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# The mediating effect of metacognitive strategies on the relationship between reading motivation and reading achievement in multilingual and english-dominant students

**Eunjee Jang**[1] · **Young S. Seo**[2] · **Janina Brutt-Griffler**[3]

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## Abstract

Reading engagement is a strong predictor of students' reading outcomes, but its consistent positive effects across diverse student groups remain unclear. Research on the reading engagement of multilingual adolescents is notably limited. We investigated the interactions of affective and cognitive dimensions of reading engagement in relation to reading achievement among multilingual and English-dominant students. Specifically, we explored how reading motivation is related to reading achievement through metacognitive strategies. For a nuanced understanding of reading engagement, we further examined whether these relationships are distinct for students with different language backgrounds. We conducted multi-group structural equation modeling using data from the U.S. Programme for International Student Assessment 2018. Our analyses included 2,928 students: 2,407 English-dominant, 359 Spanish-speaking, and 162 other-language-speaking multilingual students. We found differential relationships between reading engagement and reading achievement across language groups. For English-dominant and Spanish-speaking students, reading motivation had both a direct and indirect effect on reading achievement through metacognitive strategies. In contrast, for other-language-speaking students, motivation was only linked to achievement through metacognitive strategies, with no direct contribution from motivation. Our results suggest that metacognitive reading strategies were a critical explanatory mechanism for translating reading motivation into reading achievement. For effective reading instruction, integrated instructional practices that support both metacognitive strategies and motivation are necessary, with a tailored approach that adapts responsibly to linguistic differences among students.

**Keywords** Reading engagement · Reading motivation · Metacognitive strategies · Metacognitive knowledge · Multilingual students · Reading achievement

Extended author information available on the last page of the article

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## Introduction

Reading engagement is a strong predictor of students' reading outcomes (Guthrie et al., 2012; Ng & Graham, 2018; OECD, 2021). Engaged readers are generally viewed as proficient and high-achieving as well as academically resilient (cf. Jang et al., 2023). That said, it is not clear whether reading engagement has consistent positive effects across diverse groups of students. There is a lack of nuance in our understanding of how reading engagement affects different types of students (Guthrie & Klauda, 2015; Wantchekon & Kim, 2019). It is not sufficient to discover what works in a general sense; it is equally important to figure out for whom it works (Bowers et al., 2010). The for whom questions have not been fully addressed within the realm of reading engagement. Despite the potential role of reading engagement in reversing underachievement among students from disadvantaged backgrounds (Cummins, 2021; Ng & Graham, 2018), research on the reading engagement of academically or socioculturally disadvantaged students remains notably scarce.

Considerable research on reading engagement has been devoted to English-dominant elementary school students in the US, leaving much to be learned about multilingual adolescents[1] (Cummins, 2021; Lee et al., 2021; Schiefele et al., 2012). It is imperative to attend to multilingual adolescents for several reasons. Multilingual adolescent students are not only particularly prone to experiencing a decline in reading engagement (cf. Rogiers et al., 2020) but also face challenges in meeting national reading benchmarks. They are falling significantly behind in reading, failing to reach the basic competency level on the National Assessment of Educational Progress. In 2019, 72% and 79% of 8th and 12th graders, respectively, read at below-basic literacy levels, compared to 24% and 28% of English-dominant students (National Center for Education Statistics, 2023). In addition, cultural and linguistic differences may require them to repair more gaps in their comprehension and strategies while reading in English (McKeown & Gentilucci, 2007). As a result, assumptions may not be readily made that reading engagement work equally well for multilingual students as it does for English-dominant students. The need for a more nuanced and comparative understanding of this issue is therefore critical for designing and implementing effective reading instruction that is tailored to the unique needs of these students from various cultural and linguistic backgrounds. Given the increasing diversity within K-12 school populations globally, it is increasingly important to gain a deeper understanding of different perspectives and approaches to reading engagement (Ng & Graham, 2018).

Reading engagement is multidimensional and operationalized in multiple ways. Our conceptualization of reading engagement focuses on motivational (intrinsic motivation to read) and cognitive (metacognitive knowledge of reading strategies) dimensions. Evidence abounds supporting the positive effects of intrinsic motivation on students' reading achievement (cf. Toste et al., 2020). Yet

[1] Multilingual students will be used throughout to refer to those who speak one or more languages in addition to English and primarily or exclusively use heritage language(s) at home, while English-dominant students refer to the counterparts of multilingual students.

little is known about how motivation benefits students' reading, which mechanisms convert motivation into positive reading outcomes, and whether these mechanisms are universal and hold true for all students. To address this gap, we link student reading motivation to metacognitive strategies. It has been pointed out that motivational and cognitive factors work in tandem to build strong readers (Guthrie & Wigfield, 2000; Wantchekon & Kim, 2019). Nevertheless, there has been relatively little attention paid to how metacognitive strategies mediate the relationship between motivation and reading achievement (Jang et al., 2023; Ng et al., 2013; Schiefele et al., 2012), especially when it comes to multilingual students.

