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Patterns of Association Among Multiple Motivations and Aspects of Achievement in Reading

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Abstract

The present study investigated the multivariate relationships between several aspects of motivation and achievement in reading. Canonical correlation analysis was used to examine patterns of associations for reading information text in Phase I and for reading literary texts in Phase II. The samples were 923 and 225 seventh graders, respectively. Results revealed three multivariate patterns for information text, whereas one pattern was observed for literary text. An explanation for the difference between reading motivation information text and literary text is provided based on distinctions between these genres. Additionally, findings showed that undermining motivations predicted students' reading achievement more strongly than affirming motivations. The theoretical and practical implications of the study are discussed.

Keywords: achievement, canonical correlation, information text, motivation

Patterns of Association Among Multiple Motivations and Aspects of Achievement in Reading

Recent findings indicate that Americans are reading less over time; more specifically, results showed a decrease in the rates of voluntary reading from childhood to late adolescence, with only one third of 13-year olds reading daily (National Endowment for the Arts, 2007). Furthermore, the study showed that over the last 20 years, the percentage of high school students who never or hardly read anything for pleasure has doubled from 9% to 19%. Among college seniors, only one in three students reported reading for pleasure each week (National Endowment for the Arts, 2007). Due to these alarming trends, we believe that reading motivation is an increasingly important research topic (Guthrie, Wigfield, & You, in press).

At the same time, national interest in reading information text is being expressed in the Common Core States Standards, which have been adopted by more than 30 states (Common Core State Standards Initiative, 2010a, 2010b). A hallmark of these standards is specific requirements that students must be proficient readers of information text in history, science, and technical reports. As the world becomes increasingly more complex and technologically driven, students and graduates entering college and the workforce will also be expected to comprehend more challenging and technical information. This leads us to focus on information text comprehension and motivation for reading this form of text.

Past research has shown that achievement in reading is related to students' reading academic motivation (Guthrie & Wigfield, 2000). Many studies examining the relationship between motivation and achievement mainly focused on single motivation variables such as intrinsic motivation (Gottfried, 1990) and self efficacy (Schunk & Pajares, 2009). Increasingly, researchers are interested in how multiple aspects of motivation link to achievement, as shown

by Pintrich (2000) for mastery goals and performance goals, Wentzel (2009) for social and academic goals, and Wolters, Yu, and Pintrich (1996) for goals, values, self-regulation, and performance. More specifically, in Wolters et al.'s (1996) study, researchers examined the association between students' goal orientation (ability goal, learning goal, and extrinsic goal), motivational beliefs (task value, self-efficacy, and test anxiety), and self-regulation (cognitive strategy use, regulatory strategy use, and performance) of seventh and eighth graders. Overall results showed that learning goal and ability goal orientations were positive predictors of self-efficacy, task value, cognitive strategy use, regulatory strategy use, and performance (ability goal only). Additionally, extrinsic motivation was shown to be a positive predictor of test anxiety and performance, and a negative predictor of task value, self-efficacy, and regulatory strategy use. These findings were similar across three subject areas of English, math, and social studies. In the present study we build on this work by looking at relations of multiple aspects of reading motivation and multiple aspects of reading achievement, to get a better picture of their complex interrelations.

In the investigation of motivation and achievement it is necessary to identify the level of generality for the constructs. The specificity of motivation and achievement can be construed in a range of levels, from extremely broad to narrow and specific. This investigation examines the extent to which the level of dimensionality for a wide range of motivations and measures of achievement for reading in middle school is confirmed. We expect that the dimensionality of motivation (undermining versus affirming) would differ for two types of text consisting of literature and information text in middle school contexts. Past studies have largely examined various motivations and their relationships to reading in general, but not with respect to different genres of reading (e.g., information text, and literary text). Additionally, the types, aspects, or

components of reading have not been examined individually for possible divergence in their correlations with different motivations.

In seeking to predict reading achievement with motivation variables, Guthrie and Coddington (2009) found that when motivations are drawn from multiple theories and used simultaneously to form profiles, more variance in achievement is explained than when a more limited set of motivations is used to predict achievement. Thus, it is evident that motivational constructs drawn from different theoretical perspectives, such as self-determination theory (intrinsic motivation), social cognitive theory (self-efficacy), and social goal theory (peer value) may explain more variance in achievement than fewer motivations drawn from a single theoretical perspective. Like motivation variables, achievement constructs are also multiple and partially independent, and recent theories of reading comprehension emphasize multiple cognitive aspects of comprehension. For example, landscape theory proposes that there are dual cognitive systems (memory based, and constructionist) that operate in conjunction with each other during reading comprehension (van den Broek, Rapp, & Kendeou, 2005). The memory-based processes are rapid, automatic, effortless, and may be effective, but may also be inaccurate. In contrast, the constructionist processes are slower, higher effort, logic driven, and may be used to monitor its counterparts.

Compensatory encoding theory of reading development provides a framework for understanding the interplay between automatic processes and strategic resources in reading (Walczyk et al., 2007). The theory describes how readers compensate for poorly automated skills and identifies a list of compensatory actions that serve to mend misinformation or misunderstandings generated by these skills. Walczyk and colleagues (2007) showed that readers in later elementary school possess both automatic word recognition processes and slower

strategic processes as well. It is likely that motivations relate differentially to these different cognitive processes. Grades are often used in motivation research as indicators of achievement (Wigfield, Eccles, Schiefele, Roeser, & Davis-Kean, 2006). Because grades reflect social and emotional aspects of reading, as well as cognitive aspects, grades are likely to be partially independent of the cognitive competencies in reading such that the relationship is moderately associated.

With respect to the research and theories presented above, we propose the alignment hypothesis in framing our study of the multivariate relationships between motivation and achievement in reading. As Guthrie, Taboada, and Wigfield (in press) noted, both motivation and reading achievement are multifaceted constructs. Due to this multiplicity, several higher order patterns of association may exist between motivations and reading achievement.

The alignment hypothesis derives from the observation that both motivation and cognition in reading are multifaceted. Both have multiple psychological processes that are partially independent of each other. Although it is possible that all the motivation processes are equally well associated with all the cognitive processes, it is more plausible that some motivation processes are more tightly tied to certain cognitive processes than others. Specifically, texts such as information text in science or history are usually complex with a high vocabulary load and require extensive reasoning by the reader. We expect that proficiency in reading information texts in science is likely to be facilitated by self-efficacy, since persistence and effort in reasoning are often required to comprehend these texts (Guthrie et al., in press).

In this study, information text is expected to be associated with efficacy because we investigate two aspects of self-efficacy; one of which is measured traditionally with positive items in a scale where a high score is high self-efficacy. The other measure is based on a set of

negative items such as “Information books are confusing,” in which a high score represents low self-efficacy. We termed this latter scale ‘perceived difficulty’ because a high score represents the students’ perception that reading is difficult. In addition, we expected that proficiency of reading literary and fictional texts will be associated with intrinsic motivation. Literary texts, such as novels, that are read in Reading/Language Arts classes are often longer in length and thus take more time to read than many information texts, and we expect that fully comprehending literary texts will be facilitated by intrinsic motivation (enjoyment of reading) because intrinsic motivation increases the time an individual spends reading (Wigfield & Guthrie, 1997). Thus, we propose an alignment of motivation and cognition in reading such that self-efficacy is relatively highly related to proficiency in comprehending information text, whereas intrinsic motivation is relatively highly related to comprehending literary text.

In the most common multiple regression frameworks for studying the relationship of motivation and achievement, investigators typically use one reading cognitive variable as the dependent variable and several motivation variables as the independent factors (Guthrie & Coddington, 2009). This yields one pattern with several motivations predicting achievement. We propose that due to the complexity of cognition and motivation there may be more than one pattern occurring simultaneously. Previous studies have shown that such simultaneous patterns of associations can occur in predicting intrinsic motivations (Boyd, Weinmann, & Yin, 2002), and cognitive skills such as literacy skills (Cadima, McWilliam, & Leal, 2010). If such simultaneous patterns exist, it is valuable to investigate them to attempt to explain the complexity of the relationships of motivation and achievement.

Multiple patterns of relationships also emerged when motivations and cognitive skills were examined together for students’ motivation and cognitive self-regulation strategy variables

as shown by Shell and Husmann (2008). They reported, for example, that two patterns of relationships emerged such that the first pattern showed that a set of self-regulation variables (higher self-regulated strategic use, knowledge building strategies, high-level and low-level questioning, study time, and study effort) positively related with a set of control and motivation variables (consisting of high self-efficacy, causal attribution for learning and for grades, positive outcome expectancy for learning and for grades, positive affect, mastery and performance approach goal orientations, and lower work avoidance goal orientation). The second set of relationships included a different set of self-regulation variables with higher knowledge building strategies, high-level questioning, lower self-regulated strategy use, study time, and low-level questioning. This set of self-regulation variables was positively correlated with a another set of motivation variables that consisted of higher self-efficacy, expectancy for success, outcome expectancy for learning, mastery goal orientation, positive affect, causal attribution to interest and enjoyment for grades, lower negative affect, and causal attribution to strategy use/effort. One benefit of this multivariate pattern is that it documents that a motivational variable, such as work avoidance, may be correlated with certain cognitive attributes of self-regulation but not others. Our current study reflects the growing realization that relations of motivation and achievement in reading are complex and multifaceted (Baker & Wigfield, 1999; Guthrie & Coddington, 2009). The conceptual framework of this study is based on increasingly complex attempts to link motivations and achievement. The purpose of this research is to investigate the extent that there are patterns of association among multiple motivations for reading and multiple cognitive indicators of reading achievement in middle school students. To investigate such a possibility in reading, canonical correlation is an appropriate analytic technique to use, as illustrated by Shell and Husman (2008). With canonical correlation, the investigator uses multiple dependent

variables (e.g., in reading achievement) at the same time as using multiple independent variables (e.g., in reading motivation). It is possible to observe multiple orthogonal (independent) relationships in which several motivational factors are simultaneously associated with several cognitive reading factors. Thus, canonical correlation permits the investigator to potentially exploit the multiple relationships in both motivation and cognitive of reading.

