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BRIEF REPORT

Confirmatory Factor Analyses of the Baylor Revision of the Motivation to Read Survey (B-MRS) With Middle School Students

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Reading depends on the integration of both cognitive and motivational factors, yet reading motivation has received little attention in the research literature. The purpose of the present study was to evaluate the psychometric properties of the Baylor Revision of the Motivation to Read Survey (B-MRS; Watkins & Browning, 2015) with a sample of 731 students in Grades 6–8. The results of exploratory and confirmatory factor analyses supported the oblique two-factor structure of the B-MRS, which was invariant across gender, and regression analyses indicated that gender and grade were not significant predictors of reading motivation. These results add to the growing body of literature providing preliminary support for the B-MRS.

Impact and Implications

Reading motivation declines toward the end of elementary school, but few assessments of reading motivation have been validated for use with middle or high school students. The results of this study provide preliminary support for the use of the Baylor Revision of the Motivation to Read Survey (B-MRS) with middle school students. Valid assessment of reading motivation among middle schoolers using the B-MRS may improve the identification of students at risk for lower motivation to read and aid progress monitoring of motivation levels during adolescence.

Keywords: factor analysis, validity, reading motivation, reading

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Reading requires the integration of both cognitive and motivational factors (Schaffner & Schiefele, 2013). Cognitive factors include phonological skills, decoding skills, reading fluency, prior knowledge, and metacognitive reading strategies (Schiefele, Schaffner, Möller, & Wigfield, 2012). Reading motivation refers to an "individual's personal goals, values, and beliefs with regard to the topics, processes, and outcomes of reading" (Guthrie & Wigfield, 2000, p. 405) and includes aspects of reading attitude, task value beliefs, and self-concept (Schiefele et al., 2012). Remarkably, the scientific literature on reading instruction has primarily focused on cognitive factors and related reading skills. For example, recently published meta-analyses examined cognitive strategies and skill-based reading interventions but did not examine the impact of reading motivation (e.g., Scammacca, Roberts, Vaughn, & Stuebing, 2015).

Nonetheless, research, including a review covering the 20-year period from 1990 to 2010 (Schiefele et al., 2012), provides support for associations between reading motivation and reading achievement. Some models of this relationship, focusing on indirect associations, conceptualize reading motivation as a facilitator of reading engagement (Unrau & Quirk, 2014). For example, Clark and De Zoysa (2011) presented a model of reading that emphasizes the influence that reading enjoyment and attitudes—including motivation—have on reading behavior. De Naeghel, Van Keer, Vansteenkiste, and Rosseel (2012) presented a similar model and specified that reading motivation is related to higher reading frequency and engagement. In such models, the relationship between reading motivation and reading achievement is mediated by

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reading engagement and amount (Becker, McElvany, & Kortenbruck, 2010). Specifically, increases in reading engagement, resulting from greater reading motivation, are associated with increases in reading amount, which ultimately increases reading achievement, including comprehension (Guthrie, Wigfield, Metsala, & Cox, 1999). Other studies provide support for direct associations between reading motivation and achievement. In these studies, the relationship between reading motivation and reading achievement is not significantly mediated by reading engagement or reading frequency (e.g., De Naeghel et al., 2012; Froiland & Oros, 2014). Moreover, research supports the possibility of a bidirectional relationship between reading motivation and reading achievement in which reading achievement predicts reading motivation, which predicts subsequent reading achievement (Morgan & Fuchs, 2007; Retelsdorf, Köller, & Möller, 2014).

Unsurprisingly, researchers have suggested that it is important to raise awareness of and prioritize efforts to improve reading motivation in order to improve literacy (e.g., Torgesen et al., 2007). An important part of this process involves assessment of reading motivation, which permits the identification of students who would benefit from reading motivation interventions and progress monitoring (e.g., Cockroft & Atkinson, 2017; Guthrie & Klauda, 2014). In a recent review, Davis, Tonks, Hock, Wang, and Rodriguez (2018) summarized 16 reading motivation scales that could be used for these purposes and identified two groups of constructs typically assessed by these scales: (a) intrinsic and extrinsic reading motivation and (b) self-concept of reading ability and self-efficacy.

Intrinsic motivation refers to the willingness to read because reading is satisfying in its own right (e.g., the reader has an interest in the topic, and reading is therefore a positive experience; Schiefele et al., 2012). Reading value—referring to the interest in and perceived utility and significance of reading—is considered to contribute to intrinsic reading motivation. Extrinsic motivation refers to reading that is motivated by expected consequences (e.g., achieving positive outcomes, escaping/avoiding negative outcomes; Wigfield & Guthrie, 1997). Self-concept regarding reading motivation refers to self-perceptions about reading competence that develop as a result of a person's experiences, and self-efficacy refers specifically to a person's expectation to perform well on a reading task (Schiefele et al., 2012).