The current study explores the relation between students' motivational and cognitive reading engagement and reading achievement, making use of nationally representative samples of US adolescents participating in the OECD Program for International Student Assessment (PISA) 2018. It is one of the very few studies that have examined the integrated model of reading engagement and its heterogeneity effect on students with different language backgrounds. Specifically, we explore how intrinsic reading motivation is related to reading achievement, whether it is directly related, indirectly related through metacognitive knowledge of reading strategies (full mediation), or both (partial mediation). Furthermore, we examine whether these relationships vary among multilingual (Spanish- and other-language-speaking) and English-dominant students. To this aim, we conducted multi-group structural equation modeling (SEM).

## Reading engagement

Reading engagement refers to the quality of students' involvement or participation in reading practices. It is a potent predictor of reading achievement and a protective factor that helps vulnerable students become academically resilient (cf. Jang et al., 2023). Engagement is a meta-construct that can manifest behaviorally, cognitively, affectively, or socially. In this study, we explore affective and cognitive involvement in reading. Affective engagement covers emotional perceptions related to reading. Intrinsic motivation—inherent enjoyment and interest in reading—is an integral part of it. Cognitive engagement refers to mental effort and includes students' use of metacognition and strategies to guide their cognitive efforts (Guthrie et al., 2012; Unrau & Quirk, 2014). Of particular interest is understanding of metacognitive knowledge concerning reading strategies. Metacognitive knowledge refers to "awareness and ability to use a variety of appropriate strategies when processing texts in a goal-oriented manner" (OECD, 2019a, p. 72). Readers' metacognitive knowledge encompasses both a conscious awareness of reading strategies and the purposeful application of these strategies (Grabe & Stoller, 2020; Sheorey & Mokhtari, 2001). We view reading engagement as an interaction between motivational processes and metacognitive knowledge of reading strategies; engaged readers enjoy reading for pleasure and are aware of the strategies they employ when reading.

Intrinsic motivation is multifaceted, encompassing three broad constructs: goal orientation (e.g., performance and mastery goals), beliefs (e.g., self-efficacy, self-

concept, agency), and disposition (e.g., attitudes, interest) (see Toste et al., 2020 for a review). This study specifically examines reading enjoyment—a component of disposition characterized by positive feelings towards or orientations about reading (p. 423)—which has seldom been explored in the context of multilingual students (Barber et al., 2020; Proctor et al., 2014). While it has been repeatedly proven that reading motivation is a crucial determinant of reading achievement, the mechanisms by which reading motivation predicts student reading outcomes are unclear (Miyamoto et al., 2019). A high level of motivation does not necessarily translate into positive learning outcomes (Miyamoto et al., 2018), so it is critical to identify potential mediators that can help explain this relationship. We hypothesize that one of such mediators could be metacognitive knowledge of reading strategies.

Strong readers are often characterized by a deep understanding of metacognitive strategies for reading and achieve higher levels of reading proficiency (Ardasheva et al., 2019; Froiland & Oros, 2014). In essence, individuals who are cognizant of their learning processes and adept at employing reading strategies tend to demonstrate greater efficiency and effectiveness in reading. Baker and Beall (2009) emphasize the inseparable links between metacognition and motivational factors. Motivation is found to activate metacognitive knowledge (Kolić-Vehovec et al., 2014). Furthermore, Jang et al. (2023) indicate that sufficiently high motivation is essential for realizing the potential benefits of metacognitive knowledge in enhancing reading achievement. Readers with high motivation engage more thoroughly with texts, enabling them to comprehend and apply complex strategies effectively, thereby enhancing their reading performance (Miyamoto et al., 2019; Pintrich & De Groot, 1990). Competent readers not only acquire an appropriate set of reading strategies but also effectively deploy those strategies, knowing when, how, and why to use them and recognizing the appropriate contexts for their application (Grabe & Yamashita, 2022). They need to have not only a repertoire of strategies but also a metacognitive awareness of strategy use.

Knowledge to select the most appropriate strategies for a given situation from a range of options, namely conditional and relational strategy knowledge, is especially important (Artelt & Schneider, 2015; Hartman, 2001). Prior studies have focused predominantly on metacognitive strategy use; research has shown that metacognitive knowledge of strategy use is more predictive of reading outcomes than student self-reported strategy use (Artelt & Schneider, 2015). A meta-analytic review also emphasized the importance of metacognitive knowledge, stating that "deciding when to use different cognitive strategies may be more important than how frequently students enact them" (Dent & Koenka, 2016, p. 459). In other words, readers who are aware of their own reading process and have knowledge of metacognitive strategies may be more effective and efficient readers. Nevertheless, there have been a limited number of studies (e.g., Jang et al., 2023; Miyamoto et al., 2019; Van Kraayenoord & Schneider, 1999) that have explored the mediating role of metacognitive knowledge of reading strategy in relation to intrinsic motivation and reading comprehension. Furthermore, none of them examined multilingual students in the US.

### Reading engagement and multilingual students

There is limited knowledge about the reading engagement of multilingual students and whether the potential positive effects of reading engagement also apply to them (Cummins, 2021). Understanding how multilingual students engage in reading and how it relates to their reading achievement is important to provide them with the appropriate reading support. Despite the multifaceted nature of reading engagement, there has been very little exploration of its integrated functioning and even less focus on the interplay between motivational and cognitive engagement (Ng et al., 2013; Schiefele et al., 2012; Wantchekon & Kim, 2019). Regarding multilingual students, there is a paucity of studies examining reading motivation and/or metacognitive strategies. To our knowledge, no studies have simultaneously examined the affective and cognitive dimensions of reading engagement among multilingual students. However, there have been a few studies that examined these dimensions individually.