We addressed two main research questions in the two phases of the study: (1) To what extent are there multivariate relationships of motivation and achievement for reading information texts? (2) To what extent are there multivariate relationships of motivation and achievement for reading literary texts? Under each question, we examined whether the patterns of relationships are distinctive.

As noted earlier, we hypothesize that distinct motivations may align with distinct aspects of achievement in reading. For example, intrinsic motivation may be relatively highly associated with proficiency in reading easy, enjoyable fiction. However, self-efficacy may be associated relatively highly with measures of comprehending complex science text. We expect these associations to appear in a multivariate context where other motivations and cognitive variables are controlled.

To examine the research questions regarding whether genre of reading materials will result in differing results of relationships, this study employed quantitative methods in two phases. The first phase of the study examined students' motivation for information texts, while the second phase of this study examined students' motivation for literary texts.

The rationale for using two types of motivation measures for information text and literary text was that these two types of text are distinct in several respects. First, literature and fiction center on characters and plot that require the individual to read many pages. In contrast,

information text is knowledge based with a high vocabulary load and a dense information structure, demanding intense concentration with extensive reasoning. In their free time, adolescents often read fiction, whereas they seldom read information text for pleasure, according to Moje (2008) and Alvermann, Hinchman, Moore, Phelps, and Waff (2006). Thus, it is reasonable that students' motivations for reading these contrasting texts may differ. Further, because information text is read for school, it is plausible that it may demand specialized cognitive resources. If so, then an individual's success and failure with information text could be related to his self-efficacy for information text in relatively unique ways.

The motivation measures were constructed to reflect information text read in school and literary text read in Reading/Language Arts class. The items respectively referenced information text containing knowledge in science, social studies, and other areas, and literary text read in Reading/Language Arts class. There were no information texts in this class and thus, the questionnaire items simply referenced the texts in the class rather than literature, poetry, drama, and legends, all of which were included. Assessment of students' reading achievement included the measures of achievement in both information text reading and literary text reading. Therefore, the achievement variables comprised both informational and literary aspects of reading; these outcome variables remained constant and without change in the first and second phase of the study.

Phase I Method

Participants

The participants were part of the Reading Engagement for Adolescent Learning (REAL) study, an investigation of instructional support, motivations, cognitions, and competencies required for reading comprehension of middle school students. Participants in the study included

seventh-grade students from a rural area of a mid-Atlantic state. Students in the REAL study were predominantly European American, and represent a wide range of socioeconomic status.

The sample included 923 seventh-grade students with 20.9% African American and 72.4% European American students, including nearly equal numbers of male and female students. The students attended four middle schools in a mid-Atlantic state. Twenty-two percent of the students qualified for free or reduced lunch.

Measures

Motivation for reading. Motivation in the first phase of the study was measured using the Motivations for Reading Information Books School questionnaire (MRIB-S). The MRIB-S is a self-report instrument developed to assess middle school students' motivation for reading nonfiction information book across eight aspects of motivation. Our conceptualization of motivation identifies motivations that are positively associated with achievement and have positive attributes of motivation as *affirming motivations*, and motivations that are negatively related with achievement and reduce or undermine motivations in the domain of reading as *undermining motivations* (Guthrie & Coddington, 2009; Guthrie, Coddington, & Wigfield, 2009; Wigfield, Cambria, & Ho, in press). The MRIB-S comprised four affirming motivations (expected to correlate positively with achievement), and four undermining motivations (expected to correlate negatively with achievement) for reading (Guthrie et al., 2009; Wigfield et al., in press). The affirming motivations included intrinsic motivation, value, efficacy, and peer value for reading. These are affirming motivations in the sense that higher levels of motivation are expected to relate with higher achievement, so by affirming motivation we are referring to the positive correlation between motivation and achievement. The undermining motivations included avoidance, devalue, perceived difficulty, and peer devalue of reading. These are undermining

motivations in the sense that higher levels of avoidance, devalue, perceived difficulty, and peer devalue of reading would relate with lower achievement, so by undermining motivations, we are referring to the negative correlation between motivation and achievement.

Items representing the eight aspects of motivation were conceptualized and developed from several theoretical perspectives. For example, intrinsic motivation was defined as the interest and enjoyment in reading, and desire to read often (Gottfried, Fleming, & Gottfried, 2001; Ryan & Connell, 1989; Unrau & Schlackman, 2006), whereas avoidance was defined as an aversion toward reading information text for school, and expending the least amount of time and effort toward reading (Dowson & McInerney, 2003; Meece & Miller, 2001; Nicholls, 1990). Valuing was conceptualized as the belief that reading information text books for school was important and useful for one's future (Trautwein, Lüdtke, Schnyder, & Niggli, 2006; Wigfield & Eccles, 2000), and devaluing reading motivation was conceptualized as the view that reading is not important and lacks usefulness for one's future (Legault, Green-Demers, & Pelletier, 2006). Reading self-efficacy was defined as the beliefs about one's capability to complete reading tasks (Schunk, 2003; Usher & Pajares, 2006), while perceived difficulty in reading was defined as one's perceptions that reading information text books in school is a difficult task (Chapman & Tunmer, 1995; see egocentric difficulty in Nicholls & Miller, 1983). Finally, the motivation constructs of peer value and devalue of reading were conceptualized as the belief that one's reading habits and viewpoints about reading are valued, or devalued, by one's peers (Furrer & Skinner, 2003), respectively. It is important to note that the affirming and undermining motivation constructs are not direct opposites; items on an affirming motivation scale are not simply reversed in wording on an undermining scale. Different items were included on different scales to reflect the multifaceted nature of the eight aspects motivation.

Each subscale included seven items that measured students' motivation on a 4-point Likert scale, which included: not at all true of me, not very true of me, somewhat true of me, and very true of me. The questionnaire consisted of 56 items total, and was administered to students by their teacher. Directions and sample questions were read aloud by teachers, and students completed the questionnaire themselves by rating their response on each item. Cronbach alphas for the motivation scales ranged from .78 to .88 (intrinsic motivation = .84, value = .83, efficacy = .85, and peer value for reading = .82, avoidance = .84, devalue = .88, perceived difficulty = .88, and peer devalue of reading = .78).

Reading achievement. Achievement for both phases of the study was assessed using six measures that examined students' comprehension and achievement in reading information text including: (a) knowledge construction from information text, (b) reading fluency, (c) literal text comprehension, (d) inferencing in information text, (e) simple passage comprehension, and (f) students' Language Arts class grade. These six achievement variables, comprising both measures of information text and literary text, were included as outcome variables in both the first and second phase of the study. These variables remained the same for each phase of the study. Researcher-developed measures and standardized achievement tests were utilized in this study.

Knowledge building from information text was measured through a research-developed measure, which comprised three 250 to 300 word passages on science topics. Five multiple choice questions followed each passage, which consisted of identifying the main concept, applying understanding of subconcepts, casual reasoning, and identifying the best summary for the passage. Students' correct percentage scores were used in the analyses. Cronbach alphas ranged from .65 to .72 for the three test forms employed in the study.

Reading fluency was assessed with the Woodcock Johnson III Reading Fluency Test, which measures the speed and accuracy of simple sentence reading. Students have 3 minutes to silently read as many sentences as they can, and indicate whether each sentence is true or false (McGrew, Schrank, & Woodcock, 2007; Schrank, Mather, & Woodcock, 2004). Standardized scores were used.

Literal text comprehension was assessed with researcher-developed measure, which included understanding of word meaning in context, phrase understanding, sentence paraphrase, and basic conceptual understanding. The measure consisted of three 60- to 100-word passages on science topics; each passage was followed by four or five multiple choice questions (14 items total). The passages were low in difficulty for seventh graders, which required selecting the correct exact or near paraphrase of each passage or making linkages between two consecutive sentences in the passage. Cronbach alphas ranged from .73 to .76. Students' percent correct scores were used for analyses.

Inferencing in information text was also assessed using a research-developed measure that included five passages on science topics, with four incomplete sentences in each passage where students select the correct word or phrase to complete the sentence from three options. These sentence completion tasks required students to make referential, causal antecedent, causal consequence, or state inference (Magliano, Baggett, & Graesser, 1996). Each student's percent correct scores from the April assessment was used for analyses. Cronbach alphas ranged from .65 to .73 for the three test forms employed in the study.

Simple passage comprehension was assessed using Form T of the Gates-McGinitie Comprehension Test (Levels 5, 6, or 7/9) during the assessment. Students were assigned different levels of the test based on their performance on a state reading assessment the prior

year. This multiple choice test was used for assessing simple passage comprehension, based on its requirement of text-based level comprehension rather than the fuller knowledge network employed in our knowledge-construction measure. The test contained narrative and expository passages, which were followed by questions with multiple-choice answers. Students' extended scale scores were used in analyses.

Students' overall reading comprehension for literary text was also assessed using grades from students' Reading/Language Arts class. Students' language arts grades were obtained from the school district; the third marking period in the 2008-2009 school year and used for analyses. Grades ranged from A to F, and according to the district's Student Handbook of 2008-2009, a grade of A = 90 - 100%, B = 80 - 89%, C = 70 - 79%, D = 60 - 69%, and F = 0 - 59%. Letter grades were converted to numerical codes (A = 5, B = 4, C = 3, D = 2, and F = 1) for statistical analyses.