In their review, Davis et al. (2018) noted that although many reading motivation scales are available for elementary school students, attempting to locate scales for middle and high school students may be difficult. In addition, they noted that the adolescent scales of reading motivation that they identified are relatively new and have limited published research regarding their validity. These findings are notable because attitudes toward reading change as students move toward adolescence. Students in higher grade levels generally report less reading enjoyment, less time spent reading outside of school, worsening attitudes toward reading, and a significant decline in overall reading motivation (Mc Kenna, Conradi, Lawrence, Jang, & Meyer, 2012). Accordingly, Davis et al. (2018) recommended additional research on and development of reading motivation scales for use across elementary, middle, and high school.

The Baylor Revision of the Motivation to Read Survey (B-MRS; Watkins & Browning, 2015) is a revision of the survey portion of the Motivation to Read Profile (MRS; Gambrell, Palmer, Codling, & Mazzoni, 1996) that was created to assess major reading motivation constructs identified in previous literature (see Schiefele et al., 2012). It reflects models that suggest that reading behavior and performance can be explained, in part, by individuals' beliefs about how well they will perform in reading (i.e., self-concept) and the extent to which they value reading (i.e., value of reading). Notably, reading self-concept is associated with reading skills and reading comprehension (e.g., Park, 2011), and value of reading is associated with reading frequency and reading comprehension (e.g., Durik, Vida, & Eccles, 2006).

The MRS has been applied in reading research (e.g., Applegate & Applegate, 2010), but noted drawbacks of the MRS include the small sample size used in its validation studies (Davis et al., 2018) and that it was only initially validated with students in Grades 3 and 5 (Gambrell et al., 1996). Subsequent research on the MRS also revealed several problematic test items (Watkins & Browning, 2015). Analysis of a revision of the MRS, the previously mentioned B-MRS, revealed the same factor structure as the MRS but with no problematic items; for the B-MRS, problematic items were replaced with new items based on psychometric performance. However, prior studies of the factor structure of the B-MRS were based primarily on samples of elementary students or on samples that combined elementary and middle school students (Watkins & Browning, 2015). Consequently, the degree to which the B-MRS measures reading self-concept and value of reading in middle school students, alone, remains unknown. The purpose of the present study was to evaluate the factor structure of the B-MRS with a sample of middle school students. The resulting validity evidence will inform the appropriate use of the B-MRS for research and practice with adolescents, filling an important gap in the reading motivation assessment literature.

Method

Participants and Procedure

Participant data were obtained from Watkins and Browning (2015) for secondary analyses. Watkins and Browning collected these data by acquiring the names and work addresses of 1,000 randomly selected Texas teachers in Grades 2 through 6 from a commercial marketing firm and solicited via U.S. mail to anonymously collect and share B-MRS data from their classrooms. Each solicitation letter contained a classroom supply of B-MRS forms and a standardized script for data collection, which included (bolded) directions for group administration of the B-MRS. No further steps were taken to ensure participating teachers adhered to the script. However, participating teachers were encouraged to contact the research team with any questions they had regarding the standardized administration of the survey (no participating teachers contacted the research team). Responses were received from 88 teachers who provided B-MRS data for 2,371 students in Grades 1 through 8. The data of 731 students in 21 Grade 6 through 8 classrooms who completed all 20 B-MRS items were retained for the present study. No other identifying information about students or teachers was collected to maintain participants' confidentiality.

Participants included 731 students (47.7% female) in Grades 6 through 8 who completed the B-MRS. The sample was composed of 606 students in Grade 6 (46.7% female), 102 students in Grade

7 (54.9% female; 1 student with unknown gender), and 23 (43.5% female) students in Grade 8 across 21 classrooms. The total sample of 731 students in Grades 6 through 8 was randomly bifurcated into two samples in preparation for exploratory factor analysis (EFA; $n = 366$; 47.8% female) and confirmatory factor analysis (CFA; $n = 365$; 47.7% female). Random selection of participants for each subsample was stratified by gender and grade level in order to maintain approximately equal proportions of males and females and Grade 6, 7, and 8 students in the two subsamples. The EFA sample included 303 students in Grade 6 (46.9% female), 51 students in Grade 7 (54.9% female; 1 student with unknown gender), and 12 (71.4% female) students in Grade 8 across 12 classrooms, whereas the CFA sample included 303 students in Grade 6 (46.5% female), 51 students in Grade 7 (54.9% female), and 11 (83.3% female) students in Grade 8 across 15 classrooms.