As to intrinsic reading motivation, two notable studies compared multilingual students with English-dominant students in the US context. Proctor et al. (2014) found that motivation (measured as self-efficacy) positively predicted reading comprehension in US middle school students with disabilities (grades 6–8, 59% of whom were Latinx students), regardless of their language status. Barber et al. (2020) also found that reading motivation (measured as curiosity, involvement, and self-efficacy) was related to both current reading and reading growth in English-dominant and multilingual students (95.1% Hispanic) in grades 4 and 5, with no significant differences between the two groups. Both revealed that motivation is positively associated with reading comprehension, and the relationship was identical for multilingual and English-dominant students. However, neither study looked at how motivation was linked to reading achievement. More research is needed with diverse age and cultural groups of students to better understand reading motivation among multilingual students (Griffin et al., 2022; Miyamoto et al., 2019).

Metacognitive knowledge is considered one of the key components contributing to multilingual students' reading (Ardasheva & Tretter, 2013). The study of Van Gelderen et al. (2004) indicated that metacognitive reading knowledge was significantly more relevant to L2 (English) reading comprehension than language-specific vocabulary knowledge among Dutch secondary school students. Barber et al. (2020) also investigated the effects of cognitive strategy use and behavioral engagement (e.g., independent reading) with 4th and 5th graders. Especially notable was the finding that cognitive strategies did not predict concurrent comprehension but did predict growth, suggesting that the effects of strategy might not be immediately manifest but could possibly emerge over time. Considering that adolescents already possess metacognitive knowledge and skill, unlike early elementary school students who participated in their study, research with higher-grade students might produce different results.

This study explores the relationship between reading motivation, metacognitive knowledge of reading strategies, and reading achievement among US adolescents. We aim to understand how reading motivation relates to reading achievement, and

whether this effect is direct, indirect (through the use of metacognitive strategies), or both. Additionally, we examine whether these relationships are distinct for students with different language backgrounds: multilingual students (Spanish- and other-language-speaking) and English-dominant students.

## Methods

### Participants and data source

The U.S. PISA 2018 data were used for analysis. PISA has measured the reading, math, and science performance of 15-year-old students who are approaching the end of compulsory education every three years since 2000. In PISA 2018, 4,838 students from 164 schools participated, and our final structural equation model (SEM) and multi-group SEM analyses included 2,928 students.

### Identifying language groups

Different language groups were identified based on students' immigrant status and home language use. Multilingual students were classified as either first-generation or second-generation immigrants who spoke a heritage language (HL) at home. Those who spoke Spanish were placed into the Spanish-speaking multilingual group ($N=359$), while speakers of other HL were designated as the other-language-speaking multilingual group ($N=162$). English-dominant students ($N=2{,}407$) were identified as those without an immigration background and who spoke English at home. The characteristics of the students are presented in Table 1. Descriptive statistics, correlation analyses, and collinearity diagnostics affirmed the absence of multicollinearity and outliers among the independent variables, mediator, and covariates in this study.

### Measures

#### Reading achievement

The outcome used in this study was reading achievement. In PISA, reading literacy is defined as "students' capacity to understand, use, evaluate, reflect on and engage with texts in order to achieve one's goals, develop one's knowledge and potential, and participate in society" (OECD, 2019b, p. 35). With students nearing the end of compulsory education as the target population for PISA, it assesses the functional knowledge and skills that are required for students to make an effective transition between compulsory education and additional education, training, or employment (OECD, 2019c). Ten plausible values (with a mean of 500 and standard deviation of 100) derived from computing posterior distributions of possible reading achievement scores for each student were used in this study, since they would be considered unbiased estimation of reading achievement (Von Davier et al., 2009).

**Table 1** Participant characteristics

| | English-dominant students ($N$=2,407) | | | | Spanish-speaking multilingual students ($N$=359) | | | | Other-language-speaking multilingual students ($N$=162) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Variables | M/% | SD | Min. | Max. | M/% | SD | Min. | Max. | M/% | SD | Min. | Max. |
| *Gender* | | | | | | | | | | | | |
| Male | 50.4% | - | - | - | 45.6% | - | - | - | 51.3% | - | - | - |
| Female | 49.6% | - | - | - | 54.4% | - | - | - | 48.7% | - | - | - |
| SES | 1.62 | 1.09 | 0 | 3 | 0.53 | 0.87 | 0 | 3 | 1.65 | 1.09 | 0 | 3 |
| *Immigration status* | | | | | | | | | | | | |
| Non-immigrant | 100% | - | - | - | 0% | - | - | - | 0% | - | - | - |
| First-generation | 0% | - | - | - | 24.0% | - | - | - | 46.5% | - | - | - |
| Second-generation | 0% | - | - | - | 76.0% | - | - | - | 53.5% | - | - | - |
| Age of arrival | - | - | - | - | 7.19 | 4.83 | 0 | 16 | 8.87 | 4.54 | 0 | 16 |
| Language use | - | - | - | - | 1.87 | 0.32 | 1 | 2.67 | 1.90 | 0.34 | 1 | 2.67 |
| Reading motivation | -0.00 | 0.79 | -1.42 | 1.58 | 0.01 | 0.67 | -1.42 | 1.58 | 0.09 | 0.72 | -1.42 | 1.58 |
| Metacognitive strategies | -0.01 | 0.86 | -1.62 | 1.49 | -0.03 | 0.85 | -1.62 | 1.49 | 0.15 | 0.89 | -1.62 | 1.49 |
| Reading achievement | 505.34 | 106.54 | 170.45 | 868.87 | 470.65 | 101.69 | 199.32 | 754.24 | 523.51 | 110.53 | 219.54 | 786.58 |