Procedures

A battery of instruments and questionnaires was administered to the participants to assess the variety of motivational and cognitive constructs in reading as just described. Assessments were administered to students during their Language Arts class period by their teachers who participated in several training sessions. Trained graduate research assistants were also present in each classroom to observe and assist the teachers while the assessments were being administered. The data were collected in April 2009.

Phase I Results

Canonical correlation analyses were conducted to examine the first research question concerning multivariate relationships among the eight information text motivation variables and six achievement variables.

Assumptions

Univariate and multivariate assumptions (outliers, normality, linearity, homoscedasticity, multicollinearity, and singularity) were assessed by evaluating means, standard deviations, frequency range, histograms, normal Q-Q plots, detrended Q-Q plots, boxplots, residual scatterplot, correlation matrix, tolerance values, and standardized values of skewness and kurtosis for each variable.

Means, standard deviations, frequency range, standardized values of skewness and kurtosis, box plots, normal Q-Q plots, detrended Q-Q plots, and histogram plots were examined to assess normality assumptions for each variable. All variables appeared to have normal distribution and did not appear to have any normality issue, except information text literal text comprehension and language arts grade; these variables showed high negative skewness. Linearity and homoscedasticity were assessed through inspection of bivariate scatterplots. All variables appeared to meet the assumptions and did not seem to be deviating in any curvilinear fashion, and showed randomly scattered points throughout the graph.

Outliers were examined to identify whether aberrant cases existed that could potentially affect the normal distribution of variables. Based upon visual inspection of outliers through the scatterplots, no apparent outliers were identified in the scatterplot. However, we further evaluated multivariate outliers by examining the numerical statistics of studentized residuals, leverage values, Cook's D values, Mahalanobis values, and standardized *DFBETA* values. Results showed that there were cases found in each instance of assessing aberrant cases for each of the mentioned statistics. However, it appears that no one case has met all of these criteria to be considered a case that would be too problematic or having too high of leverage, discrepancy, or influence. As such, no case was removed from further analyses.

Initial inspection of multicollinearity through the correlation matrix did not reveal any multicollinearity within the data; all r -values were below .90. Further examination of the tolerance values from the collinearity diagnostics showed that values were greater than .10, thus indicating lack of multicollinearity issues for all variables (Tabachnick & Fidell, 2007). Singularity was assessed through calculation of squared multiple correlation (SMC) values. Such values should be less than the .99 through .9999 range, because as values approach 1, they explain more and more of the same variance. Absence of singularity was found after calculation; all variables had SMC values less than .9999. This indicates that these variables are accounting for independent variances and that the whole is not equal to the sum of parts.

Issues with normality were identified among two variables (information text literal text comprehension and language arts grade) in the assessment of the assumptions. Square-root transformation is one procedure that can be utilized to attempt to reduce skewness and remedy normality issues. Using guidelines outlined by Tabachnick and Fidell (2007), and Cohen, Cohen, West, and Aiken (2003), square-root transformation procedures were performed on the information text literal text comprehension, and language arts grade variables. Although skewness was reduced subsequent to transformation, issues arose such that scales of both variables were inverted and reversed correlational values. Cohen et al. (2003) suggest keeping the original variables if transformations pose issues. The reversed directionality of relationships did not support our theoretical framework, and thus, we decided to keep the original variables to reflect the truer nature of the data.

The motivation and comprehension variables were assessed for univariate and multivariate assumption violations and found to be acceptable. The means and standard deviation of the motivation and comprehension variables are shown in Table 1.

Descriptive Statistics

For information text motivation, the means, standard deviations, and correlations are presented in Table 1. As the scale ranged from 1 (low) to 4 (high), it is evident that students' intrinsic motivation was 1.95, which is lower than the midpoint of 2.5 for this scale, showing that the students disliked these information texts. Consistent with this, students were also avoidant of these texts with a mean of 2.75, which was higher than the midpoint. In contrast, students showed positive self-efficacy with a mean of 3.01 and stated that their peers valued their opinions about text with a mean of 2.69. Students reported both valuing and devaluing the texts at equal levels. Correlations were positive among affirming motivations of intrinsic motivation, valuing, self efficacy, and peer valuing. Correlations of these affirming motivations were negative with undermining motivations of avoidance, devaluing, perceived difficulty, and peer devaluing.

Cognitive measures correlated positively with each other. It is noteworthy that standardized reading comprehension correlated negatively with intrinsic motivation for information text and negatively with avoidance. In other words, in comparison to low achievers, high achievers disliked the texts but did not avoid them systematically. Positive correlations were found between cognitive variables and affirming motivation variables, with two exceptions. Intrinsic motivation was negatively correlated with cognitive variables, and valuing was not significantly correlated with the cognitive assessments. Generally, undermining motivation variables showed negative correlation with cognitive variables as expected, although devaluing showed no significant associations, except a negative correlation with grades.

Canonical Correlation Results

Canonical correlation analyses were conducted to examine the multivariate relationships among the eight motivation variables and six cognitive variables. Canonical correlation is a multivariate method which assesses the relationships between two sets of variables. Canonical correlation may be used to assess the number of dimensions along which two sets of variables are related (Tabachnick & Fidell, 2007). Applied here, the motivation items and comprehension items may be interrelated in a number of different ways beyond their bivariate associations. Canonical correlation extracts the multiple dimensions along which the sets are related by deriving canonical variate pairs, and the associations between the canonical variate pairs form the canonical correlations.

Canonical correlation analyses comprise a set of independent and dependent variables, a canonical variate for each set of variables, canonical loadings between each variable and its variate, and a canonical correlation between the two variates. A canonical variate is the latent linear combination of variables that represent the weighted sum of two or more variables within each set of the independent and dependent variables; it is similar to a factor in a factor analysis. The structure canonical loadings are examined to identify and determine the contribution of variables to each variate, and interpret each variate based on the inclusion and loadings of variables. The canonical loadings are the simple linear correlation between each variable and its respective canonical variate, and can be thought of like factor loadings in factor analysis. Variables with structure loadings of .30 or higher are considered salient and should be retained for interpretation within the variate; variables with structure loadings less than .30 account for less than 10% of the variance, thus do not show meaningful contribution to the variate (Hair, Black, Babin, & Anderson, 2009; Tabachnick & Fidell, 2001). The canonical correlation is the

bivariate correlation between the two canonical variates (independent and dependent variates) in each set, and represents the overall strength of relationship between each set of canonical variates. The set of independent and dependent variables were selected based on our theoretical framework, research questions, hypotheses, and prior established research findings. For example, our research questions focused on the extent to which multiple patterns of students' motivation may relate to their achievement in reading, and thus our independent variables included the eight motivation variables and our dependent variables included the six achievement variables.

Results from the canonical correlation analysis revealed three statistically significant sets of canonical correlations of six possible canonical functions (the number of variables in the smaller set of variables) with each set having p -values less than .05. Results from the significant sets are shown in Table 2. The first set of canonical function showed a canonical correlation of $R_c = .53$ between the motivation variate and comprehension variate ($p < .001$), with $R_c^2 = .28$ representing the amount variance shared between the sets of motivation and comprehension variables. The second statistically significant set of canonical function demonstrated a correlation of $R_c = .18$ ($p = .001$), with 3% of the variance shared between the respective canonical variates. The third set of canonical correlation had $R_c = .15$ ($p = .037$), with 2% of the variance shared between the respective canonical variates. Overall, the set of motivation items and the comprehension items were interrelated along three significant dimensions, resulting in three canonical correlations. Examination of the redundancy index, the proportion of variance explained by the opposite set of variables, revealed that the motivation variates from the three statistically significant canonical correlations together explained approximately 17% of the variance in the achievement variables. Although this may represent a somewhat small amount of variance being explained, it should be noted that the redundancy index is affected by both the

squared canonical correlation and the variate's own shared variance. The second and third canonical correlations were low, thus affecting the cumulative redundancy index. Further, a total redundancy value of 10% or higher is considered meaningful for interpretations (Pedhazur, 1982). Taken together, the level of statistical significance, the size of the canonical correlation, and the magnitude of the redundancy index indicate that the results are adequate to make meaningful interpretations (Hair et al., 2009; Pedhazur, 1982; Tabachnick & Fidell, 2007).

Standardized canonical coefficients and structure canonical coefficients (or canonical loadings) are two indices that can be used to define and interpret each canonical variate. Similar to beta weights in regression, the standardized canonical coefficients are the weights of each variable in the canonical function that defines the canonical variate, representing the individual contribution of each variate to its respective variate with the remaining variables partialled out. The structure coefficients (also known as canonical loadings) are the simple linear correlation between the variables and its canonical variate. Structure canonical loadings are preferred over standardized canonical coefficients when variables are intercorrelated and because canonical coefficient weights can vary for different samples due to the weights that are computed to maximize the canonical correlation from the observed variables within a specific sample.

Results specific to the three significant pairs of canonical variates appear in Table 2, and the corresponding coefficients are reported in Table 3. To interpret these findings, the loadings of the variables for each canonical variate are examined. These associations are then interpreted for each variate pair.

Structure of the first canonical dimension. In the motivational variate of the first canonical correlation, the highest weight was accorded to perceived difficulty, which had a loading of .83. The second highest weight was for self-efficacy, which had a relatively high

negative loading of $-.67$, as expected. Because these two variables were predominant in this variate we named this portion of the canonical correlation as 'Perceived Difficulty.' Although the respective peer value variables had loadings congruent with this variate named 'Perceived Difficulty,' intrinsic motivation did not load in the expected manner with this variate. Intrinsic motivation loaded in the same direction as perceived difficulty, showing that students with high intrinsic motivation were reporting high perceived difficulty. This finding is contrary to much research showing positive relations of intrinsic motivation with achievement, suggesting that high-achieving students with low perceived difficulty for reading were reporting low intrinsic motivation for reading these texts, and students with high intrinsic motivation had lower achievement scores. However, we hypothesized that this inconsistency was due to the fact that the motivation questionnaires addressed information book reading, and that motivation questionnaires addressing literary reading may not display this apparent anomaly. This hypothesis was investigated in Phase II of the study using motivation questionnaires based on literary text, rather than information text reading questionnaires.