Instrument

The B-MRS (Watkins & Browning, 2015) is a 20-item group-administered survey of reading motivation based on the survey portion of the MRS (Gambrell et al., 1996). It uses a 4-point behaviorally anchored ordinal rating scale to measure two aspects of reading motivation: (a) self-concept as a reader and (b) value of reading. As a result, response choices on the B-MRS contextualize each item stem. For example, the response choices for Item 1, "My friends think I am . . ." are as follows: "A. a very good reader," "B. a good reader," "C. an OK reader," or "D. a poor reader." The oblique two-factor structure of the B-MRS was initially identified from exploratory factor analyses with a sample of 545 students in Grades 1 through 8 recruited from a mid-Atlantic state and later confirmed on a separate sample of 2,136 students in Grades 2 through 6 recruited from Texas (Watkins & Browning, 2015). Internal consistency reliability for the reading self-concept factor was 0.84 and 0.87 in the EFA and CFA samples, respectively, and internal consistency reliability for the value of reading factor was 0.87 in both samples (Watkins & Browning, 2015).

Analyses

EFA of the B-MRS. EFA of the polychoric correlation matrix was estimated using weighted least squares means and variances (WLSMV) because B-MRS items are measured on an ordinal scale. WLSMV outperforms other estimators with ordinal data (Flora & Curran, 2004), especially when items contain fewer than five response categories (Beauducel & Herzberg, 2006). Several criteria were used to determine the correct number of factors to retain for rotation. These criteria included the mean- and variance-adjusted χ^2 statistic (alongside its degrees of freedom [*df*] and *p*-value), comparative fit index (CFI; Bentler, 1990), root mean square error of approximation (RMSEA; Steiger & Lind, 1980), and the standardized root-mean-square residual (SRMR; Bentler, 1995). The χ^2 statistic is sensitive to sample size; therefore, supplemental fit statistics (i.e., CFI, RMSEA, SRMR) were weighed more heavily for determining the number of factors to extract. Following recommendations by Hu and Bentler (1999), RMSEA and SRMR ≤ 0.08 and CFI ≥ 0.90 were considered evidence of adequate model fit, and RMSEA and SRMR ≤ 0.06 and CFI ≥ 0.95 were considered evidence of good model fit. An oblimin rotation (Jennrich & Sampson, 1966) was applied to the extracted factors to aid conceptual clarity. In addition, an admissible solution was determined when a factor model contained at least two salient factor pattern loadings ($\lambda \geq .30$; Child, 2006) and made theoretical sense (Nunnally & Bernstein, 1994). Factor-pattern loadings that followed a simple structure were also preferred so as to minimize ambiguity in the interpretation of the extracted factors (Gorsuch, 1983).

Prior research on the B-MRS has indicated that the self-concept as a reader and value of reading factors are highly correlated (Watkins & Browning, 2015), suggesting the presence of a general factor. Therefore, a bifactor rotation (Jennrich & Bentler, 2011) was also applied to the EFA sample using an orthogonal Geomin rotation criterion in order to explore the extraction of a general breadth factor (in addition to salient group factors). The Geomin orthogonal rotation criterion specifies that group factors are uncorrelated with the general factor and uncorrelated with each other. Moreover, this rotation criterion has been recommended for use in EFA in bifurcated samples in which the results of EFA and CFA are to be compared (Schmitt & Sass, 2011).

CFA of the B-MRS. CFA was conducted to evaluate the degree to which the factor model identified as the best fit from the EFA could be confirmed in an independent sample of 365 middle school students. In addition, the fit of two other competing factor models was also evaluated: (a) a one-factor model in which all 20 B-MRS items loaded onto a single factor and (b) a bifactor model with group factors informed by EFA results (or prior research conducted by Watkins & Browning, 2015) and a general breadth factor. B-MRS items are measured on an ordinal scale, as previously stated. Consequently, CFA of the B-MRS was conducted using WLSMV estimation of the polychoric correlation matrix. Finally, multigroup CFA (MGCFA[1]) was conducted to test the measurement invariance of the confirmed factor model across gender for the total sample (excluding one student whose gender was unknown; $n = 730$). The mean- and variance-adjusted χ^2 statistic, CFI, RMSEA, and SRMR were inspected to evaluate the overall model fit. RMSEA and SRMR ≤ 0.08 and CFI ≥ 0.90 were considered evidence of adequate model fit, and RMSEA and SRMR ≤ 0.06 and CFI ≥ 0.95 were considered evidence of good model fit (Hu & Bentler, 1999). The improved relative fit of a factor model in CFA and MGCFA was determined by ΔCFI $> .01$ and ΔRMSEA $\geq .015$ (Chen, 2007; Cheung & Rensvold, 2002).