*Note* Language use (=Language spoken at home with mom, dad, siblings, best friends, or schoolmates [with 1 [mostly heritage language use], 2 [About equal use of heritage language or test language], 3 [mostly test language])

### Intrinsic reading motivation

Five items were used to assess reading motivation. The participants were asked how much they agreed or disagreed with the following statements: (1) I read only if I have to; (2) reading is one of my favorite hobbies; (3) I like talking about books with other people; (4) for me reading is a waste of time; and (5) I read only to get information I need. The options for the items were (1) strongly disagree, (2) disagree, (3) agree, and (4) strongly agree. The first, fourth, and fifth items were reverse-coded to correspond to the other two items, with higher values indicating higher reading motivation. Only one factor was identified and Cronbach's alpha was acceptable (alpha = 0.87). The five items were used as manifest variables for the construct of reading motivation.

### Metacognitive knowledge of reading strategies

Two composite PISA indices were utilized to measure metacognitive knowledge of reading strategies– summarizing and understanding/memorizing. PISA assessed students' metacognitive strategy knowledge or students' awareness of the usefulness of strategies to understand, memorize, and summarize a piece of text. Several reading scenarios were given to the students, and they were asked to rate the quality and usefulness of given strategies on a 6-point Likert scale (1 = not useful at all, 6 = very useful). The index of summarizing comprised five items, including "Before writing the summary, I read the text as many times as possible," and "I carefully check whether the most important facts in the text are represented in the summary". Understanding and remembering was measured by six items such as "After reading the text, I discuss its content with other people," "I summarize the text in my own words," and so on. The students' ratings, which provided a ranked order of strategies for each scenario, were then compared to those of reading experts. Higher values on this index indicated greater perception of the usefulness of these strategies. One factor was identified from factor analysis and internal consistency of reliability was acceptable (alpha = 0.75). The two composite items, with higher values indicating higher summarizing and understanding/memorizing, were used as manifest variables to denote metacognitive strategies.

### Covariates

Students' language use, gender (male, female), multilingual status (English dominant, Spanish speaking, and other language speaking), and socioeconomic status (SES) were used as covariates. The language use variable was generated by using five items: language spoken with mom, dad, siblings, best friends, and schoolmates most of the time. The response options were (1) mostly my heritage language, (2) about equally often my heritage language, and (3) mostly test language. For SES, we used the PISA index, a composite indicator encompassing the highest parental occupation, parental education, and the household possession of a number of material wealth or educational resources (OECD, 2020). Multilingual status was used as a grouping variable in multi-group mediational SEM models.

**Table 2** Partition of direct and indirect effects [entire group]

| Effects from MOTIVATION to READING | β | S.E. | β/S.E. |
|---|---|---|---|
| Total effect | 0.27*** | 0.02 | 13.94 |
| Indirect effects | 0.11*** | 0.01 | 8.34 |
| *Motivation* ➔ *Metacognitive* | 0.24*** | 0.03 | 9.18 |
| *Metacognitive* ➔ *Reading* | 0.47*** | 0.02 | 21.89 |
| Direct effects | | | |
| *Motivation* ➔ *Reading* | 0.16*** | 0.02 | 7.97 |

*Note* β (=standardized coefficient); Metacognitive (=metacognitive strategies); Motivation (=reading motivation); Reading (=reading achievement), *** $p<0.001$

**Table 3** Partition of direct and indirect effects [english-dominant, spanish-speaking, and other-language-speaking groups separately]

| | English-dominant group | | | Spanish-speaking group | | | Other-language-speaking group | | |
|---|---|---|---|---|---|---|---|---|---|
| | β | S.E. | β/S.E. | β | S.E. | β/S.E. | β | S.E. | β/S.E. |
| Total effect | 0.26*** | 0.02 | 11.95 | 0.39*** | 0.05 | 7.72 | 0.21** | 0.08 | 2.67 |
| Indirect effects | 0.11*** | 0.02 | 7.02 | 0.11*** | 0.03 | 3.52 | 0.15** | 0.05 | 3.12 |
| *Motivation* ➔ *Metacognitive* | 0.23*** | 0.03 | 7.61 | 0.31*** | 0.07 | 4.72 | 0.32*** | 0.08 | 4.12 |
| *Metacognitive* ➔ *Reading* | 0.48*** | 0.02 | 20.80 | 0.36*** | 0.07 | 5.25 | 0.47*** | 0.09 | 5.40 |
| Direct effects | | | | | | | | | |
| *Motivation* ➔ *Reading* | 0.15*** | 0.02 | 6.76 | 0.28*** | 0.06 | 4.68 | 0.06 | 0.09 | 0.72 |