Examining the cognitive variate reveals that all variables were similarly loaded at about $-.80$. This shows that the comprehension variate was a global reading comprehension construct. Only grades loaded lower at $-.60$, showing that other factors such as conscientiousness and cooperation affected grades in addition to cognitive competence. Thus, we named this variate 'Low General Comprehension.' The canonical correlate is represented as 'High Perceived Difficulty with Low General Comprehension.' Figure 1 shows a pictorial representation of this relationship.

Note that in naming the canonical correlates we referred to a motivational scale, in this case perceived difficulty, and the scoring level of students who are high on the scale in the

canonical correlation. In this structure, students with high perceived difficulty (finding the texts hard) are high on this scale. Likewise, we refer to a cognitive scale, in this case general comprehension, and the scoring level of students who are high on the scale in the canonical correlation. Because the cognitive variables are loaded negatively on the scale, a high score on a cognitive variable is placed at the bottom of the scale. In this situation, a student with high score on the reading test of Gates-MacGinitie, for example, would have a low position on the scale in the canonical correlate. Conversely, a student with a low score on the reading test of Gates-MacGinitie, for example, would have a high position on the scale in the canonical correlate. As reported, the two variates are correlated positively at .53. In this situation, a student with high placement on the variate represented by perceived difficulty is likely to have a low score on the variate represented by general comprehension. To depict this association we added the descriptors of 'high' to perceived difficulty and 'low' to general comprehension. We follow this procedure for naming each of the canonical correlates.

Structure of the second canonical dimension. The motivational variate of the second canonical correlation was self-efficacy. It was loaded negatively on its variate at -.46. In other words, low self-efficacy was placed at the top of the scale of this variate. Thus, we named this variate as 'Low Self-Efficacy.' The cognitive variate of this canonical correlation was comprised of two cognitive tests and grades. The test of higher information text comprehension loaded at -.40 and information text comprehension inferencing loaded at -.31. Following the previously described procedure, we named this variate as 'Low Information Text Comprehension.' Thus, the canonical correlate was named 'Low Self-Efficacy with Low Information Text Comprehension.' It is noteworthy that grades in Reading/Language Arts loaded in the opposite direction at .64, showing that high grades were associated with lower information text

comprehension competencies. This association was not reflected in the zero order correlation of grades and higher information text comprehension which was 0.34 ($p < .01$). This is due to the fact that this variate was formed statistically after the general positive association of grades and information text comprehension was controlled.

This second canonical correlation, as shown in Figure 2, represented a genre-specific form of self-efficacy. After the first global pattern of high perceived difficulty and low general comprehension was accounted for statistically, there was another statistically significant pattern, which was that low self-efficacy was correlated with low information text comprehension.

Structure of the third canonical dimension. The motivational variate in the third canonical correlation was represented by relatively high positive loadings in peer value (.75), intrinsic motivation (.58), value (.52), and self-efficacy (.32). These were all affirming motivations. They were appropriately complemented by negative loadings of peer devalue (-.52.) and avoidance (-.45). We represented this pattern by naming the variate as ‘High Affirming Motivation.’ The comprehension variate was comprised of grades (.34) and fluency (.31), which are positively loaded. We named this variate ‘High Reading/Language Arts Grades’ due to the power of grades in students’ lives. Thus, the canonical correlate was named ‘High Affirming Motivation with High Reading/Language Arts Grades.’ The multivariate relationship in the third canonical correlation is depicted in Figure 3. As a third canonical correlate, this pattern was orthogonal (laid on top of) with the prior two dimensions of canonical correlation in this analysis.

Phase I Summary

A brief summary of the results found in the first phase of the study will be provided here. A fuller and more detailed discussion of the results will be provided in the final discussion

section in order to compare and contrast results from Phase I and Phase II. We will interpret the meaning of results from the first phase in comparison to the second phase in the latter section. In Phase I, the first canonical correlation was characterized with an undermining motivation associated with an overall achievement in reading. Specifically, perceived difficulty was the strongest variable in the motivation set and simple comprehension was the strongest achievement variable. The full achievement variate included simple passage comprehension, reading fluency, information text literal comprehension, information text knowledge construction, information text inferencing, and Reading/Language Arts grades.

The second pattern was that ‘Self-Efficacy’ specific to information text was associated with achievement on a challenging measure of information text comprehension. This pattern featured a specialized form of self-efficacy associated with comprehending information text that required knowledge building and inferencing.

The third canonical correlation was characterized with positive motivation scores associated with general achievement with a substantial weight for grades in reading. Intrinsic motivation and peer value of reading were the strongest variables in the motivation set and language arts grades was the strongest comprehension variable in the achievement set. This third pattern was termed ‘General Interest’, representing the finding that many positive motivation variables including intrinsic motivation, valuing, and peer value of reading were associated with grades in Reading/Language Arts and fluency, which consisted primarily of performance in literary reading.

In Phase I, intrinsic motivation was negatively correlated with all the achievement variables in the first canonical correlate. Due to this, intrinsic motivation loaded in the same direction as perceived difficulty in the first canonical correlate. In this situation, high intrinsic

motivation was associated with a low score in the multivariate cognitive variate. These findings are inconsistent with the existing literature, which shows that intrinsic motivation is correlated positively with achievement. Additionally, the third canonical correlate showed that intrinsic motivation positively correlated with achievement variables not specific to information text (i.e., reading fluency, and Reading/Language Arts grade). We hypothesized that this was attributable to the fact that intrinsic motivation was measured with respect to information text comprehension in Phase I, whereas it is often assumed to be measured with respect to literary text in studies of motivation.

We conducted Phase II to investigate whether the multivariate pattern would change when we measured motivation for reading literary books. We expected that the most proficient readers would have high intrinsic motivation for reading literary books. The question for Phase II was: To what extent will multivariate relations appear between constructs of motivation for reading literary text and multiple measures of achievement for both information text and literary text?

Phase II Method

Participants

The participants were part of the REAL study, an investigation of instructional support, motivations, cognitions, and competencies required for reading comprehension of middle school students. Participants in the study included seventh-grade students in a rural area of a mid-Atlantic state. Students in the REAL study were predominantly European American, and represent a wide range of socioeconomic status.

Participants in Phase II of the study comprised approximately 86% European American, 10% African American, 2% Asian, and 2% Hispanic students, with approximately equal

numbers of male and female students. Thirteen percent of the students qualified for free or reduced lunch. The sample included 225 seventh-grade students, and was representative of the population of the county, which is predominately European American (approximately 6% of this population is African American). All students were enrolled in traditional Reading/Language Arts classrooms that had an anthology exclusively containing literary text.

Four teachers in two middle schools taught the students in this phase of the study. There were two male and two female teachers and all of the teachers were European American. Their years of teaching experience ranged from 9 to 32 years. Years of teaching experience in the county ranged from 3 to 22 years. All teachers held a bachelor's degree in elementary education for grades 1 - 6 and two teachers held master's degrees.

In Phase I of this study, students completed all the assessments in April 2009. In Phase II of this study, students completed motivation assessments in June 2009 and achievement variables were from the April 2009 assessment. Students completed two motivation measures and five comprehension tests that occurred in 90-minute sessions. Students in Phase II participated in Phase I eight weeks earlier in completing the achievement measures in April.

Measures

Reading motivation. Motivation in the second phase of the study was measured using the Adolescent Motivations for School Reading questionnaire (AMSR) (Coddington, 2009). The AMSR is a self-report instrument developed to assess middle school students' motivation for school reading (e.g. fiction, nonfiction, Web sites, magazines, newspapers) across six aspects of motivation, which comprised three affirming motivations and three undermining motivations for reading. The affirming motivations included intrinsic motivation, efficacy, and prosocial

interactions in reading, while the undermining motivations included avoidance, perceived difficulty, and antisocial interactions in reading.

Items representing the six aspects of motivations were conceptualized and developed from several motivation research and theoretical perspectives. As described above, measures of intrinsic motivation, avoidance, self-efficacy, and perceived difficulty were defined and developed based on previous research in these areas. The social motivation construct of prosocial interactions in school reading was conceptualized as the behavior, goal, or desire to help, share opinions, or demonstrate interest in other classmates' school reading, while antisocial interactions included behaviors, goals, or desires that reflect negative attitudes towards school reading including teasing, disrespecting, or convincing classmates that reading for school is a waste of time (Wentzel, Filisetti, & Looney, 2007). Again, it is important to note that the affirming and undermining motivation constructs are not direct opposites of each other; items on an affirming motivation scale are not simply reversed in wording on an undermining scale. Different items were included on different scales to reflect the multifaceted nature of the six aspects of motivation. Cronbach alphas for the motivation scales were: intrinsic motivation = .92, avoidance = .75, self-efficacy = .89, perceived difficulty = .92, prosocial interactions = .80, and antisocial interactions = .84 (Coddington, 2009).

Reading achievement. Similar to Phase I, achievement for the second phase of the study was assessed using six measures that examined students' comprehension and achievement in reading information text and literary text including: (a) knowledge construction from information text, (b) reading fluency, (c) literal text comprehension, (d) inferencing in information text, (e) simple passage comprehension, and (f) Reading/Language Arts class grades. As described above, students' knowledge building (Cronbach alphas ranged from .65 to .72), literal text

comprehension (alphas ranged from .73 to .76), and inferencing comprehension (alphas ranged from .65 to .73 for the three test forms employed) were assessed with researcher-developed measures; reading fluency, and simple passage comprehension were assessed using the Woodcock Johnson III Reading Fluency Test, and the Gates-McGinitie Comprehension Test, respectively. Students' reading comprehension was also assessed with the grades from students' Reading/Language Arts class. Assessments of students' reading comprehension and achievement occurred in April 2009.

