generalizability of results.

Keywords Reading motivation · Reading amount · Reading comprehension · Self-determination theory · Elementary students

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Introduction

Far too many elementary school children in U.S. public schools have low levels of intrinsic reading motivation (Dearing, 2008; Gottfried, Fleming, & Gottfried, 2001; Wigfield, Eccles, Schiefele, Roeser, & Davis-Kean, 2006). On a nationally representative survey of reading achievement, only 34% of fourth-grade children stated that reading was a favorite activity (National Center for Education, 2015). Similarly, on an international survey of reading achievement, only 36% of U.S. fourth-graders said that they “very much like reading”, ranking 32nd out of 50 participating countries (International Association for the Evaluation of Educational Achievement, 2016).

Furthermore, after fourth grade, the dominant pattern in children’s achievement motivation and intrinsic motivation is one of decline (Wigfield et al., 2006). Gottfried et al. (2001) found that children’s academic intrinsic motivation to read dropped by 0.24 standard deviations from age 9 to 13, which corresponds to grades four to six. McKenna, Kear, and Ellsworth (1995) found that children’s attitudes toward recreational reading dropped by 0.26 standard deviations between grades four and six. This may be due to children’s declining feelings of competence, as students’ self-assessments of their abilities in relation to their peers becomes more accurate (Guthrie & Wigfield, 2000), or due to the increasingly poor person-environment fit of the American school system as children grow older (Eccles & Roeser, 2011). The decline in elementary school children’s intrinsic reading motivation is likely to lead to a drop in the amount of leisure reading activities they engage in outside school. This is troubling because out-of-school reading is a powerful predictor of verbal ability and reading comprehension (Lindsay, 2010; Mol & Bus, 2011).

This relationship is particularly important for low-income children in the U.S. By all measures, low-income American children have less developed literacy skills than their middle- and high-income counterparts (Reardon, Valentino, & Shores, 2012). Furthermore, the gap between low- and middle-income children’s reading comprehension skills has been found to increase significantly during the summer months, when children are not in school (Allington et al., 2010). Presumably, intrinsic motivation to read plays a powerful role in determining whether and how much children engage in leisure-time reading during the summer. Thus, understanding whether and how reading motivation may contribute to reading comprehension is especially critical among low-income populations.

Some recent research suggests that the relationship between students’ motivation to read and reading achievement may be mediated by the *amount* that they read (De Naeghel, Van Keer, Vansteenkiste, & Rosseel, 2012; Miyamoto, Pfost, & Artelt, 2018; Schaffner & Schiefele, 2016; Schaffner, Schiefele, & Ulferts, 2013; Stutz, Schaffner, & Schiefele, 2016). In other words, highly motivated students engage in more recreational reading than less motivated students, and it is this quantity of reading that predicts students’ reading achievement. Thus, this line of thinking argues, reading motivation itself has no direct effect on achievement. Contributing to this literature, the present study uses structural equation

modeling to investigate the relationship among reading comprehension, intrinsic and extrinsic motivation to read, and amount of reading during the summer vacation for rising fourth- and fifth-graders ($n=4529$) in high-poverty U.S. schools. In particular, the aim of this study is to test the hypothesis that reading amount mediates the relationship between motivation and reading comprehension. This is one of the largest empirical studies to replicate and extend existing measures and analytic models in order to explore interrelationships among children's reading motivations, reading amount outside school, and comprehension. This study is framed around the following research questions:

What are the relationships among intrinsic and extrinsic reading motivation, leisure-time reading amount, and reading comprehension among low-income US elementary school children? Specifically, does reading amount mediate the relationships between intrinsic and extrinsic reading motivation and reading comprehension?

Conceptual background

Intrinsic and extrinsic motivation to read

Self-determination theory defines intrinsic motivation as “the doing of an activity for its inherent satisfactions” (Ryan & Deci, 2000, p. 56). The present study operationalizes intrinsic motivation as composed of four sub-constructs. The first three, *curiosity*, *involvement*, and *self-efficacy* are drawn from Schiefele and colleagues' review of 20 years of both quantitative and qualitative empirical research on reading motivation (Schiefele, Schaffner, Möller, & Wigfield, 2012). Curiosity is defined as reading “to learn more about personally interesting topics;” involvement means enjoyment of texts or getting “lost in a story”, and self-efficacy is a person's perception of his or her own competence as a reader (Schiefele et al., 2012, p. 433). Although intrinsic reading motivation is a broad construct, it has typically been operationalized using these three sub-constructs, and measured using items from Wigfield and Guthrie's (1997) original Motivations for Reading Questionnaire (MRQ).

The fourth sub-construct in the present study is based on de Naeghel and colleagues' (2012) *autonomous recreational* reading motivation. Autonomous motivation means motivation that is fully self-determined, or the choice to engage in a behavior for one's own enjoyment. Thus, autonomous motivation may draw on aspects of curiosity and/or involvement. However, de Naeghel and colleagues distinguish between children's motivation to read in school, which they refer to as controlled reading, and their desire to read during leisure time, which the researchers call recreational reading. Thus, autonomous recreational reading motivation refers to students' fully self-determined choice to engage in out-of-school reading. Recent work by Schüller, Birnbaum, and Kröner (2017) has also emphasized the importance of measuring context-specific determinants of reading behavior, suggesting that it may be critical to use measures of motivation that focus on either recreational out-of-school reading or academic in-school reading. Because the reading

behaviors addressed in this study took place during the summer, when children were not attending school, any reading in which they engaged was inherently leisure-time reading. Thus, for the purposes of the present study, autonomous recreational reading motivation was considered an important component in measuring students' intrinsic motivation to read. The present study replicates and extends prior measurement of children's intrinsic reading motivation by incorporating items related to curiosity, involvement, and self-efficacy from Wigfield and Guthrie (1997) in addition to a context-specific measure of recreational intrinsic reading motivation from de Naeghel and colleagues (2012).