*Note* β (=standardized coefficient); Metacognitive (=metacognitive strategies); Motivation (=reading motivation); Reading (=reading achievement), ** $p<0.01$, *** $p<0.001$

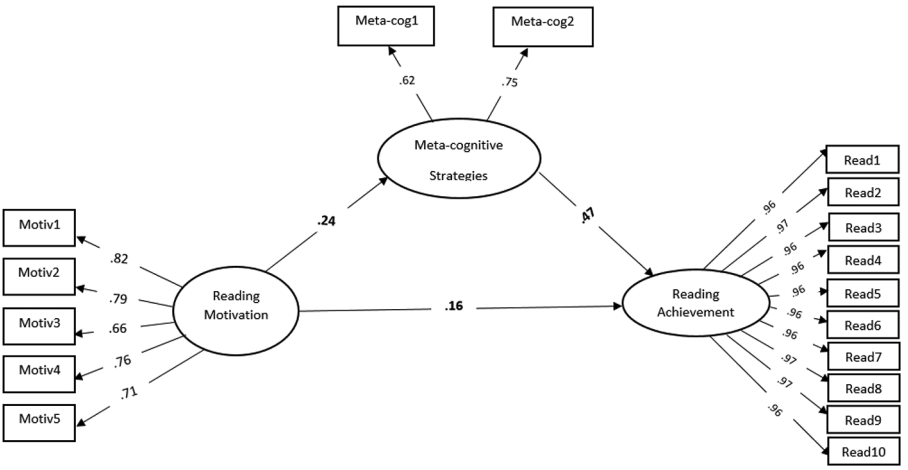


**Fig. 1** SEM Model with metacognitive strategies as a mediator

## Statistical analyses

We conducted confirmatory factor analyses (CFAs) to assess measurement model fit for reading motivation and metacognitive strategies. Then, we performed SEM to explore the relationship between reading motivation and achievement, with metacognitive strategies as a mediator. Lastly, multi-group SEM models were used to

investigate variations across language groups. For preliminary analysis including descriptive statistics and collinearity test, we used Stata (Version 17: StataCorp, 2021). CFAs and SEM models were run in Mplus (Version 7: Muthén & Muthén, 2012). Maximum likelihood estimation (ML) based on multivariate normal data was used for the SEM and multi-group SEMs, while full information maximum likelihood (FIML) was used for missing data treatment. Analyses were weighted for nationally representative estimates. Regarding the model fit indices, we used Hu and Bentler's (1999) cut-off criteria: CFI/TLI > 0.90; RMSEA < 0.08; SRMR < 0.08.

## Results

### Measurement models

We performed CFAs for two latent constructs: reading motivation (with five manifest variables) and metacognitive strategies (with two manifest variables). The results showed good model fits (CFI/TLI = 1.00/0.98, RMSEA = 0.05, SRMR = 0.01 for reading motivation; CFI/TLI = 1.00/1.00, RMSEA = 0.00, SRMR = 0.00 for metacognitive strategies).

### Structural models

Upon confirming overall model fitting in our measurement models of student reading motivation and metacognitive strategies, we evaluated the structural models of the association between reading motivation and reading achievement and whether metacognitive strategies served as a mediator in the association. Model fit indices for the structural models were evaluated (Chi-Square test of model fit = 821.47, df = 191, $p < 0.001$; RMSEA = 0.03, CFI/TLI = 0.99/0.99, SRMR = 0.05) prior to examining the parameter estimates of the full SEM with the mediator. We evaluated the direct effect of reading motivation on reading achievement, followed by the indirect effect through metacognitive strategies, while controlling for the covariates. The model fitting of our final model was good for multi-group SEM: Chi-Square test of model fit = 1316.46, df = 589, $p < 0.001$; RMSEA = 0.04, CFI/TLI = 0.99/0.99, SRMR = 0.06).

### Direct and indirect effects for the entire groups

As shown in Table 2; Fig. 1, a significant direct effect of reading motivation on reading achievement was observed for the entire groups (β = 0.16, SE = 0.02, β/SE = 7.97, $p < 0.001$). The association between reading motivation and reading achievement was mediated through metacognitive strategies (β = 0.11 [= 0.24*0.47], SE = 0.01, β/SE = 8.34, $p < 0.001$). Specifically, reading motivation was positively associated with metacognitive strategies ($\beta_a$ = 0.24, $SE_a$ = 0.03, $\beta_a$/ $SE_a$ = 9.18, $p < 0.001$), which in turn were positively associated with reading achievement ($\beta_b$ = 0.47, $SE_b$ = 0.02, $\beta_b$/ $SE_b$ = 21.89, $p < 0.001$).