Phase II Results

To answer the second research question, we explored the relations of motivation for literary text and achievement in reading. A particular focus was whether students' intrinsic motivation for literary reading in school would correlate differently with other motivations and achievement than intrinsic motivation for information books.

Assumptions

Univariate and multivariate assumptions (outliers, normality, linearity, homoscedasticity, multicollinearity, and singularity) were assessed for the school motivation variables investigated in this study. All motivation variables in this set met the assumptions of canonical correlation and were retained for further analyses. The means and standard deviation of the motivation and comprehension variables are shown in Table 4.

Descriptive Statistics

For school reading motivation, the means, standard deviations, and correlations are presented in Table 4. As the scale ranged from 1(low) to 4 (high), it is evident that students' intrinsic motivation of 2.59 was slightly higher than the midpoint of 2.5 for this scale. In comparison to the midpoint, students showed positive self-efficacy with a mean of 3.19 and low

perceived difficulty with a mean of 1.87. Prosocial goals were slightly positive (2.64). Avoidance was also below the midpoint (2.39) and antisocial goals in reading relatively low at 1.62. Correlations were positive among affirming motivations of intrinsic motivation, self efficacy, and prosocial goals. As expected, correlations of these affirming motivations were negative with undermining motivations of avoidance, perceived difficulty, and antisocial goals.

Cognitive measures correlated positively with each other. Positive correlations were found between affirming motivation variables and cognitive variables, while negative correlations were found between undermining variables and cognitive variables. For example, standardized reading comprehension correlated positively with intrinsic motivation for literary text and negatively with avoidance.

Canonical Correlation Results

Results from the canonical correlation analysis revealed one statistically significant canonical correlation. Results from the significant sets are shown in Table 5, and the corresponding coefficients are reported in Table 6. The significant canonical correlation showed a correlation of $R_c = .59$ between the motivation variate and comprehension variate ($p < .001$), with a 35% shared variance between the respective sets of canonical variates as seen by the R_c^2 value.

Examination of the redundancy index, the proportion of variance explained by the opposite set of variables, revealed that the motivation variate from the statistically significant canonical correlation explained approximately 19% of the variance in the comprehension variables. Overall, the set of motivation items and the comprehension items were interrelated along a significant dimension, resulting in one canonical correlation.

Structure of the first canonical dimension. The first variate, shown in Figure 4, was comprised of perceived difficulty with a high loading of .97, and self-efficacy which had a relatively high negative loading of -.85. The social variables loaded consistently with the perceived difficulty variable such that prosocial goals loaded negatively (-.53) and antisocial goals loaded positively (.44) with the variate. As it predominated over other loadings, we named this variate Perceived Difficulty. Due to the positive loading, we added 'High' to the name. Thus, the motivational variate was named 'High Perceived Difficulty.' The second variate included 6 achievement variables with similar loadings of about -.45, all loaded negatively. Thus, using previously described conventions, this was named 'Low General Comprehension.' The canonical correlate was 'High Perceived Difficulty with Low General Comprehension.' It can be noted that intrinsic motivation loaded in the expected direction with other affirming motivation variables. Its sign was in the same direction as efficacy and prosocial goals, and was opposite to perceived difficulty, avoidance, and antisocial goals. This analysis shows that the apparent anomaly of intrinsic motivation was resolved. We provide interpretation and discussion of these findings in the following section.

Discussion

The present study investigated the multivariate relationships between several aspects of motivation and achievement in reading. More specifically, we examined the extent to which there are multivariate relationships of motivation and achievement, and we examined motivation for reading information texts and literary texts separately. In the psychological literature on motivation for reading, the vast majority of studies present motivation constructs as associated with cognitive or achievement variables (Guthrie & Coddington, 2009). Very often these associations are simple, zero order correlations or multiple regressions of several motivations on

one cognitive or achievement variable. Under these conditions, researchers report that several motivations are simultaneously associated with reading achievement. This shows that motivation is multifaceted. Students simultaneously possess several goals, beliefs, and dispositions that impact their achievement. This shows a many (motivations) to one (achievement variable) relationship.

The present study expanded on the existing literature by showing that there are multiple patterns of relationship between sets of motivations and sets of cognitive variables in reading. We proposed that there may be multiple relationships of many (motivations) to many (achievement) varieties that operate simultaneously. Furthermore, we expected a difference in these patterns for the two text types of literature and information text.

For information text, the prominent pattern between motivation and achievement was that the motivation of perceived difficulty, along with a cluster of motivations, was associated with the full set of six cognitive variables measured in this study. A canonical correlation (multivariate correlation) of .53 showed that students with high perceived difficulty, who lacked confidence in reading information books, scored relatively low on all achievement measures, including a standardized reading comprehension test and grades that represents pattern number 1 in the first phase of the study. Next, the simultaneously operating pattern 2 was that students showed a specific form of self-efficacy for information texts. Beyond the belief in one's capacity to read well, the form of self-efficacy consisted of belief in competence in reading information books to gain knowledge. This specific reading self-efficacy was correlated with the assessment that required students to gain knowledge and draw inferences from challenging information texts in science. This pattern appeared after pattern 1 had been removed statistically. It is plausible that students may acquire such specialized motivation because successful comprehension of

information texts demands a high amount of background knowledge, and skill for unlocking the structure of these texts (McNamara, O'Reilly, Best, & Ozuru, 2006; Meyer & Poon, 2001; van den Broek & Kendeou, 2008).

The multivariate analysis of motivation and cognition for the genre of information text also yielded pattern 3, which consisted of a generalized positive motivation for reading that was associated with grades in Reading/Language Arts and reading fluency. As these grades are usually awarded for achievement in reading literary texts, this pattern shows that students' intrinsic motivation (enjoyment of reading) and positive peer valuing of reading were correlated positively with grades and fluent reading. This pattern appears to represent generalized motivational positivity for reading. This positivity is tied to reading fluency, and Reading/Language Arts teachers tend to reward it with high grades.

For literary text, the multivariate analysis of canonical correlation between motivation and achievement yielded a single pattern. The prevailing relationship was that perceived difficulty, along with self efficacy, was correlated with all the achievement variables which were led in statistical strength by simple passage comprehension. The direction of the correlation was negative, with high perceived difficulty occurring for students who scored relatively low on the cognitive measures. This pattern is similar to the first pattern for information text motivation and achievement.

A major finding in this study was that different numbers of multivariate associations of cognition and motivation (canonical correlations) were observed when information text was referenced in the motivation questionnaires compared to when literary text was referenced in the motivation questionnaires. Three multivariate patterns were observed for information text reading, whereas one pattern was observed for literary text reading. Our proposed explanation

for this difference is based on the distinctiveness of the cognitive attributes required for reading these two types of text. It is known that information text is typically abstract, heavily weighted with difficult vocabulary, and complexly structured (Best, Floyd, & McNamara, 2008). These attributes place cognitive demands on the reader for identifying text structures and reasoning abstractly to derive meaning during reading (Cote, Goldman, & Saul, 1998). In comparison, literary text comprehension places lower reliance on these cognitive processes and more reliance on identifying human motives and making inferences about events in action scenarios (e.g., plots) (Yuill & Joselyne, 1988).

It is plausible that the distinctiveness of information text comprehension led to multiple patterns of relationship between achievement and motivation in this study. The first multivariate relationship was the same for the two genres, consisting of the motivations of perceived difficulty and self-efficacy being related to a wide range of reading achievements in multiple assessments. These achievements were characterized by the cognitive processes of using general background knowledge, retrieving common word meanings, and integrating simple text. Such processes are common to both literary and information text reading (van den Broek, Rapp, & Kendeou, 2005).

The second multivariate relationship appears for information text consisting of self-efficacy being associated with a specific form of challenging information text comprehension tasks. This suggests that a form of self-efficacy is specialized to connect to cognitive demands that are distinctly present in information text. Such cognitive demands consist of identifying text structures (cause-effect, compare-contrast, and others), and reasoning abstractly using newly acquired, text-based information (van den Broek & Kendeou, 2008). Students who are especially capable of these processes will have high achievement and relatively high self-efficacy in

reading information text. Thus, the second multivariate pattern in information text reading reflects a particularized self-efficacy that is attached to successful performance in relatively unusual processing required by information text.

The third pattern in information text motivation is a generalized, positive set of motivations associated with literary text comprehension as reflected in grades. This pattern emerged because a substantial amount of variance in literary text comprehension had not been explained by the first two multivariate patterns. Because those patterns were heavily loaded onto information text comprehension, and literary text comprehension is only moderately correlated with information text comprehension, variance in literary comprehension remained to be associated with motivation constructs. As shown in the correlations in this study and other research (Wigfield & Tonks, 2002), literary text comprehension is positively correlated with intrinsic motivation (Gottfried, Fleming, & Gottfried, 2001), valuing (Jang, 2008) and peer relations (Wentzel, Filisetti, & Looney, 2007). In this multivariate analysis, this same finding appeared wherein literary text comprehension was associated with those three constructs in the third multivariate pattern.

Thus, the relatively unique properties of information text comprehension which distinguish it from the more common properties of literary text comprehension generated several multivariate patterns of motivation and cognition for information text. However, only one multivariate pattern appeared for literary text because literary text comprehension relies on relatively generalized cognitive processes which are positively associated with a relatively large number of motivational constructs including intrinsic motivation, valuing reading, and shared peer values in reading.