According to self-determination theory, extrinsic motivation refers to "behavior where the reason for doing it is something other than an interest in the activity itself", (Deci & Ryan, 2000, p. 35). Schiefele and colleagues (2012) posit that extrinsic motivation to read is composed of three components: *recognition*, *competition* and *grades*. These three components of extrinsic motivation replicate items from Wigfield and Guthrie (1997).

Some research suggests that while intrinsic reading motivation has a positive relationship with reading comprehension, extrinsic motivation to read may be negatively associated with comprehension. For example, one study, focused on 7- to 13-year-olds in England, found that good readers were more intrinsically motivated than poor readers, but the groups did not differ in extrinsic motivation (McGeown, Norgate, & Warhurst, 2012). A longitudinal study in Germany found that third-grade reading achievement positively predicted intrinsic motivation in fourth grade (Becker, McElvany, & Kortenbruck, 2010). Controlling for third-grade reading achievement, fourth-grade intrinsic motivation strongly predicted sixth-grade reading achievement. Third-grade reading achievement negatively predicted extrinsic motivation in fourth grade, which weakly negatively predicted sixth-grade reading achievement, controlling for third-grade achievement. Also in Germany, Schiefele and Löweke (2017) used latent profile analysis to create four motivational profiles among third-graders: high intrinsic, high involvement, high overall motivation (both intrinsic and extrinsic), and moderate overall motivation. They found that controlling for prior achievement, students with the two intrinsic profiles read more and had higher scores on passage comprehension than either the high overall or moderate overall groups. This suggests that extrinsic motivation may undermine the effects of intrinsic motivation on reading amount and comprehension. Interestingly, 35% of the children in this study changed motivational profiles between third and fourth grade, suggesting that motivation may be context-dependent. Collectively, these studies suggest that good readers tend to be more intrinsically motivated than poor readers and that extrinsic motivation may not promote achievement. The critical implication for the present study is that intrinsic and extrinsic motivation may predict reading comprehension separately, yet simultaneously, making structural equation modeling the ideal method to investigate these complex relationships.

Furthermore, some research suggests that the relationship between reading motivation and comprehension may differ for different individuals. Schaffner, Philipp and Schiefele (2016) conducted a longitudinal analysis of 296 German students in both academic track and nonacademic track schools. They found a reciprocal relationship between intrinsic reading motivation and comprehension, such that fifth-grade

motivation predicted sixth-grade reading competence, and fifth-grade reading competence predicted sixth-grade motivation, *for students in academic tracks only*. No relationship between reading motivation and competence was demonstrated for students in nonacademic tracks. Similarly, Miyamoto, Pfof and Artelt (2018) examined the cross-lagged relationships among intrinsic reading motivation and reading comprehension for 4619 students in German schools, comparing immigrant and native students. They found that while fifth-grade reading competence predicted seventh-grade reading motivation for all students, fifth-grade motivation predicted seventh-grade competence only for native students, not for immigrants. In other words, if we assume that immigrant status serves as a proxy for students' skill level with the German language, this study suggests that while all students with higher reading skills developed higher levels of *will* to read, *will* only led to increased *skill* when a prerequisite level of skill was in place. The findings of these two studies highlight the importance of attending to contextual and mediating factors when examining the relationships among reading motivations and comprehension.

Reading motivation, reading amount, and reading comprehension

Some recent research has suggested that the relationship between reading motivation and reading comprehension may be partially or fully mediated through the amount that students read. However, empirical analyses of this relationship have produced mixed findings. First, Schaffner, Schiefele and Ulferts (2013) found that in their sample of 159 German fifth-graders, reading amount fully mediated the positive effect of intrinsic motivation on reading comprehension, while extrinsic motivation was negatively associated with reading comprehension both directly and indirectly, mediated through amount. Secondly, Stutz, Schaffner and Schiefele (2016) conducted a study of 1053 second- and third-graders in Germany, and found that intrinsic motivation, operationalized as involvement, predicted reading comprehension, but that this relationship was fully mediated through reading amount. They found that extrinsic motivation, operationalized as competition, did not predict reading amount, but did directly and negatively predict reading comprehension. Third, using a sample of 223 third-grade students in Germany, Schaffner and Schiefele (2016) found that, controlling for prior reading achievement, intrinsic motivation predicted reading comprehension indirectly, mediated through reading amount, while extrinsic motivation was not a statistically significant direct or indirect predictor of reading achievement. However, in this study, the researchers made an a priori assumption that there would be no direct path from intrinsic motivation to reading achievement, and therefore did not test this relationship.

In contrast, in a study of 1260 Flemish fifth-graders, de Naeghel and colleagues (2012) found that recreational autonomous reading motivation directly predicted both leisure-time reading frequency and reading comprehension, but that there was no indirect relationship between motivation and comprehension, mediated through frequency. Finally, in a large longitudinal study of 4619 fifth- through seventh-graders in Germany, Miyamoto and colleagues (2018) found that, controlling for fifth-grade comprehension, fifth-grade intrinsic reading motivation predicted sixth-grade

reading amount, and sixth-grade reading amount predicted seventh-grade reading comprehension, for all students. They also found that motivation had a significant indirect effect on comprehension, mediated through amount; however, they made an a priori assumption that the effect of motivation on comprehension was fully mediated through amount, and did not test a direct path from motivation to comprehension. Importantly, they also examined the relationships among motivation, amount and comprehension for different groups of students, including students in academic and nonacademic track schools, and both immigrant and native students. They found that while reading motivation predicted reading amount for all students, and amount predicted comprehension for all students in academic track schools, amount failed to predict comprehension for immigrant students in nonacademic track schools, and therefore there was no indirect effect of motivation on comprehension for immigrant students in nonacademic track schools.