Regression analyses. Sample sizes precluded the ability to test the invariance of the final factor model across grades. Therefore, multiple regression was performed on the total sample to

[1] Muthén and Asparouhov (2002) recommended testing only configural and scalar invariance for ordinal data because ordinal data contain less information. For example, metric invariance only requires that factor loadings be equal between groups. However, Millsap (2011) pointed out that factor loadings are not computed in the same way in the continuous and categorical cases. Polychoric correlations represent the correlation between the continuous latent response variate that is assumed to underlie the observed ordered categories according to the threshold model. Therefore, factor loadings for ordinal variables represent the relationship between the observed ordered categories, the intermediate continuous latent response variate, and the factor, whereas factor loadings for continuous variables merely represent the relationship between the observed continuous variables and the factor. In other words, the invariance of factor loadings for ordinal data cannot be tested alone. In fact, Wu and Estabrook (2016) demonstrated that a multigroup model estimated from ordinal data with only invariant factor loadings is equivalent to the baseline model.

determine the degree to which grade, gender, or a grade-by-gender interaction significantly predicted B-MRS scores.

Finally, nonindependence of student data may affect the results and should be considered in analyses if the design effect[2] is >2 (Muthén & Satorra, 1995). Item intraclass correlations for the EFA sample ranged from .01 to .10, and the average cluster size was 30.5, yielding design effects between 1.30 and 3.95 across B-MRS items (only 7 items with a design effect <2). Likewise, item intraclass correlations for the CFA sample ranged from .004 to .160, and the average cluster size was 30.5, yielding design effects between 1.00 and 4.73 across B-MRS items (only 11 items with a design effect <2). This indicates that students' scores within classrooms were more similar than students' scores between classrooms for both the EFA and CFA subsamples. Classroom-level effects may have affected scores on the B-MRS and should be considered within the analyses. Consequently, cluster-robust standard errors were used to account for nonindependence of student data in all analyses (EFA, CFA, and multiple regression). EFA and CFA were conducted in Mplus Version 8.3 (Muthén & Muthén, 2017) because Mplus permits the use of cluster-robust standard errors in both EFA and CFA with categorical data using weighted least squares estimation, whereas other statistical software packages do not. Multiple regression analyses were conducted in R Version 3.5.1 (R Core Team, 2018), with Version 3.0-16 of the *miceadds* package (Robitzsch, Grund, & Henke, 2018).

Results

EFA of the B-MRS

Table 1 contains fit statistics for the EFA extracting one to six factors (polychoric correlations and demographic statistics can be found in Table S1 of the online supplemental materials). Extraction of more than six factors produced a poorly identified solution and fit statistics for these models are not reported as a result. The mean- and variance-adjusted χ^2 statistic suggested extraction of five or six factors, and extraction of two to six factors resulted in a good fit according to supplementary fit statistics (CFI > .95, RMSEA/SRMR < .06). However, factor-pattern loadings for both the five- and six-factor models exhibited large violations to simple structure by containing six items with salient cross-loadings (both solutions), and neither model contained at least two salient factor-pattern loadings per factor or made theoretical sense. The three- and four-factor models also exhibited large violations to simple structure. The extraction of three factors produced three items with salient cross-loadings, and extraction of four factors produced six items with salient cross-loadings. Moreover, neither of these models aligned with established reading motivation theory. As a result, extraction of three or four factors was similarly dismissed as providing an adequate fit to the data.

Extraction of two correlated factors closely aligned with the theory underlying the B-MRS and items loaded onto the same two factors that have been identified in prior studies (Watkins & Browning, 2015) with one notable exception. Item 12 exhibited a salient loading on both the reading self-concept and value of reading factors (originally theorized as an indicator of value of reading). Consequently, we conducted a second EFA after removing Item 12. The mean- and variance-adjusted χ^2 statistic suggested that extraction of four factors and extraction of two to four factors resulted in good fit according to supplementary fit statistics, as evidenced by CFI > .95 and RMSEA/SRMR < .06. Fit statistics for these analyses are contained in Table 1. A similar pattern of results emerged: Extraction of three or four factors produced factor-pattern loadings that violated simple structure (three items demonstrated salient cross-loadings for the three-factor model, and four items demonstrated salient cross-loadings for the four-factor model). Extraction of two correlated factors, once again, closely aligned with the theory underlying the B-MRS, with items loading saliently onto the same two factors that have been identified in prior studies (Watkins & Browning, 2015). There were no violations to simple structure after removal of Item 12 (factor-pattern loadings for this model can be found in Table S2 in the online supplemental materials). However, Item 12 was retained for CFA due to its theoretical and empirical fit with the value of reading factor in previous research on the factor structure of the B-MRS (Watkins & Browning, 2015). Table 2 contains the factor-pattern loadings for the two-factor solution for the full EFA sample. Loadings ranged from 0.62 to 0.92 for the reading self-concept factor (excluding the salient cross-loading on Item 12) and from 0.37 to 0.89 for the value of reading factor. The reading self-concept and value of reading factors were highly correlated at .57. Cronbach's alpha coefficients of internal consistency for the reading self-concept and value of reading subscores were 0.90 and 0.88, respectively.