The prominence of perceived difficulty in the patterns of connection with achievement for these middle school students is intriguing. For both genres this motivation prevailed in the first multivariate correlation. In addition, it was quite highly associated with self-efficacy and moderately associated with intrinsic motivation and peer relationships. These findings confirm studies conducted from the three theoretical perspectives of social-cognitive theory (Bandura, 1997; Schunk & Pajares, 2009), self-determination theory (Ryan & Deci, 2009), and socialization theory (Wentzel, 2009). The simple correlations showed that the central constructs in these theories, consisting of self-efficacy, intrinsic motivation, and peer value derived from the three theories respectively, all correlated significantly with each of the achievement measures. The finding that perceived difficulty had the highest strength of association with achievement indicated that perceived difficulty was simply stronger in its connection to achievement. In addition, effects of other motivations on achievement may have been mediated through perceived difficulty. It may be that students are focusing on how hard information texts are to read rather than how interesting.

Perceived difficulty is closely aligned with self-efficacy, but is not identical to it. In factor analytic studies (Guthrie, Coddington, & Wigfield, 2009), these variables form two factors. This shows that a substantial minority, consisting of approximately 10% of the students, are high on self-efficacy and also high on perceived difficulty. Such students believe that they are good readers, but that they are not proficient at reading certain texts in certain situations. Because the constructs of perceived difficulty and self-efficacy were both highly reliable, the differences between them are not due to inconsistency in students' responses. A second distinction between the variables is that self-efficacy may carry more social desirability and familiarity, leading students to be less accurate in responding to self-efficacy questions than

perceived difficulty questions. On self-efficacy questionnaires it is typical to ask students “Are you a good reader?” Students feel compelled to answer in the affirmative, perhaps despite their actual viewpoints. In contrast, in the perceived difficulty questionnaire, the question, “Do you find books difficult to read?” is less familiar and less loaded with expectations for a particular answer, leading students to be more candid in their replies. This could be a reason that perceived difficulty explained more variance in achievement than self-efficacy.

A developmental dynamic that could be related to the finding is that motivation for information text showed three multivariate patterns, whereas motivation for reading literary text showed a single pattern, is based on the role of information text in schools. Students in elementary grades 1 - 5 are taught how to read predominantly through stories (Duke, 2000). Thus it is likely that good readers often grow to enjoy fiction and become intrinsically motivated to read this genre. However, when students enter middle school they confront a high volume of information texts in science, social studies, math, health, and other subjects. Such texts are dense, with high vocabulary load (Yopp & Yopp, 2000). Further, students may often have few motivational supports for reading (e.g., choice) in courses with these texts. Consequently, students in middle school predominantly state that they dislike information books read in school and some students seek to avoid reading them whenever possible (Guthrie, Klauda, & Morrison, in press). However, because school-based information text books are necessary for school success, students must devote more time and energy to reading them, despite their dislike for them. This circumstance sets up multiple motivations for reading. First, struggling readers find the information texts extremely hard and develop an aversion for them, whereas other students do not. Second, some students learn specific skills and knowledge that are specialized for information text and become confident in reading them, whereas other students do not (pattern

2). Third, students who enjoy reading and interacting with friends in general tend to read fluently and garner good grades in Reading/Language Arts classes which mainly use literary texts, whereas other students do not (pattern 3). Note that we are not proposing that there are three subsets of students. Rather, the multivariate correlations show that these three patterns are occurring simultaneously for all students in the sample.

In the case of motivation for reading literary text, the circumstances rarely arise for the same level of multiplicity. There is little need to develop motivations specialized to literary text, such as self-efficacy for information text, because students have read literary text for many years before middle school. Statistically there was little opportunity to observe a multivariate correlation related to a generalized positive motivation for reading literary text because that motivation (intrinsic motivation) was represented, although it was not dominant, in the first main pattern. In other words, in the main motivational pattern for literary text, students with high perceived difficulty were relatively lower achievers and those students tend to dislike the literary texts. On the other hand, students with high self efficacy were higher achievers and tend to enjoy the texts. Thus, enjoyment is connected to achievement more closely in literary text reading than in information text reading. For information text, many students achieve highly but dislike the texts (low intrinsic motivation). This rarely occurs in literary text reading.

We expected that motivation of literary text would relate to information text comprehension because it is likely that motivations for literary and information text are correlated moderately. Although this has not been explicitly investigated, evidence from this study shows that several motivation constructs including self-efficacy, perceived difficulty, peer valuing (prosocial), and peer devaluing (antisocial) were correlated with achievement in similar ways which were used in reference to information text and literary text.

Overall, the findings showed that the scales of perceived difficulty, self-efficacy, valuing, and devaluing for the two genres correlated quite similarly with the cognitive variables of information text comprehension. This was most apparent in the structures of the first canonical correlate in the two phases of the study, which addressed information text comprehension and literary text comprehension respectively. The one difference was that, as expected, self-efficacy for information text correlated specifically with information text comprehension in a distinct canonical correlation, while this did not occur for self-efficacy for literary text comprehension. Therefore, the lack of a canonical correlate of self-efficacy for literary text with information text comprehension suggests that there is some specialization in the connections of motivations and cognitions for reading, as proposed by the alignment hypothesis.

We initially expected that the more challenging information text would be associated with self-efficacy. In Phase I, after the general, prevailing relationship between all cognitive variables and several motivation variables featuring self-efficacy and perceived difficulty, self-efficacy was associated with the challenging measure of information text comprehension. Confirming our expectation, there was a specialized self-efficacy for information text comprehension that was not present for literary reading achievement motivation measured in Phase II.

We initially expected that intrinsic motivation would be associated positively with literary reading, though not with information text reading. This was confirmed in the data from Phase II. Intrinsic motivation was positively associated with the achievement variate that was defined by grades in Reading/Language Arts, which is focused on literary reading. In both phases, grades in Reading/Language Arts represented achievement in literary reading because the course consisted exclusively of reading literary texts such as novels, plays, legends, and

poetry. Note that in Figure 4 intrinsic motivation loaded negatively on the motivation variate, and the cognitive variables loaded negatively on the achievement variate. A positive multivariate correlation occurred between these sets. This means that a high score in intrinsic motivation was associated with high grades. It is also evident that intrinsic motivation for literary text correlated .32 ($p < .01$) with grades in Reading/Language Arts. Note that intrinsic motivation for reading information text was negatively associated with grades in Reading Language Arts in Phase I. Thus, the data confirmed expectation drawn from the alignment framework that intrinsic motivation would be positively correlated with literary reading, whereas self-efficacy would be positively correlated with information text reading, when other variables were accounted for.

Regarding some of the individual constructs, it is reasonable that avoidance is negatively associated with achievement in reading, and this concurs with recent work showing associations between behavioral engagement and achievement (Fredricks, Blumenfeld, & Paris, 2004). Likewise, perceived difficulty is negatively associated with achievement, which supports a body of findings in the self-efficacy literature (Schunk & Pajares, 2009). The negative correlation of intrinsic motivation and reading comprehension in the first phase of the study may possibly be explained by the fact that children learn to read through literature, which is positively associated with intrinsic motivation (Coddington, 2009). Our findings in the second phase support this conclusion. While fiction is easy reading, information books are dense, challenging in vocabulary, and associated with hard study. All these attributes of information texts combined with the fact that students find them irrelevant, non-social, and incoherent make these texts uninteresting.

In our examination of the specificity of motivation and achievement, we found that the dimensional level was confirmed. In our view, there are at least four main levels of specificity,

ranging from extremely broad to narrow and specific. At the broadest or more general level, motivation can be viewed as an attribute that refers to the collective beliefs, goals, attitudes, and emotional dispositions of an individual; and achievement can be generalized to reading, math, other school subjects, and extracurricular areas like sports and music (Won & Hon, 2010).

Research has shown that motivation and achievement are not well constructed in such a broad fashion. Motivation for reading and math, for example do not correlate highly (Gottfried, 1985). Additionally, it has been shown that achievement in reading and sports, likewise do not correlate highly (Won & Hon, 2010).

The next level of generality is at the domain level, consisting of more specific motivations such as self-efficacy and intrinsic motivation. At this level the individual might have, for example, high self-efficacy for all types of reading and/or intrinsic motivation for all types of reading or math. Likewise, because reading and math are distinguished from each other as different achievement areas, all aspects of reading are expected have higher correlations with each other compared to associations across domains. This domain level is widely assumed in studies of motivation (Wentzel & Wigfield, 2009), as well as psychometric studies of reading achievement (Paris & Stahl, 2005)

The third level of generality is at the dimensional level. At this level, there are distinct forms of reading achievement, such as reading literature versus information text (NAEP, 2010; Sweet, 2005); and there are distinct forms of motivation that differ in their directionality such as self-efficacy versus perceived difficulty (Chapman & Tunmer, 2003), or intrinsic motivation for reading versus avoidance of reading (Meece & Miller, 2001; Wigfield & Guthrie, 1997). Thus for motivation, distinctions can be made between attraction/affirming motivations (self efficacy

and intrinsic motivation) and aversion/undermining motivations (perceived difficulty and avoidance).

At the most specific level of generality is the situated characterizations of motivation and achievement. At this level, the individual may be uniquely motivated to read a particular text at a specific moment within a certain social context. Likewise, characterizing an individual's achievement in reading is limited to one text at one period of time in one social context. This level assumes there is no generality to reading motivation or achievement. For motivation, this level of generality is questioned by studies showing that motivation for reading a particular book is correlated with motivation for other types of books within the domain of reading (Guthrie et al., 2007). For achievement, this situated level of generality is questioned by studies showing that reading scores on different tests taken at different times are substantially correlated. (Archambault, Eccles, & Vida, 2010).