Taken together, these studies have failed to replicate one another's findings, calling into question the relationships among reading comprehension, motivation and amount. What are the sources of this replication failure and the mixed findings? One critical explanation focuses on methodological differences across studies. First, three of these studies (De Naeghel et al., 2012; Schaffner et al., 2013; Stutz et al., 2016) did not control for prior reading achievement, and thus may drastically overestimate the amount of variation in reading comprehension explained by reading motivation. In other words, once the effects of prior comprehension are partialled out, the relations among children's motivation, reading amount, and later reading comprehension may be attenuated.

Second, some issues exist with the ways in which constructs were operationalized and measured. For example, Schaffner and Schiefele (2016) measured only word- and sentence-level comprehension, without attention to higher-order comprehension. Stutz et al. (2016) operationalized extrinsic motivation using only two items measuring the sub-construct of competition, and operationalized intrinsic motivation using only three items measuring involvement. Students responded to an additional two items measuring another sub-construct of intrinsic motivation, curiosity, but the authors' analyses suggested that curiosity was not related to reading comprehension. De Naeghel and colleagues (2012) and Miyamoto and colleagues (2018) focused only on intrinsic motivation, thus overlooking potential undermining effects of extrinsic motivation (Becker et al., 2010; Schiefele & Löweke, 2017). Studies have also used different measures of reading amount, and, despite the demonstrated importance of contextual factors (Schüller et al., 2017), have not always distinguished between in-school and leisure-time reading (Miyamoto et al., 2018). Thus, it is critical to measure reading motivation and comprehension using valid measures, and to use more context-specific measures focused on recreational reading outside school.

Third, several of these studies utilize quite small samples, falling below the recommended size for structural equation modeling (Kline, 2011).

Finally, Schaffner et al. (2013), Stutz et al. (2016) and Miyamoto et al. (2018) all cite as a limitation the lack of a measure of quality of student reading materials. These papers posit that reading challenging materials is more likely to be associated with gains in reading comprehension, and that therefore, varying quality of

students' reading materials may complicate the relationship between reading amount and reading achievement. Thus, these researchers suggest that future research into relationships between reading amount and achievement should collect more detailed data about *what* students are reading, in addition to self-reports about *how much* students are reading.

In sum, the present study offers a number of contributions that offset some limitations of previous research in this area, including a large sample, thorough and theoretically valid assessments of reading motivation and achievement, essential control variables such as prior reading achievement and student socioeconomic status, and supplementary descriptive analysis of the quality of student reading materials. The primary aim of this study is to conduct a *conceptual replication* (Schmidt, 2009)—a replication study that aims to confirm prior hypotheses using established measures and analytic models. Specifically, we (a) replicate measures of intrinsic and extrinsic motivation that are construct valid (Wigfield & Guthrie, 1997; Schaffner et al., 2013), (b) include context-specific measures of autonomous motivation, (c) test whether and to what extent intrinsic and extrinsic motivation simultaneously contribute to reading amount and reading comprehension, and (d) highlight qualitative differences in children's reading amount to extend future measurement of the key mediator. Finally, this study includes controls for prior reading comprehension ability, socioeconomic status, gender, race and age to partial out the effects of covariates with a large sample of over 4000 elementary school children.

Study context

Students in the present study were participants in a longitudinal randomized controlled trial of an evidence-based summer literacy program called READS for Summer Learning. READS was designed to improve the reading comprehension of students in high-poverty schools by increasing their engagement with books over the summer. In order to accomplish this, READS provided students with: (a) books matched to students' reading levels and interests and (b) teacher scaffolding for summer reading before the end of the school year, during which students were taught and given an opportunity to practice a reading routine they would be expected to use during the summer. Fifty-nine schools from five high-poverty districts in North Carolina were recruited to participate in READS between spring 2014 and fall 2014. All third- and fourth-grade teachers, and all third- and fourth-grade students with parental consent, participated. During the summer of 2014, all participating students received matched books plus teacher scaffolding, with no treatment versus control contrast during this period.

Measures of students' reading motivation and achievement were collected within the context of this study. Furthermore, this intervention provides an excellent context for investigating the relationships among reading motivation, amount and achievement by providing a partial solution to the problem of varying reading quality in the research described above (Miyamoto et al., 2018; Schaffner et al., 2013; Stutz et al., 2016). By providing students with books that were well-matched in interest

and challenge, READS increased the likelihood that at least some of the reading in which students engaged over the summer consisted of high quality materials.

Method

Participants

Students ($n=4529$) in 59 elementary schools in North Carolina participated; these students were in third and fourth grade in spring 2014, and in fourth and fifth grade in fall 2014. Demographic characteristics presented in Table 1 show that the sample is racially diverse and predominantly low-income.

Measures

Spring and fall reading comprehension

Students' spring (pretest) reading comprehension scores on the spring 2014 North Carolina End of Grade standardized test (EOG) were used to represent prior reading comprehension. The EOG is a silent reading comprehension test that assesses both literal and inferential comprehension of narrative and expository texts. The test included 52 multiple-choice items that are scaled based on a 3-parameter IRT (item-response theory) model. Reported KR-20 reliabilities ranged from 0.88 to 0.92 (North Carolina Department of Public Instruction, 2014).

Students' fall (post-test) reading comprehension was measured using the Iowa Test of Basic Skills (ITBS), a 38-item standardized test of reading achievement. This assessment measures word- and passage-level literal and inferential comprehension, and has reported KR-20 coefficients above 0.93 and equivalent form estimates of

Table 1 Demographic characteristics of sample

	Students	Percent
Total N	4529	100
Male	2167	47.9
Female	2362	52.1
Caucasian	1038	22.9
African-American	1654	36.5
Latino/a	1046	23.1
Other race	770	17.0
Grade 4 (fall 2014)	2407	53.3
Grade 5 (fall 2014)	2111	46.7
Low income	3446	76.1
Non low-income	1043	23.0
Limited English proficient	809	17.9
Non-limited English proficient	3687	81.4

0.86 or higher (Hoover et al., 2003). Different measures of reading achievement were used because Schaffner and colleagues (2013) suggest that “applying different tests of reading comprehension should be considered at different measurement points to decrease the stability of comprehension performance being caused by common method variance” (p. 382).