Extraction of more than six factors from the full EFA sample using a bifactor rotation (five group factors and a general breadth factor) produced a poorly identified solution. Therefore, results are only reported for bifactor models with two to five group factors. Table 1 contains fit statistics for these models. The mean- and variance-adjusted χ^2 statistic suggested extraction of four or five factors and all bifactor models yielded good fit according to supplementary fit statistics, as evidenced by CFI > .90 and RMSEA/SRMR < .06. However, all of the bifactor solutions contained multiple items that did not load saliently onto any of the extracted group factors (ranging from 6 to 14). The problematic items varied across solutions and contained no discernable pattern. Moreover, all of the bifactor solutions, with the exception of the model with two group factors and a general breadth factor, contained at least one salient cross-loading (ranging from 1 to 3). These results suggest that none of the EFA bifactor solutions provided a good alternative fit to the oblique two-factor model.

CFA of the B-MRS

Table 1 contains fit statistics for all competing B-MRS factor models. The one-factor solution did not meet preestablished criteria for adequate model fit (i.e., CFI < 0.90 and RMSEA/SRMR > 0.08), whereas the oblique two-factor solution demonstrated good model fit, as evidenced by RMSEA/SRMR < 0.06 and CFI > 0.95. Table 2 contains the standardized factor loadings for the oblique two-factor solution. Loadings ranged from 0.55 to 0.95 for the reading self-concept factor and from 0.54 to 0.95 for the value of reading factor. The reading self-concept and value of reading factors were highly correlated at .63. Cronbach's alpha coefficients

[2] A design effect is defined as $1 + (\bar{n} - 1) \times icc$, where $\bar{n}$ is the average cluster size, and *icc* is the intraclass correlation coefficient (Muthén & Satorra, 1995, p. 289, eq. 35).

Table 1
Fit Statistics for Exploratory (n = 366) and Confirmatory Factor Analyses (n = 365) of the Baylor Revision of the Reading Motivation Survey for a Sample of Students in Grades 6 Through 8

Model	χ^2	*df*	CFI	RMSEA	90% CI		SRMR
Exploratory Factor Analyses							
Oblimin rotation							
1 factor	604.73	170	.931	.084	.077	.091	.123
2 factors	232.60	151	.987	.038	.028	.048	.049
3 factors	178.28	133	.993	.031	.017	.042	.038
4 factors	144.08	116	.996	.026	.006	.038	.031
5 factors	121.87*	100	.997	.024	.000	.038	.028
6 factors	101.25*	85	.997	.023	.000	.038	.023
Oblimin rotation[a]							
1 factor	599.01	152	.929	.090	.082	.097	.128
2 factors	208.13	134	.988	.039	.028	.049	.046
3 factors	152.94	117	.994	.029	.014	.041	.034
4 factors	122.94	101	.996	.024	.000	.038	.028
Bifactor rotation							
2 group factors + general factor	178.28	133	.993	.031	.017	.042	.038
3 group factors + general factor	144.08	116	.996	.026	.006	.038	.031
4 group factors + general factor	121.87*	100	.997	.024	.000	.038	.028
5 group factors + general factor	101.25*	85	.997	.023	.000	.038	.023
Confirmatory Factor Analyses							
1-factor model	598.26	170	.893	.083	.076	.090	.104
1-factor model[a]	595.99	152	.891	.089	.082	.097	.102
Oblique 2-factor model	251.61	169	.979	.037	.027	.046	.051
Oblique 2-factor model[a]	237.01	151	.979	.040	.030	.049	.050
Multigroup Confirmatory Factor Analyses							
Phase I: Baseline model fit for each group							
Females (n = 349)	282.52	169	.987	.044	.035	.053	.050
Males (n = 381)	272.22	169	.978	.040	.031	.049	.053
Phase II: Invariance testing							
Configural invariance	549.93	338	.984	.041	.035	.048	.052
Scalar invariance	584.11	394	.985	.036	.030	.042	.053

Note. 90% CI = 90% confidence interval of the RMSEA. Standard errors and the χ^2 statistic were adjusted using sampling weights to account for nonindependence of student data. All p-values for the adjusted χ^2 statistic were statistically significant unless otherwise noted with an asterisk.
[a] Fit statistics for exploratory factor analysis and confirmatory factor analysis after removing Item 12.

of internal consistency for the reading self-concept and value of reading subscores were 0.87 and 0.89, respectively.