Our interpretation of the findings also relate to the levels of specificity in motivation and achievement. This is theoretically significant because it is one level more specific than the prevailing assumptions about the specificity in motivation research. In this study, the dimension of undermining motivations was distinguishable from the affirming motivations in the sense that the undermining motivations, predominated in the first canonical correlate for both information text and literary text. In other words, the undermining motivations of perceived difficulty, avoidance, devaluing were more highly predictive than the affirming motivations of intrinsic motivation and valuing for a variety of measures of information text comprehension. In addition, the affirming motivations were more highly predictive than the undermining motivations for literary text reading achievement. In addition, the dimensionality of achievement was shown by

the finding that measures of information text comprehension and literary text comprehension aligned with different aspects of motivations.

Implications

The findings reported in this article make a number of important contributions to both the motivation and literacy fields. We believe this is the first study to investigate systematically different aspects of middle school students' motivation and achievement for reading information and literary text. Through use of multiple measures of motivations for reading, we have documented quantitatively that there are a number of distinguishable patterns in adolescents' motivation as related to multiple dimensions of achievement for reading. Importantly, we found clear distinctions of how the positive and negative motivations are related differentially with various aspects of reading comprehension.

The inclusion of both undermining and affirming motivation variables provided us with the opportunity to investigate how these different aspects of motivation might relate to achievement in reading in different ways. A theoretical implication of the results is that prominent motivation theories, such as expectancy-value theory and self-efficacy theory, should incorporate relevant undermining motivations into their theoretical models. Theories that already include undermining motivations (e.g., self-determination theory with its construct of amotivation and goal orientation theory with its various avoidance goals) may need to expand the set of undermining motivations included in the theory. It is reasonable to say that for reading information books, comprehension is more influenced by students' undermining than by their affirming motivations. This is an important contribution to the literature because few studies have measured, in depth, students' undermining motivations.

The implications of this study for teachers or administrators are twofold. First, educators are advised to recognize that both aversion, characteristic of undermining motivation, and attraction, characteristic of affirming motivation, are potent motivations in reading. One source of aversion related to achievement is the difficulty of texts. When texts are seen by students as quite difficult, their reaction is to become de-motivated and avoid reading. These reactions inevitably decrease achievement. Therefore, strict attention to matching student ability with text difficulty is crucial if educators are to reduce students' aversion to information texts. A second implication is that educators should attempt to cultivate self-efficacy specifically for information text. Whether or not students are confident about their reading of literature, they may be discouraged in reading the school-based information texts due its difficulty, abstractness or lack of choice in classroom activities. Providing motivational supports for school-based information text reading is valuable for all students irrespective of their proficiency in literary reading.

Limitations and Future Direction

One limitation of our study was that although Phase II examined the genre of literary text for students' motivation, the majority of the achievement variables in this phase of the study included information text. Future investigations should aim to include more measures of achievement in literary text. The samples in this study were predominantly European American. Future investigations should aim to include a more diverse population to gain insight about whether similar relationships are found among other ethnicities. In the future, it would be of interest to investigate whether the patterns of relationships found in this study are similar for boys and girls. The cross-sectional nature of our study prevents us from examining how multiple aspects of motivation relate to multiple aspects of achievement over time. It is possible that the

complexity of the multivariate relations increases across the grades from 1 to 12 as texts increase in complexity and variety.

Conclusion

The analyses reported in this study have important implications for middle school students' reading in school. The finding that the undermining motivations predict students' comprehension more strongly than the affirming motivations suggests that teachers and other reading professionals face special challenges in motivating students to read information texts. We believe it likely is easier to increase the value, efficacy, and interest of reading than to reduce the devaluing, perceived difficulty, and avoidance of reading. For example, Jang (2008) successfully increased the value of reading by merely activating it through the suggestion that reading specific content will be important. However, to change students' undermining motivation toward reading, teachers will likely need to enable students to experience the benefits and uses of reading information texts in multiple concrete situations. Through repeated, positively affective and instrumentally powerful experiences with reading information texts, students may decrease their perceived difficulty and avoidance of reading these texts. Possibly at the same time, positive motivations such as intrinsic motivation, efficacy, and valuing of reading will increase. Further research on this hypothesis seems warranted.

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Tables

Phase I

Examining the Relationships of Motivation and Achievement for Reading Information Text

Table 1

Means, Standard Deviation, and Correlations of Reading Motivation for Information Text Books and Reading Achievement

Variables	Reading Motivation								Reading Achievement						M	SD
	1	2	3	4	5	6	7	8	9	10	11	12	13	14		
Reading Motivation for Information Texts																
1. Intrinsic	-														1.95	.60
2. Avoidance	-.67**	-													2.75	.68
3. Value	.66**	-.68**	-												2.71	.66
4. Devalue	-.70**	.85**	-.75**	-											2.71	.77
5. Efficacy	.28**	-.40**	.43**	-.39**	-										3.01	.60
6. Perceived Difficulty	-.08*	.39**	-.21**	.33**	-.72**	-									2.14	.70
7. Peer Value	.31**	-.32**	.41**	-.31**	.50**	-.28**	-								2.69	.60
8. Peer Devalue	-.02	.28**	-.18**	.25**	-.38**	.45**	-.58**	-							2.11	.60
Reading Achievement																
9. Simple Passage Comprehension	-.17**	-.10**	-.01	-.06	.29**	-.39**	.11**	-.23**	-						537.63	45.03
10. Reading Fluency	-.13**	-.11**	.00	-.04	.28**	-.34**	.16**	-.26**	.62**	-					111.54	17.64
11. I.T. Literal Text Comprehension	-.16**	-.06	-.01	-.03	.24**	-.31**	.09**	-.15**	.64**	.47**	-				80.47	17.79
12. I.T. Knowledge Construction	-.08*	-.12**	.05	-.08*	.33**	-.38**	.14**	-.22**	.70**	.55**	.54**	-			48.23	21.09
13. I.T. Inferencing	-.14**	-.07*	-.00	-.03	.29**	-.35**	.10**	-.19**	.67**	.51**	.55**	.59**	-		70.27	16.39
14. Language Arts Grade	-.08*	-.13**	.07*	-.09**	.18**	-.25**	.18**	-.20**	.37**	.36**	.32**	.34**	.29**	-	3.78	1.22

Note. N = 923; * $p < .05$; ** $p < .01$

Table 2

Statistics for Canonical Correlation Analysis of Reading Motivation for Information Texts and Reading Achievement

Correlation	R_c	R_c^2	Wilks's λ	X^2	df	p	Proportion of Variance (explained by opposite set)	
							Set 1	Set 2
1	.53	.28	.674	360.61	48	<.001	.059	.161
2	.18	.03	.930	66.11	35	.001	.002	.003
3	.15	.02	.960	37.78	24	.037	.005	.002

Table 3

Standardized Canonical Coefficients and Structure Coefficients for the Canonical Variates

Variable	1 st Set of Canonical Correlation		2 nd Set of Canonical Correlation		3 rd Set of Canonical Correlation	
	Standardized Canonical Coefficient	Structure Coefficient (Loading)	Standardized Canonical Coefficient	Structure Coefficient (Loading)	Standardized Canonical Coefficient	Structure Coefficient (Loading)
Reading Motivation for Information Text						
Intrinsic	.75	.32	-.97	-.21	.64	.58
Avoidance	.41	.25	-.42	-.19	-.51	-.45
Value	.05	-.04	.13	.10	.38	.52
Devalue	.03	.13	-.62	-.21	1.07	-.25
Efficacy	-.31	-.67	-.89	-.46	-.10	.32
Perceived Difficulty	.47	.83	.08	.27	.09	-.11
Peer Value	-.15	-.33	.71	.23	.40	.75
Peer Devalue	.02	.53	.16	-.15	-.42	-.52
Reading Achievement						
Simple Passage Comprehension	-.31	-.89	.47	-.02	-.99	-.34
Reading Fluency	-.27	-.79	-.09	-.09	.70	.31
I.T. Literal Text Comprehension	-.12	-.72	.17	.02	-.48	-.37
I.T. Knowledge Construction	-.15	-.79	-.79	-.40	.66	.16
I.T. Inferencing	-.20	-.78	-.45	-.31	-.13	-.19
Language Arts Grade	-.24	-.60	.85	.64	.42	.34

Note. I.T. = Information text

*Phase II**Examining the Relationships of Motivation and Achievement for Reading Literary Text*

Table 4

Means, Standard Deviation, and Correlations of Reading Motivation for Literary Text Books and Reading Achievement

Variables	Reading Motivation for Literary Texts						Reading Achievement						<i>M</i>	<i>SD</i>
	1	2	3	4	5	6	7	8	9	10	11	12		
Reading Motivation for Literary Texts														
1. Intrinsic	-												2.59	.78
2. Avoidance	-.72**	-											2.39	.72
3. Efficacy	.60**	-.50**	-										3.19	.64
4. Perceived Difficulty	-.41**	.46**	-.73**	-									1.87	.71
5. Prosocial Interactions	.65**	-.53**	.55**	-.42**	-								2.64	.57
6. Antisocial Interactions	-.47**	.39**	-.43**	.35**	-.38**	-							1.62	.65
Reading Comprehension														
7. Simple Passage Comprehension	.30**	-.29**	.45**	-.49**	.24**	-.20**	-						537.93	41.40
8. Reading Fluency	.25**	-.24**	.36**	-.40**	.17*	-.09	.66**	-					113.45	19.17
9. I.T. Literal Text Comprehension	.11	-.13	.29**	-.37**	.06	-.13	.60**	.44**	-				81.52	15.47
10. I.T. Knowledge Construction	.21**	-.24**	.42**	-.48**	.22**	-.19**	.72**	.52**	.56**	-			48.54	21.01
11. I.T. Inferencing	.17**	-.20**	.35**	-.43**	.20**	-.18**	.70**	.50**	.49**	.64**	-		69.23	17.39
12. Language Arts Grade	.32**	-.33**	.34**	-.39**	.30**	-.26**	.34**	.29**	.28**	.33**	.29**	-	3.86	.95