Intrinsic reading motivation

Using a 4-point Likert scale, students answered questions about four sub-constructs of intrinsic motivation. Items measuring *involvement* (6 items; e.g., “I make pictures in my mind when I read”), *curiosity* (5 items; e.g., “I read to learn new information about topics that interest me”), and *self-efficacy* (3 items; e.g., “I am a good reader”) were drawn from the MRQ (Wigfield & Guthrie, 1997). Schaffner et al. (2013) replicated these items, referring to them as object- and experience-oriented measures of motivation. To address context-specific determinants of reading amount, *autonomous recreational* reading motivation was also measured, using 19 items (e.g., “I read in my free time because I really like it”) drawn from the SRQ-Reading Motivation (De Naeghel et al., 2012). Alphas for these subscales ranged from 0.62 to 0.92, while the full intrinsic motivation scale had an alpha of 0.91. Thus, this study replicates and extends prior measures of intrinsic motivation to serve our goal of understanding direct and indirect effects of intrinsic reading motivation on reading comprehension and reading amount outside school during the summer months.

Extrinsic reading motivation

Using a 4-point Likert scale, students answered questions about three sub-constructs of extrinsic motivation: *recognition* (4 items; e.g., “I like to get compliments for my reading”), *grades* (4 items; e.g., “I read to improve my grades”), and *competition* (7 items; e.g., “I try to get more answers about reading right than my friends”), all drawn from the MRQ (Wigfield & Guthrie, 1997). Alphas for these subscales ranged from 0.70 to 0.77, with an alpha of 0.86 for the full extrinsic motivation scale.

Amount (survey-reported)

Students answered three questions drawn from Schaffner, Schiefele and Ulferts (2013) about the amount of reading in which they engaged during summer 2014. Students responded to questions about how *frequently* they read, and how *long* they typically read without taking a break, both answered on a five-point scale, and how *many* books they read during summer vacation, with answer choices ranging from “0–1 book” to “10 or more books”.

Amount and quality (interview-reported)

In addition, a subset of students ($n=83$) engaged in individual interviews about the books they were supposed to receive during the summer. For each text, students were shown a picture of the cover and asked to report whether they had read all,

some or none of the text. These data were used for supplementary analysis of the self-reported measure of reading amount on the student survey. Furthermore, we consider this a measure of “reading quality” because these texts were matched to children’s reading comprehension ability and reading interests in spring.

Procedure

The ITBS and the reading motivation and amount surveys were group-administered to all participating students during September 2014. Students completed the EoG during three 60-min blocks of time during their regularly scheduled testing period in the spring of 2014; scores were provided to the researchers by the districts. The subsample of students who were interviewed were randomly selected from eleven schools in one district. Students were stratified by school, and eight students were selected from each school. Students were interviewed during the regular school day, in a quiet room in their school buildings, by trained interviewers, during September and October 2014. Each interview lasted approximately 20 min.

Analysis

To investigate the relationships among reading motivation, amount and comprehension, structural equation modeling was conducted using Mplus. Structural equation modeling allows analysis of relationships among latent variables, making it the ideal analytic method for the present study. Although the students in the sample were drawn from 59 schools, the present study is focused on reading during the summer, when students were not in school. Therefore, we determined that nesting students by school was theoretically unnecessary; similarly, Schaffner and Scheifele (2016) did not use multilevel modeling in their study of summer reading among 223 students from 15 schools.

Endogenous variables met the normality assumptions required for structural equation modeling. Overall, there were only small amounts of missing data: for individual variables, missing values ranged from 1.6 to 2.1% of the total. Our model makes the assumption that these data were missing at random, and since the amount of missing data is so small, any bias introduced by missing data may be assumed to be negligible. Full information maximum likelihood estimation was used to account for missing data. This method allowed analysis of the full sample of children for whom we had outcome data ($n = 4529$), even though, as illustrated in Table 2, some students were missing data on subscales and covariates.

First, a confirmatory factor analysis was performed to define the three latent variables: intrinsic motivation, extrinsic motivation and reading amount. Next, a structural equation model was specified that incorporated the simultaneous effects of intrinsic and extrinsic reading motivation on reading amount and comprehension, controlling for prior reading achievement, race, gender, grade (i.e., rising fourth vs. rising fifth) as a proxy for students’ age, and SES as measured by students’ free lunch status. Furthermore, the three exogenous variables (prior reading achievement, intrinsic and extrinsic motivation) were allowed to freely covary. Satisfactory

Table 2 Descriptive statistics and bivariate correlations

	N	M	SD	1	2	3	4	5	6	7	8	9
1	4449	2.96	0.70									
2	4432	2.98	0.73	0.60***								
3	4434	2.84	0.87	0.61***	0.61***							
4	4452	3.08	0.74	0.50***	0.49***	0.51***						
5	4456	2.89	0.78	0.52***	0.56***	0.52***	0.57***					
6	4454	3.25	0.72	0.49***	0.57***	0.48***	0.58***	0.62***				
7	4453	2.82	0.72	0.46***	0.47***	0.40***	0.57***	0.60***	0.54***			
8	4473	2.81	1.03	0.34***	0.30***	0.43***	0.29***	0.29***	0.24***	0.19***		
9	4529	193.65	29.63	0.17***	0.06***	0.14***	0.27***	0.06***	0.20***	0.07***	0.10***	
10	4390	439.56	10.70	0.13***	0.03~	0.09***	0.24***	0.04**	0.19***	0.05**	0.04**	0.80***

Note: ~ $p < .10$, ** $p < .01$, *** $p < .001$

model fit was assessed using the following criteria: a non-significant Chi squared test, a root mean squared error of approximation (RMSEA) ≤ 0.08 , a Comparative Fit Index (CFI) ≥ 0.90 and a standardized root mean squared residual (SRMR) ≤ 0.08 (Hu & Bentler, 1999). For these analyses, the fit criterion of a non-significant Chi square test was relaxed because the Chi square value is influenced by large sample sizes (Cheung & Rensvold, 2002).