Although a bifactor solution did not fit the EFA sample data well, the fit of a bifactor model to the B-MRS with the reading self-concept and value of reading group factors matching those identified for the oblique two-factor EFA solution and a general breadth factor was evaluated for the CFA sample. The model did not converge. Therefore, the oblique two-factor model of the B-MRS was determined to offer the best fit to the CFA sample data (this exact same pattern of results also emerged when Item 12 was removed).

Fit statistics for MGCFA of the oblique two-factor model of the B-MRS across gender are contained in Table 1. The oblique two-factor model of the B-MRS fit the baseline model for males and females equally well, as evidenced by RMSEA/SRMR < 0.06 and CFI > 0.95. In addition, the results of MGCFA indicated a good fit for both the configural and scalar invariance models, as evidenced by RMSEA/SRMR < 0.06 and CFI > 0.95. Direct comparison of the two MGCFA models yielded a nonsignificant χ^2 difference test, $\Delta\chi^2(56) = 59.09$, $p = .36$, which supports scalar invariance across gender; and, ΔCFI and ΔRMSEA were negligible. This suggests that the B-MRS reading self-concept and value of reading latent means, variances, and covariances can be compared between males and females. In other words, any differences in B-MRS scores across gender are likely due to real differences in reading motivation.

Regression Analyses

The boxplots in Figure 1 illustrate the B-MRS reading self-concept and value of reading scores disaggregated by gender and grade. Gender, grade, and the interaction of gender and grade were not significant predictors of B-MRS reading self-concept scores ($p > .05$), and all three predictors accounted for only 0.7% of the variance in B-MRS reading self-concept scores. Likewise, neither gender, grade, nor a gender by grade interaction significantly predicted the B-MRS value of reading scores ($p > .05$). Moreover, 2.4% of the variance in the B-MRS value of reading scores was accounted for by all three predictors. Consequently, there were no

Table 2
Factor Loadings for the Oblique Two-Factor Model of the Baylor Revision of the Reading Motivation Survey for a Sample of Students in Grades 6 Through 8 Following EFA (n = 366) and CFA (n = 365)

Item	EFA		CFA	
	Reading self-concept	Value of reading	Reading self-concept	Value of reading
1. My friends think I am _____.	**.826**	.054	**.782**	
2. Reading a book is something I like to do.	.141	**.719**		**.876**
3. I read _____.	**.827**	−.056	**.727**	
4. My best friends think reading is _____.	.111	**.532**		**.541**
5. When I come to a word I don't know, I can _____.	**.619**	.059	**.554**	
6. I tell my friends about good books I read.	.208	**.466**		**.708**
7. When I am reading by myself, I understand _____.	**.719**	.043	**.673**	
8. People who read a lot are _____.	−.057	**.757**		**.670**
9. I am _____.	**.924**	.031	**.947**	
10. I think libraries are _____.	−.106	**.833**		**.687**
11. I have trouble with reading _____.	**.793**	−.066	**.647**	
12. Knowing how to read well is _____.	**.377**[a]	**.371**[a]		**.647**
13. When my teacher asks me a question about what I have read, I _____.	**.673**	.066	**.597**	
14. I think reading is _____.	.053	**.892**		**.946**
15. Reading is _____.	**.900**	−.045	**.858**	
16. When I grow up, I will spend _____.	.073	**.667**		**.815**
17. When we talk about reading assignments in class, I _____.	**.647**	.086	**.729**	
18. I would like for my teacher to spend more time on reading _____.	.092	**.623**		**.702**
19. When I read out loud, I am _____.	**.635**	−.040	**.562**	
20. When someone gives me a book for a present, I feel _____.	−.058	**.774**		**.778**

Note. EFA = exploratory factor analysis; CFA = confirmatory factor analysis. Salient factor loadings ≥ .30 are bolded.
[a] Item 12 exhibited a salient cross-loading on both the reading self-concept and value of reading factors. However, it was determined to fit better theoretically as an indicator of value of reading.

reliable differences in reading motivation scores as measured by the B-MRS across gender and grade.