Note. N = 225; * $p < .05$; ** $p < .01$; I.T. = Information text

Table 5

Statistics for Canonical Correlation Analysis of Motivation and Achievement for Reading

Literary Text

Correlation	R_c	R_c^2	Wilks's λ	X^2	df	p	Proportion of Variance (explained by opposite set)	
							Set 1	Set 2
1	.59	.35	.570	122.37	36	<.001	.166	.190

Table 6

Standardized Canonical Coefficients and Structure Coefficients for the Canonical Variates

Variables	1 st Set of Canonical Correlation	
	Standardized Canonical Coefficient	Structure Coefficient (Canonical Loading)
Reading Motivation for Language Arts Class in School		
Intrinsic	-.10	-.60
Avoidance	.10	.61
Efficacy	-.22	-.85
Perceived Difficulty	.72	.97
Prosocial Interactions	.02	-.53
Antisocial Interactions	.02	.44
Reading Achievement		
Simple Passage Comprehension	-.32	-.51
Reading Fluency	-.17	-.42
I.T. Literal Text Comprehension	-.02	-.36
I.T. Knowledge Construction	-.29	-.48
I.T. Inferencing	-.10	-.42
Language Arts Grade	-.42	-.42

Note. I.T. = Information text

Figures

Phase I

Examining the Relationships of Motivation and Achievement for Reading Information Text

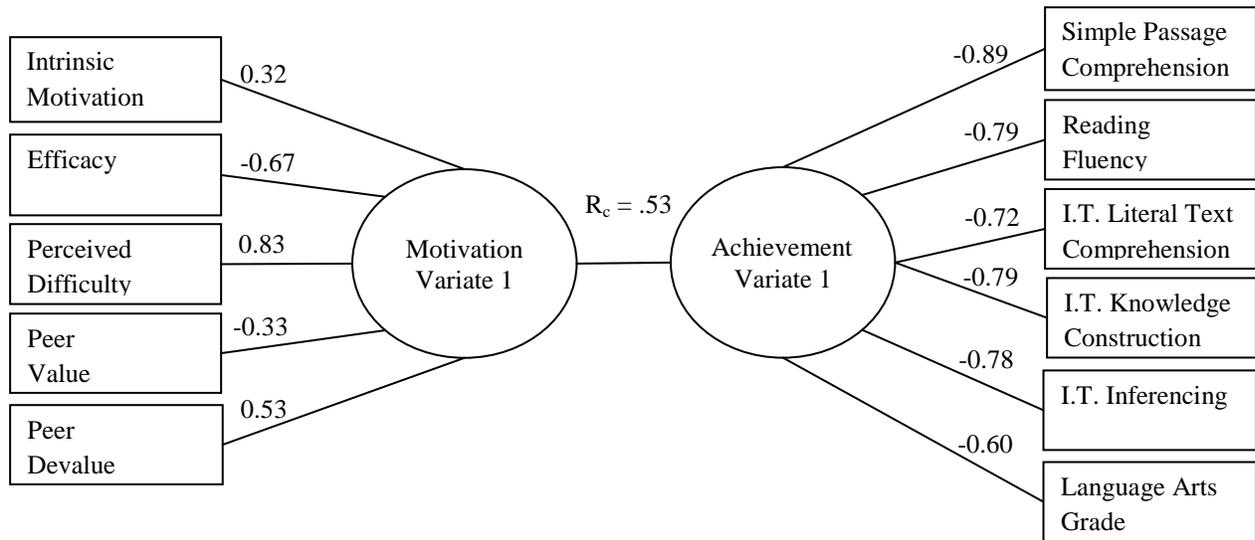


Figure 1. First set of canonical correlation with canonical loadings for reading information text.

Note. I.T. = information text

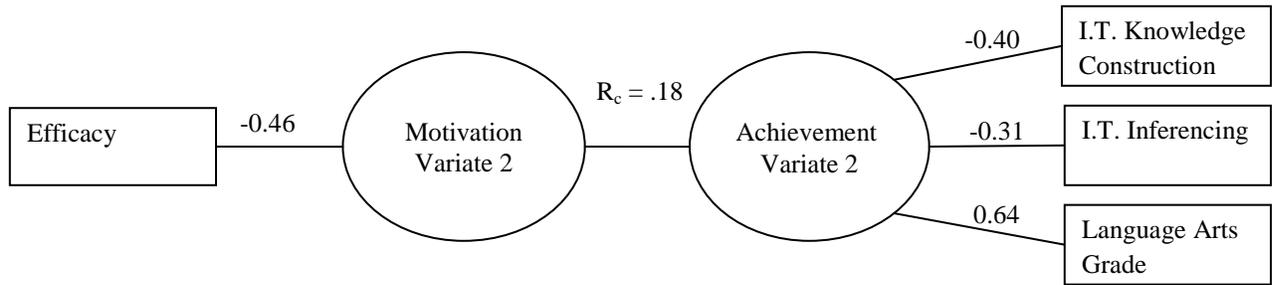


Figure 2. Second set of canonical correlation with canonical loadings for reading information text.

Note. I.T. = information text

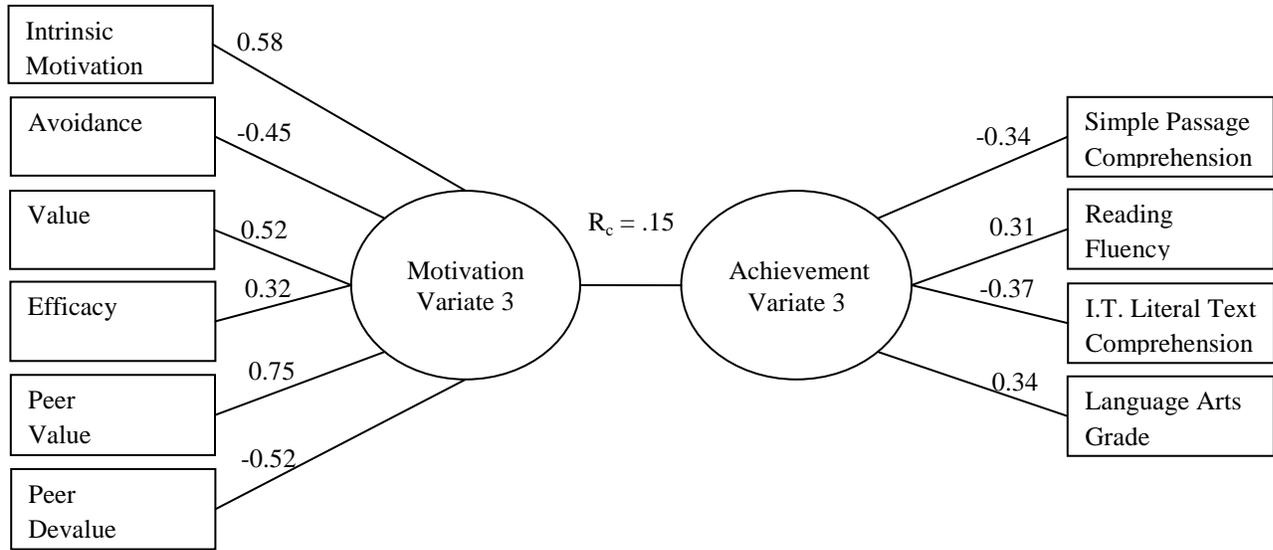


Figure 3. Third set of canonical correlation with canonical loadings for reading information text.

Note. I.T. = information text

Phase II

Examining the Relationships of Motivation and Achievement for Reading Literary Text

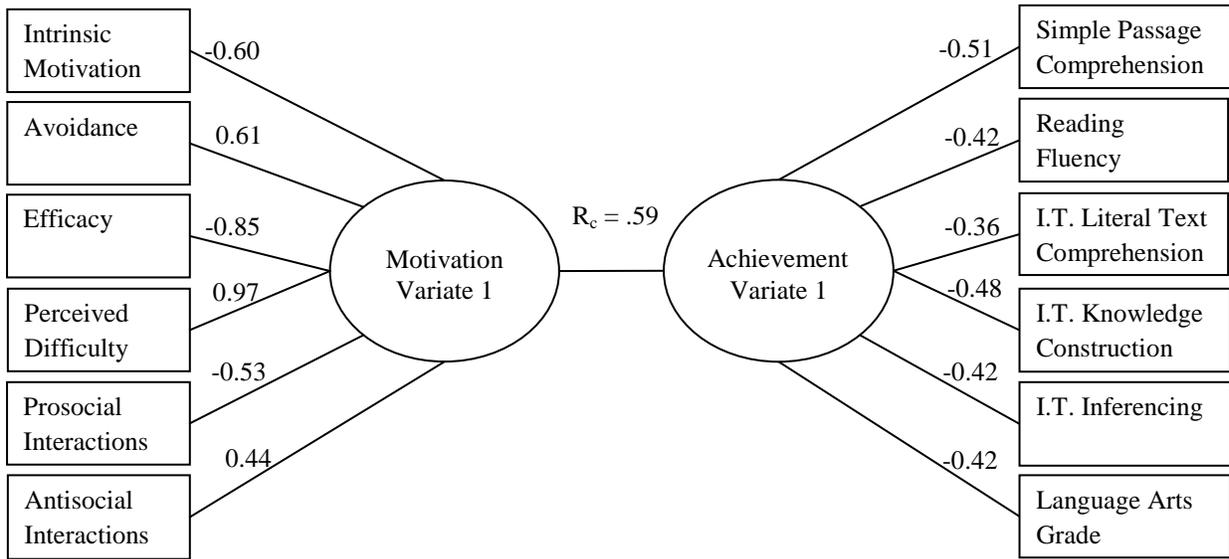


Figure 4. First set of canonical correlation with canonical loadings for reading literary text.

Note. I.T. = information text