Results

Means and standard deviations of all variables, along with bivariate correlations among variables, are reported in Table 2.

Replicating a model of relationships among children’s reading motivation, amount, and reading comprehension

With the goal of replicating a model exploring relations among children’s intrinsic and extrinsic reading motivation, reading amount, and reading comprehension (Schaffner et al., 2013, p. 379), structural equation modeling was conducted using Mplus. First, the three latent variables (intrinsic motivation, extrinsic motivation, and reading amount) were defined. The measurement model showed a close fit with the data, $\chi^2(32) = 961.91, p < .001, RMSEA = 0.08, CFI = 0.95, SRMR = 0.04$. Therefore, a model was specified (pictured in Fig. 1) that incorporated the simultaneous effects of intrinsic and extrinsic reading motivation on reading amount and comprehension, controlling for prior reading achievement, race, gender, grade and SES.

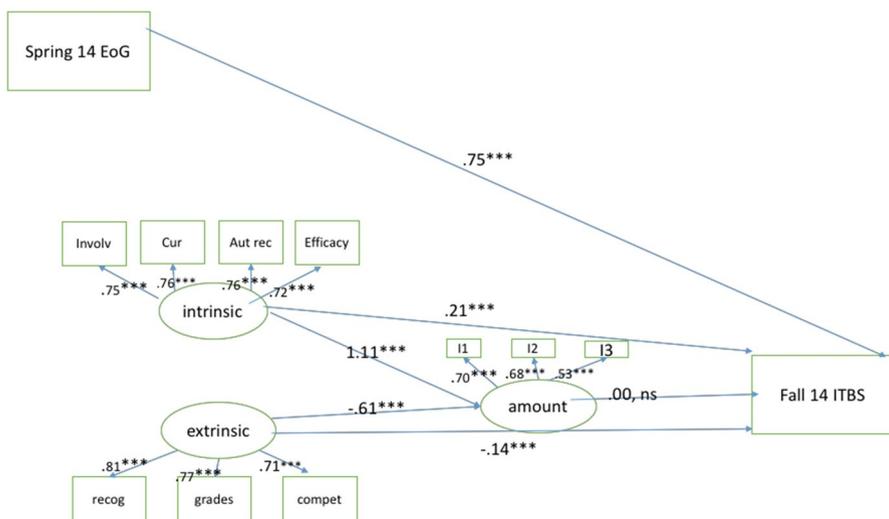


Fig. 1 Model of relations among reading motivation, amount and comprehension. Model is a conceptual replication of Schaffner, Schiefele and Ulferts (2013). Note: *** $p < .001$

Satisfactory fit values were obtained, $\chi^2(109)=2190.49, p < .001, RMSEA=0.07, CFI=0.91, SRMR=0.07.$

All demographic control variables demonstrated statistically significant relationships with the outcome, reading comprehension, in the expected directions based on previous research. Specifically, reading comprehension scores were slightly higher, on average, for girls than for boys ($\beta = 0.04, p < .001$) and for fourth-graders as compared to fifth-graders ($\beta = 0.05, p < .001$). Caucasian students scored, on average, 0.08 standard deviations higher than African-American students and 0.05 standard deviations higher than Latino/a students ($p < .001$ for both). Finally, there was a small, statistically significant, negative association between reading comprehension and receiving free lunch, a proxy for low-SES status ($\beta = -0.03, p < .001$). While the sheer size of our dataset may influence the statistical significance of these small associations, these findings replicate relationships observed in prior research, and nonetheless serve as important controls in our model. For simplicity, these paths are not presented in Figs. 1, 2 and 3, but these covariates are included in all models.

Furthermore, as expected, prior reading achievement was a strong predictor of students' fall reading comprehension (ITBS outcomes) ($\beta = 0.75, p < .001$). Intrinsic motivation had a statistically significant, positive relationship with both reading amount ($\beta = 1.11, p < .001$) and reading comprehension ($\beta = 0.21, p < .001$), while extrinsic motivation had a statistically significant negative association with both reading amount ($\beta = -0.61, p < .001$) and comprehension ($\beta = -0.14, p < .001$). In other words, a difference of one standard deviation in intrinsic reading motivation was associated with a difference of just over one standard deviation in reading amount, and a 0.21 standard deviation difference in reading comprehension, controlling for all other variables in the model. In contrast, a difference of one standard

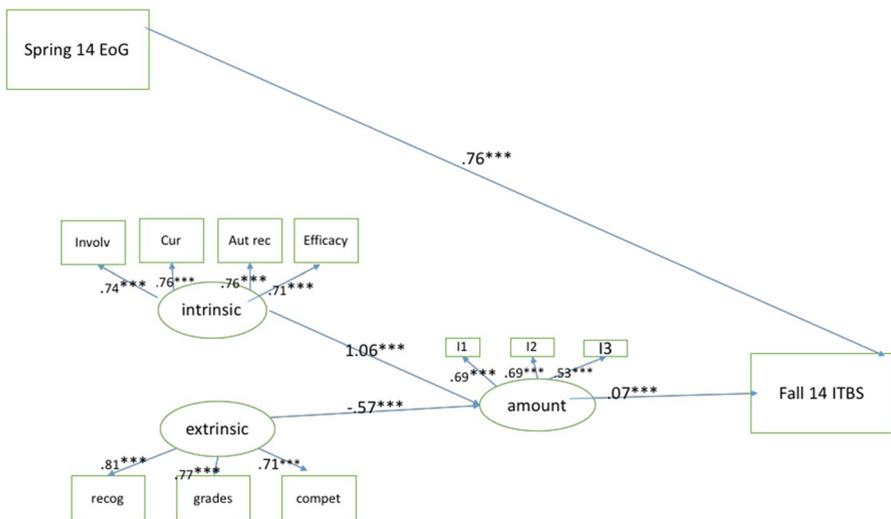


Fig. 2 Model 2: alternative model of relations among reading motivation, amount and comprehension. Model is a conceptual replication of Schaffner and Schiefele (2016). Note: *** $p < .001$