### Direct and indirect effects for english-dominant and spanish-speaking students

For English-dominant students, a significant direct effect of reading motivation on reading achievement was found (β = 0.15, SE = 0.02, β/SE = 6.76, $p < 0.001$). Additionally, there was a significant indirect effect of metacognitive strategies in the association between reading motivation and achievement (β = 0.11 [= 0.23*0.48], SE = 0.02, β/SE = 7.02, $p < 0.001$). Students' reading motivation was associated with increased use of metacognitive strategies ($\beta_a = 0.23$, $SE_a = 0.03$, $\beta_a/SE_a = 7.61$, $p < 0.001$), which in turn were positively associated with reading achievement ($\beta_b = 0.48$, $SE_b = 0.02$, $\beta_b/SE_b = 20.80$, $p < 0.001$).

For Spanish-speaking students, there was a significant direct effect of reading motivation on reading achievement (β = 0.28, SE = 0.06, β/SE = 4.68, $p < 0.001$). Metacognitive strategies served as a significant mediator in the association between reading motivation and reading achievement (β = 0.11 [= 0.31*0.36], SE = 0.03, β/SE = 3.52, $p < 0.001$). Specifically, students' reading motivation was associated with increased students' metacognitive strategies ($\beta_a = 0.31$, $SE_a = 0.07$, $\beta_a/SE_a = 4.72$, $p < 0.001$), which in turn were positively associated with reading achievement ($\beta_b = 0.36$, $SE_b = 0.07$, $\beta_b/SE_b = 5.25$, $p < 0.001$). Table 3; Figs. 2 and 3 provide a comprehensive summary of the results.

### Direct and indirect effects for other-language-speaking students

While there was no significant direct effect of reading motivation on reading achievement (β = 0.06, SE = 0.09, β/SE = 0.72, $p > 0.05$), a significant indirect effect of metacognitive strategies in the association between reading motivation and reading achievement was observed (β = 0.15 [= 0.32*0.47], SE = 0.05, β/SE = 3.12, $p < 0.01$, as shown in Table 3; Fig. 4). Students' reading motivation was associated with increased use of metacognitive strategies ($\beta_a = 0.32$, $SE_a = 0.08$, $\beta_a/SE_a = 4.12$, $p < 0.001$),