Discussion

The act of reading involves both cognitive and motivational factors (Schaffner & Schiefele, 2013), but reading interventions often focus on the former and disregard the latter. Moreover, there is evidence to suggest that the motivating factors that drive reading behavior change around middle school (McKenna et al., 2012; Nootens et al., 2019), and as a result, it is important that the tools used to assess reading motivation be psychometrically sound for students at both the elementary and secondary levels. The B-MRS is a group-administered student survey designed to assess two facets of students' reading motivation: reading self-concept and value of reading. However, prior analyses of the structural validity of the B-MRS have been conducted primarily with elementary students or in samples of students spanning elementary and middle school, analyzed together. Therefore, its structural validity with middle school students, alone, remains unknown (Watkins & Browning, 2015). Consequently, the purpose of the present study was to explore the underlying structure of the B-MRS for a sample of 731 middle school students in Grades 6–8. EFA was performed on a random subsample of 366 participants, and CFA was performed on the remaining 365 participants. The results of EFA and CFA supported the oblique two-factor structure of the reading self-concept and value of reading factors identified in a prior EFA with a sample of students in Grades 1–8 and confirmed in a second sample of students in Grades 2–6 (Watkins & Browning, 2015).

Preliminary evidence supports the use of the B-MRS with middle school students, which fills an important gap for this population (see Davis et al., 2018). In practice and research, the B-MRS could be used to evaluate the effects of interventions that target reading motivation. One example of a related intervention for high school students includes adapting motivational interviewing techniques to target affective aspects of reading and reading-engagement behaviors (Cockroft & Atkinson, 2017). For example, middle school students could be provided multiple motivational-engagement supports, including competence support, choice to increase intrinsic motivation, emphasis on the importance of reading, and facilitation of collaboration (e.g., group discussion, exchanging feedback with peers), to increase the amount of engaged reading (Guthrie & Klauda, 2014). Moreover, the B-MRS could be used as a pre- and posttest measure to evaluate the effects of this type of intervention on increasing reading motivation and to explore the degree to which increased reading motivation manifests in increased reading behavior.

In the current study, the oblique two-factor model of the B-MRS exhibited scalar invariance across gender. This suggests that any B-MRS score differences observed between males and females likely represent actual differences in reading motivation. Moreover, neither gender, grade, nor a gender-by-grade interaction significantly predicted B-MRS reading self-concept and value of reading scores. These results are partially consistent with prior studies. Watkins and Browning (2015) reported that male and female students across EFA and CFA samples did not significantly differ on B-MRS reading self-concept scores. However, the authors reported that female students demonstrated significantly higher B-MRS scores on value of reading when compared with male students in the confirmatory sample. In addition, Watkins and Browning reported that the perceived value of reading as measured