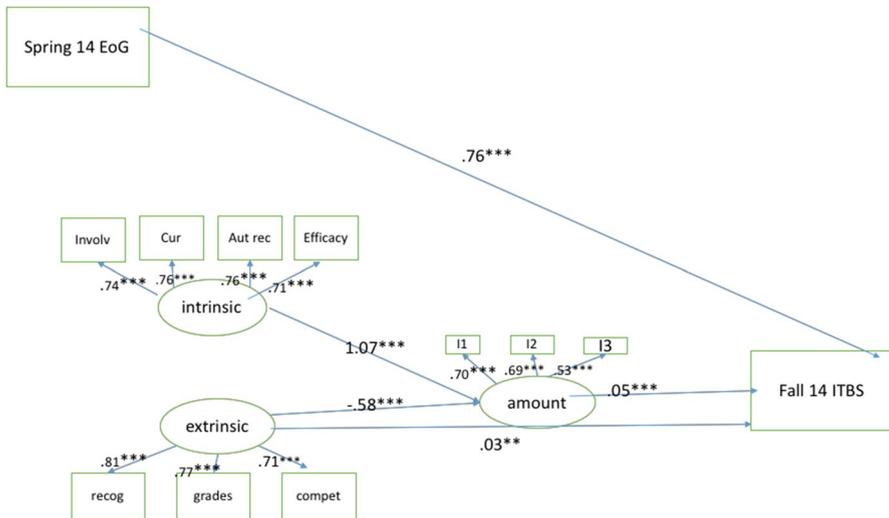


Fig. 3 Model 3: alternative model of relations among reading motivation, amount and comprehension. Model is a conceptual replication of Schaffner, Schiefele and Ulferts (2013) and Stutz, Schaffner and Schiefele (2016). Note: $**p < .01$, $***p < .001$

deviation in extrinsic motivation was associated with a 0.61 standard deviation decrement in reading amount and a 0.14 standard deviation decrement in reading achievement, controlling for all other variables in the model. However, in this model, no significant direct effect of reading amount on reading comprehension was found ($\beta = 0.00, p = .93$); therefore, no indirect effect of intrinsic or extrinsic motivation, mediated through amount, could be estimated.

Finally, intrinsic and extrinsic motivation were also strongly related ($r = 0.90, p < .001$), and spring 2014 (pretest) reading comprehension was associated with both intrinsic ($r = 0.16, p < .001$) and extrinsic ($r = 0.13, p < .001$) motivation.

Test of alternative structural models

Two additional structural models were tested. The first of these (M2), based on Schaffner and Schiefele (2016), hypothesized that the effect of intrinsic and extrinsic motivation on reading motivation was fully mediated through reading amount. The fit of this model was satisfactory, though not superior to our proposed model: $\chi^2(111) = 2218.47, p < .001, RMSEA = 0.07, CFI = 0.91, SRMR = 0.07$. This model found an effect of amount on reading comprehension ($\beta = 0.07, p < .001$) (see Fig. 2). However, we argue that this model forces variation through indirect paths that is better explained by the direct paths present in our original model, and thus the original model provides a theoretically superior explanation for observed data.

The second alternative model (M3), drawing on Schaffner et al. (2013) and Stutz et al. (2016), hypothesized that while the effect of intrinsic motivation on reading comprehension was fully mediated by amount, extrinsic motivation had both direct and indirect effects on comprehension. This model also demonstrates

adequate fit with the data, $\chi^2(110)=2210.344$, $p < .001$, RMSEA = 0.07, CFI = 0.91, SRMR = 0.07, and also found an effect of reading amount on comprehension ($\beta = 0.05$, $p < .001$) (see Fig. 3). However, in addition to the theoretical argument that this model forces variation through an indirect path that is better explained with a direct path, the direct path from extrinsic motivation to reading comprehension in M3 shows a positive effect of extrinsic motivation, contradicting the findings of previous research in this area. This provides further evidence that a model without a direct path from intrinsic motivation to comprehension offers a theoretically invalid explanation of relationships among these variables.

Supplemental analysis of quality of reading amount measure

One limitation cited by Schaffner et al. (2013), Stutz et al. (2016) and Miyamoto et al. (2018) was that students' self-report of the amount of reading in which they engaged might not be very accurate, and/or might not take into account quality of reading material, which has been shown to influence the relationship between amount of reading and reading comprehension scores. In the present study, a subset of 83 students from 11 schools were interviewed about whether or not they had read specific texts during the summer (the same time period as the survey-reported reading amount measure included in the structural equation models). These interviews present a more fine-grained and presumably more accurate picture of reading amount than students' responses to survey questions. This subsample was demographically representative of the full sample, although Caucasian students were somewhat underrepresented in the interviewed subsample, with African-American and Latino/a students somewhat overrepresented as a result. Interviewed students did not differ significantly from the full sample on any measure of reading motivation, amount or comprehension.

Of the eight books they were supposed to receive over the summer, on average interviewed students reported reading at least some of 6.10 books. (On average, they reported reading all of 3.21 books, some of 3.05 books, and none of 1.74 books.) The average amount of assigned books that interviewed students reported reading was positively correlated with these students' reported reading amount on the student survey ($r=0.51$, $p < .001$).

In addition, a median split was created based on survey-reported amount of overall reading. Students in the high-amount group reported on the survey that they read, on average, 14-15 books over the summer. Students in the low-amount group reported reading, on average, 5-6 books over the summer. Consistent with the SEM findings reported above, and with the literature on reading motivation in general (e.g., Gottfried et al., 2001; McGeown, Duncan, Griffiths, & Stothard, 2015; Miyamoto et al., 2018), girls were more likely than boys, and rising fourth-graders were more likely than rising fifth-graders, to fall into the high-amount group. While there were no statistically significant differences between Caucasian and African-American students, or between high- and low-SES students, Latino/a students and students with limited English proficiency were more likely to be in the low-amount group (see Table 3 for complete descriptive statistics).