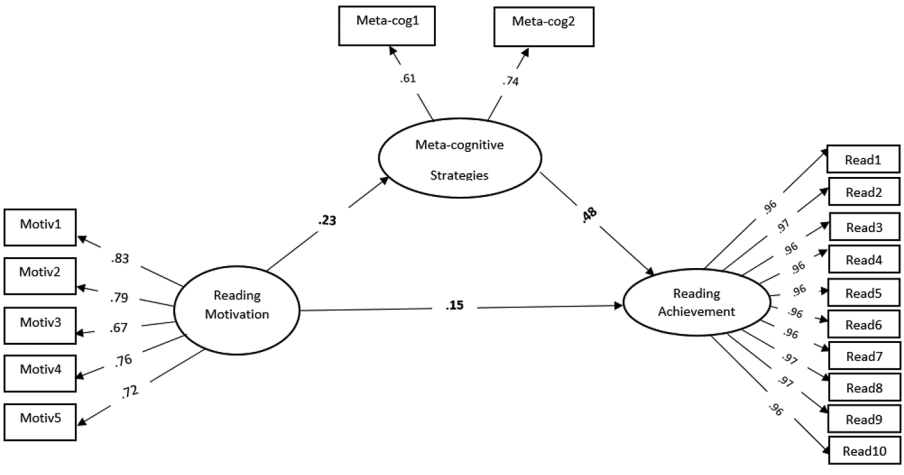


**Fig. 2** Multi-group SEM model (english-dominant group) with metacognitive strategies as a mediator

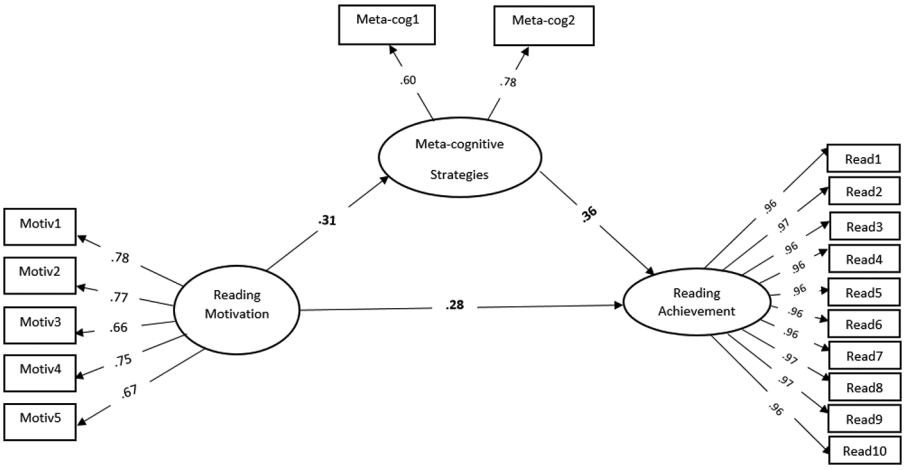


**Fig. 3** Multi-group SEM model (spanish group) with metacognitive strategies as a mediator

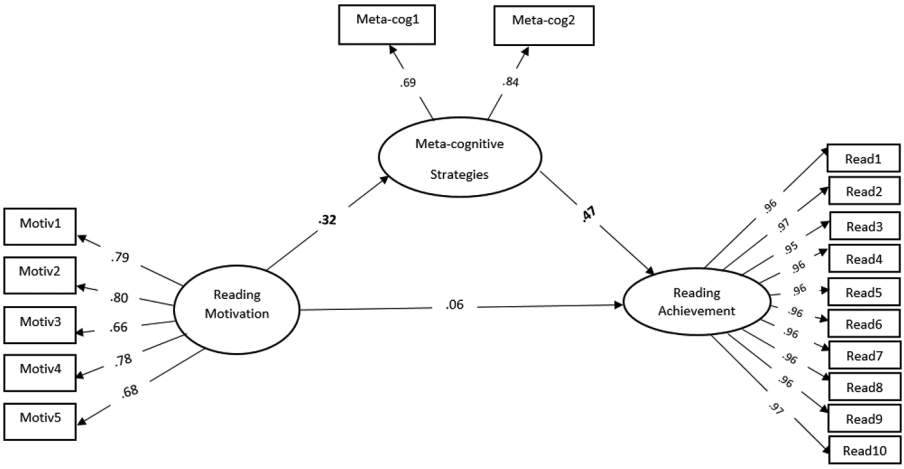


**Fig. 4** Multi-group SEM model (other language group) with meta-cognitive strategies as a mediator

which in turn were positively associated with reading achievement ($\beta_b = 0.47$, $SE_b = 0.09$, $\beta_b/SE_b = 5.40$, $p < 0.001$).

## Discussion

In the present study, we investigated the interactions of affective and cognitive dimensions of reading engagement with reading achievement among multilingual and English-dominant students. Specifically, we examined the mechanism by which reading motivation is related to reading achievement, specifically whether it has a direct effect, an indirect effect through metacognitive knowledge of reading strate-

gies (full mediation), or both (partial mediation). We also examined whether these relationships differ for students with different language backgrounds: multilingual students (Spanish- and other-language-speaking) and English-dominant students. To that end, we conducted multi-group SEM, drawing data from nationally representative samples of US adolescents.

We found that intrinsic reading motivation had a direct and indirect effect on adolescents' reading achievement. Metacognitive reading strategies partially mediated the relationship between motivation and achievement. In other words, intrinsic reading motivation directly predicted reading achievement and predicted the metacognitive reading strategies, which in turn predicted achievement. Students who were motivated to read and aware of how to use a variety of strategies effectively tended to have better reading performance. The results of our study align with those of previous research (Jang et al., 2023; Miyamoto et al., 2019; Van Kraayenoord & Schneider, 1999), which found the mediating effect of metacognitive knowledge of reading strategy in the relationship between motivation and reaching achievement.

More importantly, our results showed that the relationship between reading motivation and reading achievement differed among language groups. For the English-dominant and Spanish-speaking groups, intrinsic motivation had both a direct and indirect effect on reading achievement through metacognitive reading strategies. In contrast, for the other language group, metacognitive strategies fully mediated the relationship between reading motivation and reading achievement, with no direct contribution from motivation. Reading motivation was only associated with achievement through metacognitive strategies. Put another way, motivation was necessary but far from sufficient for these students to become proficient readers; metacognitive reading strategies, or the awareness of and ability to use appropriate strategies, came into play. Intrinsically motivated students were likely to be more aware of how to use a variety of strategies effectively when reading. As a result, they tended to have higher reading achievement.

In short, the effect of metacognitive strategies as a mediator was more pronounced for the other language group than for the two other groups. The stronger effect of metacognitive strategies among the other language group could be attributed to their higher levels of motivation for reading and greater knowledge of reading strategies. This could make them more effective at converting their reading motivation into positive reading achievement. There were especially significant discrepancies in metacognitive strategies, with the greatest difference being evident between Spanish and other language groups. This could be due to their different schooling experiences resulting from their immigration and SES. The other language group included a higher percentage of first-generation immigrants (46.5%) who had arrived more recently, with an average age of arrival (AOA) of 8.87. In contrast, 24% of the Spanish group were first-generation immigrants, and their average AOA was 7.19. It is possible that the other language group had a better foundation in reading and metacognition, as it is likely that they received formal education in their home countries and in their strong language. This may have helped them develop better metacognitive knowledge, because it is known that the development of metacognition begins around the age of five to seven years and is further enhanced through schooling (cf. Hartman, 2001). In terms of SES, the Spanish group was the most disadvantaged. Low-SES

students often attend underfunded schools that offer limited literacy-related experiences and less challenging curricula with decontextualized knowledge, independent of the lives of students. These students may also face lower expectations from teachers. That is, multiple contextual factors may be responsible for less engagement in reading and lower reading outcomes (cf. Gándara, 2010; Jang et al., 2023).

In a nutshell, our study revealed that metacognitive knowledge of reading strategies was a critical explanatory mechanism for translating intrinsic reading motivation into reading achievement. This relationship was consistent across all student groups, but it was particularly influential for the other-language-speaking multilingual students.