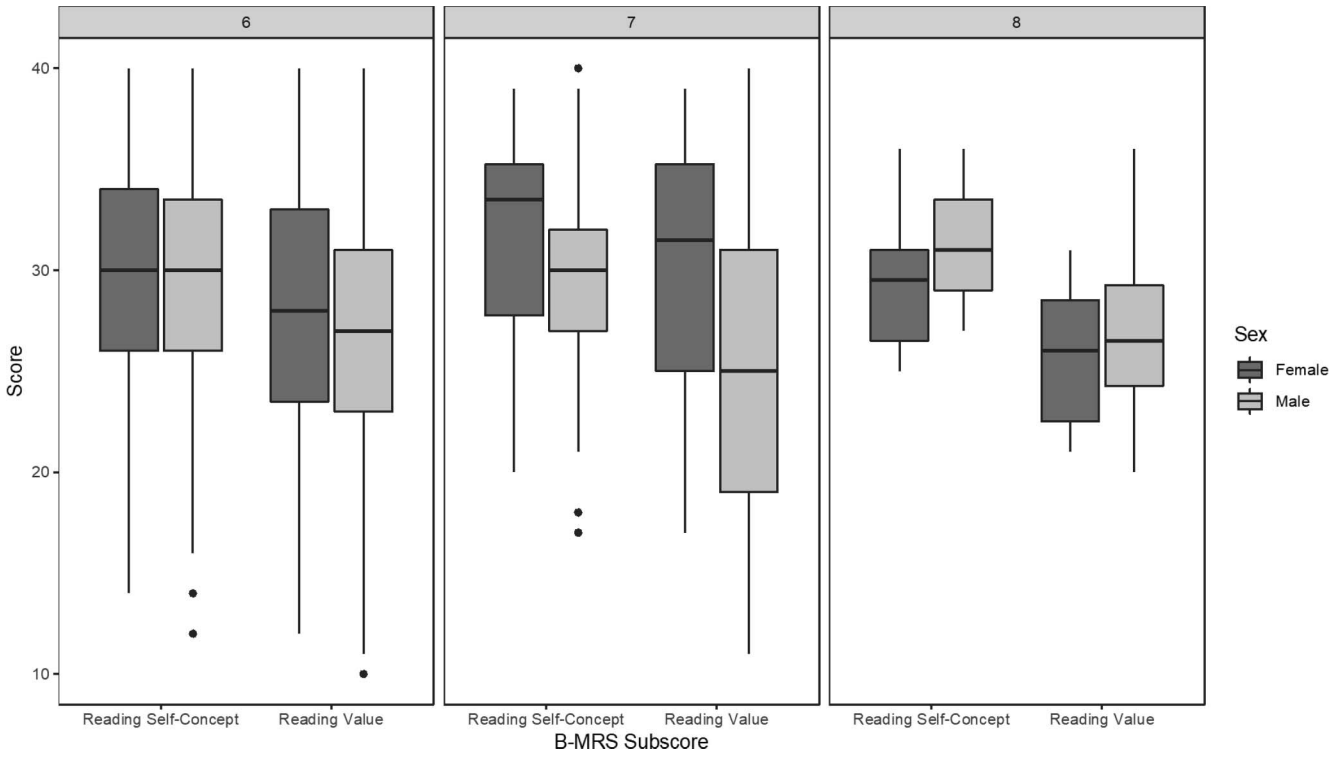

Figure 1. Boxplots depicting Baylor Revision of the Motivation to Read Survey (B-MRS) reading self-concept and value of reading scores disaggregated by gender and grade level.

by the B-MRS in the confirmatory sample significantly declined across Grades 2 through 6, suggesting that the perceived value of reading may decline as students are promoted to the next grade level. These findings are similar to those regarding general gender and grade differences regarding reading attitudes and underscore the importance of the present study (McKenna et al., 2012; Nootens et al., 2019).

A limitation of the present study is that the sample was recruited from a single geographic region, and it is possible that reading motivation differs across states due to differences in population characteristics and/or reading curriculum and related literacy programs. Also, limited demographic information was collected from study participants and the teachers from whom study participants were recruited. This precluded our ability to report such information as student age and race/ethnicity or teacher-level variables (e.g., teacher race/ethnicity, years of teaching experience, etc.), which limits the generalizability of our findings. We were also unable to link teachers to schools and student participants due to the anonymity of the data-collection procedures. Therefore, it is conceivable that some teachers may have been clustered within schools and that the B-MRS was administered to one or more student participants more than once. In addition, no steps were implemented to ensure that participating teachers adhered to the standardized administration script for the B-MRS. It is possible that the actual administration instructions provided to study participants varied somewhat in their presentation, although the B-MRS administration instructions are short and simple to aid group administration, similar to other surveys and behavior rating scales.

Notwithstanding these limitations, the present study adds to a body of research supporting the underlying structure of the B-MRS in a sample of middle school students (Watkins & Browning, 2015). Future research should continue to explore the structure of the B-MRS with additional samples of elementary and middle school students using exploratory structural equation modeling (Asparouhov & Muthén, 2009) and confirmatory analytical techniques. In addition, future research should continue to explore the psychometric properties of the B-MRS with other subpopulations (e.g., invariance across gender, grade, race/ethnicity, or students with and without reading difficulties). Person-centered analyses might also be useful adjuncts to the variable-centered analyses applied in this study (Howard & Hoffman, 2018).

There were also a few statistical findings in our study that warrant specific attention in future psychometric investigations of the B-MRS. In particular, Item 12 loaded saliently onto both the reading self-concept and value of reading factors in the oblique two-factor EFA solution, and the bifactor model failed to offer a viable solution in both the EFA and CFA subsamples. The former finding is unique to the EFA sample of the present study and has not been documented previously (Watkins & Browning, 2015). These results might be indicative of a potential problem with Item 12 as measuring value of reading for middle school students or might reflect particular idiosyncrasies with the present study sample (e.g., socioeconomic status and family values about reading). The failure of the bifactor model to offer a viable solution may also reflect the unique characteristics of our study sample. Bifactor models generally fit data sets well; however, convergence problems have also been documented in large psychometric studies of

other psychological assessment instruments (e.g., Carlucci et al., 2018). Future research should evaluate these possibilities.

Psychometric studies aside, analyzing B-MRS data longitudinally using linear-linear piecewise growth mixture models with unknown random knots (Kohli & Sullivan, 2019) may assist researchers in pinpointing at what point a developmental shift occurs in attitudes toward reading from positive to negative. This could aid in the application of targeted reading motivation interventions during sensitive periods in development. The B-MRS demonstrates potential as a psychometrically sound tool for assessing reading problems that are generated by performance, as opposed to skill deficits—an important hypothesis that school psychologists must test prior to intervention.

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