Table 3 Demographic characteristics of high amount versus low amount groups

	Low amount		High amount		t	p
	Students	Percent	Students	Percent		
Total N	2134	47.1	2395	52.9		
Male	1106	51.8	1061	44.3	-5.07	<.001
Female	1028	48.2	1334	55.7		
Caucasian	499	20.3	534	22.4	0.92	0.36
African-American	795	37.6	854	35.9	1.19	0.24
Latino/a	429	20.3	616	25.9	-4.47	<.001
Other race	392	18.5	377	15.8	2.39	0.02
Grade 4 (fall 2014)	1028	48.3	1379	57.7	6.37	<.001
Grade 5 (fall 2014)	1101	51.7	1010	42.3		
Low income	1630	77.2	1816	76.4	0.67	0.50
Non low-income	481	22.8	562	23.6		
Limited English proficient	319	15.1	490	20.6	-4.83	<.001
Non-limited English proficient	1796	84.9	1891	79.4		

However, for the 83-student subsample, those in the high amount group reported reading, on average, 6.38 of the 8 assigned READS books over the summer ($SD=2.96$), while students in the low amount group reported reading, on average, 5.69 assigned READS books ($SD=3.03$). There was no statistically significant difference between the number of READS books read by students in the high versus low group over the summer [$t(93)=-1.14, p=.26$]. Thus, it appears that for students in the low amount group, assigned READS books may have composed a much greater proportion of their summer reading material than they did for students in the high amount group.

Discussion

The alarming decline in children's reading motivation during the elementary and middle school grades has been well documented in numerous national and international surveys (e.g., Gottfried et al., 2001; McKenna et al., 1995; Wigfield et al., 2006). Educators and policymakers have been rightfully concerned that this decrease in children's intrinsic reading motivation is likely to contribute to a decline in leisure reading and reading comprehension growth (e.g., Lindsay, 2010; Mol & Bus, 2011). Although the association between reading motivation and reading comprehension has been well established, recent research has suggested that this relationship may in fact be mediated through reading amount. In other words, rather than contributing to reading achievement directly, motivation may simply cause students to read more, and it may be this amount of reading that improves reading skills. Thus, the amount that students read outside of school might be a better target for intervention

than attempts to increase students' motivation to read. However, empirical analyses of this relationship have thus far been inconclusive.

Summary and interpretation of findings

To address these concerns and to extend prior research, we sought to replicate methods used in prior research to explore whether and to what extent amount of reading outside school mediates the relationship between intrinsic and extrinsic motivation and later reading comprehension in a sample of over 4000 students in U.S. elementary schools. The present study offers a number of advantages as compared to existing research on this topic, including replication of theoretically valid motivation measures used in prior research, administration of measures to a large sample suitable for SEM analysis, a control for prior reading comprehension, and supplementary descriptive analysis of the quality of student reading materials.

In line with previous research, our findings suggest that above and beyond the effects of prior reading achievement, race, gender, age and SES, intrinsic reading motivation positively predicts both reading amount and reading achievement, and extrinsic reading motivation negatively predicts both amount and achievement (Becker et al., 2010; Miyamoto et al., 2018; Schaffner et al., 2013; Wang & Guthrie, 2004). Furthermore, the relationships demonstrated in the present study are similar in magnitude to those of the research we attempted to replicate: Schaffner and colleagues (2013) found that intrinsic motivation had an association with reading amount of 0.93 standard deviations, and with comprehension of 0.27 standard deviations; the present study found associations of 1.11 and 0.21, respectively. Likewise, Schaffner et al. (2013) found relationships between extrinsic motivation and reading amount of -0.33 standard deviations, and between extrinsic motivation and comprehension of -0.16 ; associations found in the present study were -0.61 and -0.14 , respectively. The magnitude of the associations in the present study, and their close alignment with the findings of prior research, suggest that intrinsic and extrinsic motivation make a substantively meaningful contribution to reading amount and comprehension, controlling for all other variables in the model.

However, findings of the present study suggest that reading amount does not predict achievement above and beyond the effects of intrinsic and extrinsic motivation. These findings stand in contrast to Schaffner, Schiefele and colleagues' work (Schaffner & Schiefele, 2016; Schaffner et al., 2013; Stutz et al., 2016), which found that the effects of motivation on comprehension were mediated through amount. The failure to replicate these findings raises a number of important questions.

Implications and directions for future research

One possible explanation for the contrast between the findings of the present study and those of existing research may be a simple measurement issue. Several of the prior studies of relationships among reading motivation, amount and comprehension did not simultaneously include both intrinsic and extrinsic motivation as both direct and indirect predictors of reading comprehension (De Naeghel et al., 2012;

Miyamoto et al., 2018; Schaffner & Schiefele, 2016). We argue that leaving out one or more of these paths (as well as, in some cases, critical covariates including prior reading achievement) may inappropriately force too much variance through the indirect path, potentially creating a spurious relationship.

Secondly, the contrast in findings between the present study and much previous research raises the question: for whom—for which students—have relationships among reading motivation, amount and comprehension been demonstrated in previous research? Existing research on this topic has taken place primarily in Europe, specifically Germany, rather than in low-income U.S. schools. Although all of the existing research, including the present study, focuses on upper-elementary grade students, background characteristics of participating students are quite different across studies. Some recent research has suggested that the proposed relationships among motivation, amount and comprehension exist only for students in academic track schools, and/or only for native German students, rather than immigrants (Miyamoto et al., 2018; Schaffner, Philipp, & Schiefele, 2016). Specifically, Miyamoto and colleagues (2018) found that for immigrant students, while reading competence in fifth grade predicted intrinsic reading motivation in seventh grade, the reverse was not true: motivation did not predict comprehension for immigrant students as it did for native Germans. Furthermore, in nonacademic track schools, sixth-grade reading amount did not predict seventh-grade reading competence for immigrant students as it did for natives. Miyamoto and colleagues chose to focus on group-level differences between immigrant and native students because of immigrant students' lower average levels of reading competence, presumably due to their lower socioeconomic status. The implication of their findings is that intrinsic motivation is not sufficient to outweigh the socioeconomic disadvantages associated with coming from an immigrant background in Germany.