## Implications for practice

Our findings demonstrated the synergetic roles of affective and cognitive processes of reading engagement in students' reading achievement. This suggests the importance of not just motivating but also equipping students with metacognitive knowledge of reading strategies to help them improve their performance in reading. Therefore, we argue that integrated instructional practices that support metacognitive strategies and motivation are necessary for effective reading instruction. All students, regardless of language background, may benefit from focusing on developing their metacognitive strategies to improve their reading achievement. At the same time, there may be some modifications required to the instructional focus and approach depending on the group. Notably, Spanish-speaking students had the lowest awareness of metacognitive strategies—despite being more motivated than English-dominant peers—and had the weakest pathway from metacognitive strategies to reading achievement. It highlights the pressing need for tailored instruction that specifically addresses the metacognitive strategies for Spanish-speaking students to improve their reading achievement.

The differential relationships between reading engagement and reading achievement across language groups reveal that students from different language backgrounds may require different approaches and strategies to support their reading success. By having a nuanced and comparative understanding of reading engagement, teachers can better serve multilingual students by tailoring their instruction and providing the most effective support for their reading development. Specifically, teachers who are being prepared to work with multilingual students should be trained and supported to equip them with the necessary knowledge and skills pertaining to metacognitive strategies to ensure their students' successful development as readers.

With respect to the strategy component, our study examined and underscored the importance of the conditional and relational aspects of metacognitive knowledge, namely awareness and ability to select the most appropriate strategies for a given situation from a range of options. To effectively improve students' reading skills, it is important to teach them explicitly not only how to use specific strategies, but also when and why to use them in different situations (Artelt & Schneider, 2015; Dent & Koenka, 2016). To this end, teachers should ensure their instruction is providing students with adequate opportunities to practice and refine their metacognitive strategies

so that they can effectively apply them while reading. As stated earlier, multilingual students may need to put in more effort to repair gaps in their comprehension and use of strategies while reading in English due to cultural and linguistic differences. The development of strategic competence may therefore be particularly beneficial in improving academic outcomes for multilingual students (Ardasheva et al., 2019). Culturally relevant texts and pedagogy can play a significant role in improving their reading engagement and achievement. When students find themselves in readings and curriculum and can draw on their cultural experiential knowledge to make sense of it, they tend to be motivationally and cognitively engaged in their reading (Clark & Fleming, 2019; Ebe, 2015). This could be particularly advantageous for Spanish-speaking multilingual students who may be facing the intersecting challenges associated with coming from low-SES families and attending under-resourced schools. That is, multilingual students would benefit from differentiated but responsive instruction (Jang & Brutt-Griffler, 2023). Also, it has been demonstrated that digital reading practices, which allow students to engage in reading activities and various genres of digital multimodal texts, can be useful in increasing student motivation and cognitive engagement in reading (Lee & Wu, 2013).

## Study limitations and future directions

Findings from the present study should be considered in light of limitations. First, due to the limited sample size, the other-language-speaking student group was treated as homogeneous. Diversity within this group was not considered. Further research is needed to gain a more comprehensive understanding of diverse groups of multilingual students. Another limitation is the lack of consideration of language proficiency in both English and heritage language(s) as well as the linguistic distance between the languages are regarded as important factors for the academic outcomes of multilingual students (Ardasheva & Tretter, 2013; Jang & Brutt-Griffler, 2019). As large-scale assessment data rarely collects information on language skills, it was not possible to take them into consideration. Finally, as we used cross-sectional data in this study, causality could not be determined based on our mediational analysis.

It is important to note that some studies that looked into the role of behavioral engagement, such as independent reading (Barber et al., 2020) and reading investment (De Naeghel et al., 2012), as a mediator between reading motivation and achievement did not find support for this relationship. It would be valuable for future research to examine different dimensions of reading engagement with the diverse student body to clarify whether and how it contributes to student reading outcomes. Regarding motivational engagement, this study focused on its dispositional aspect. As noted earlier, motivation is multifaceted, and its effects may vary depending on the specific motivational constructs examined. Notably, research by Baker and Wigfield (1999) and Wang and Guthrie (2004) illustrated the varied dimensions of reading motivation and their distinct associations with the reading achievements of students from diverse sociodemographic backgrounds. Further research is needed to explore these nuances in more detail.

The main aim of this study is to explore how motivation contributes to students' reading achievement and the underlying mechanisms. We hypothesized pathways from motivation to metacognition, and from metacognition to reading achievement. However, motivation and metacognition may also mutually reinforce each other, suggesting pathways from metacognition to motivation, as previous studies have indicated. This calls for further research to elucidate their interrelationships.

Lastly, it would be worthwhile to further investigate why there exists a discrepancy among multilingual students in their reading engagement. Given the structural inequalities and systemic barriers that work against minoritized multilingual students (cf. Jang & Brutt-Griffler, 2023), school context and instructional practices may be contributing factors. We believe this is an area that merits further exploration.

## Declarations

**Conflict of interest** No potential conflict of interest was reported by the authors.

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## Authors and Affiliations

**Eunjee Jang[1] · Young S. Seo[2] · Janina Brutt-Griffler[3]**

✉ Eunjee Jang
eunjee.jang@uwrf.edu

[1] English Department, University of Wisconsin-River Falls, River Falls, WI 54022, USA

[2] Department of Counseling, School and Educational Psychology and Quantitative Methods, The State University of New York at Buffalo, Buffalo, USA

[3] Department of Learning and Instruction, The State University of New York at Buffalo, Buffalo, USA