A majority of the students in the present study come from a low-income background. Thus, for this group of low-SES U.S. fourth-graders, like the immigrant students in nonacademic tracks in Germany, reading motivation and reading amount may be less salient predictors of reading comprehension than they are for students of higher SES, with higher levels of reading achievement. This may be one explanation for the contrast between the findings of previous research (e.g., Schaffner & Schiefele, 2016; Schaffner et al., 2013; Stutz et al., 2016) and those of the present study. This carries important implications: given the strong correlations in the U.S. between socioeconomic status and educational outcomes, particularly in reading comprehension (Reardon et al., 2012), research and practice are most likely to focus on developing and implementing interventions to improve the literacy skills of low-SES students. Therefore, it is critically important to understand the relationships among reading motivation, amount and comprehension for low-SES American students before investing effort and funding into targeting one or more of these areas for intervention.

Another possible explanation for the contrast between our findings and those of previous research may be the quality of reading materials with which students in the present study engaged during the summer. Several existing studies suggest the importance of quality over quantity of leisure-time reading in improving students' reading comprehension (Miyamoto et al., 2018; Schaffner et al., 2013; Stutz et al., 2016). Defining

quality texts as texts that are well-matched to the reader's interests and skill level, the eight study-provided texts ("READS books") that each student in this sample received were all of high quality. The supplemental interview data in the present study demonstrates no statistically significant difference in the number of READS books read by students in the high-amount group and students in the low-amount group during the summer. Thus, for students in the low-amount group, almost all of their summer reading may have been composed of high-quality study-provided texts, while for students in high-amount group, quality cannot be assessed for more than half of their summer reading materials. If in fact, as a result of the eight READS books that every child in our sample received, all students in our sample read relatively equal amounts of high-quality text over the summer regardless of overall volume of reading, and if, as previous work has suggested, quality of reading materials is a more important predictor of comprehension gains than quantity, this may explain why overall amount of reading was not a significant predictor of reading comprehension in the present study. Future research into relationships among reading motivation, amount and comprehension should more explicitly measure quality of all texts students engage with during leisure-time reading.

In addition to quality of texts, the ways in which students engage with texts may play a role in the relationship between reading amount and reading comprehension. The present study's student survey included several questions about students' interaction with family members around text. While analysis of this construct is beyond the scope of the present conceptual replication, exploratory analyses did suggest a relationship between this type of social engagement with text and our variables of interest; for example, students' response to the question *During summer vacation, how often did you talk about books with someone in your family?* was correlated 0.42 with their reading amount ($p < .001$), and there was a statistically significant difference on this survey item between the low amount and high amount groups (low amount: $M = 1.98$, $SD = 1.06$; high amount: $M = 2.72$, $SD = 1.12$, $t(4398) = -22.26$, $p < .001$). This suggests that future investigations into relationships among reading motivation, amount and comprehension should take into account the ways in which students engage with text.

Another promising direction for future research may be to take a more person-centered approach to understanding the relationships among reading motivation, comprehension and amount. Given the possible undermining effects of extrinsic motivation on intrinsic motivation (Becker et al., 2010; Schiefele & Löweke, 2017), it may be helpful to consider relative levels of intrinsic and extrinsic motivation at an individual level as a predictor of reading amount and comprehension. For example, Schiefele and Löweke (2017)'s recent work using latent profile analysis might be incorporated into an investigation of the mediating effect of reading amount on the relationship between motivation and comprehension.

Limitations and conclusion

Although the present study presents a number of advantages as compared with most existing research in this area, several limitations are to be acknowledged. First, we acknowledge the limitation of collecting motivation, amount and achievement data

at a single time point, which allows us only to observe correlations among variables. One promising direction for future research is to collect longitudinal data on the relationship between reading motivation, amount and achievement in order to better understand predictive relationships. For example, in earlier work (Kim et al., 2016), we found that the quality of reading—as measured by the number of well-matched books children read—mediated the effects of a treatment designed to promote reading engagement at home. These findings are also broadly consistent with meta-analytic work by Mol and Bus (2011) suggesting that the quality of the reader-text match matters for younger children and less-skilled readers who are developing reading proficiency.

Secondly, like other existing research, the present study relies on children's self-report to measure reading motivation and amount of reading. Surveys about reading amount and motivation rely on levels of recall and abstract thinking that may present serious challenges for elementary school children. Furthermore, surveys presume that motivation is a stable construct, despite evidence that children's motivational profiles may vary over time and across contexts (Neugebauer, 2014; Schiefele & Löweke, 2017). While the present study's supplemental interviews offer evidence that students' self-report of reading amount was fairly accurate, future research might benefit from conducting surveys about reading motivation and amount at multiple time points, adding observational measures of these variables, or triangulating children's self-report with teacher report.

Third, although our large dataset creates an advantage in our analyses, it does increase the likelihood of finding statistically significant relationships among variables in cases where the magnitude of correlations is too small to be meaningful.

Finally, although our data on quality of students' reading material is superior to much of the literature in this area, it is still limited and preliminary. Thus, findings about quality of reading material must be considered merely suggestive of directions for future, more rigorous research. Future research would benefit from collecting data about all of the specific texts students read during their leisure time, as well as data about the activities they engaged with around those texts, i.e., talking about these texts with friends or family members.

In conclusion, our findings suggest that, at least among low-income U.S. students, simply increasing the amount that students read is unlikely to increase their comprehension. Instead, attention must be paid both to the quality of materials that students read, and to increasing students' intrinsic motivation to read by building their self-efficacy, curiosity and involvement with texts.

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