Correspondence: Uriel Richman, Children's Specialized Hospital, URichman@childrens-specialized.org

---

43 Interactions of Decoding, Working Memory, and Mind Wandering on Reading Comprehension

Abigail Farrell[1], Paul T. Cirino[1], Marcia A. Barnes[2], Steven P. Woods[1]
[1]University of Houston, Houston, TX, USA.
[2]Vanderbilt University, Nashville, TN, USA

Objective: Reading is an important skill, and becomes even more so beyond elementary years, when the focus shifts to comprehension as a means of learning and understanding academic material across subjects (Kamil et al., 2008; Shanahan et al., 2010; Snow, 2002). One construct receiving much recent interest in research, especially that related to academic achievement, is mind wandering (MW). MW has been defined as "a shift away from a primary task toward internal information" (Smallwood & Schooler, 2006). Though it is known to be ubiquitous among people (McVay & Kane, 2012), there are numerous theories about why MW occurs, in different contexts, and in relation to various other factors, and no one theory is currently dominant. MW and other factors such as working memory (WM) and decoding are all known to influence functional outcomes such as reading comprehension (RC), but there is little information on how all of these factors interact with one another with regard to RC. Most prior work focuses on adults and thus generalization to children is still needed. Therefore, the goals of this project were to examine the roles of WM, MW, decoding, and their interactions in relation to RC. It was hypothesized that each would demonstrate a significant relationship with the outcome of RC and that they would interact with one another beyond their individual main effects.
Participants and Methods: The sample included 214 6th and 7th grade students with a larger proportion of struggling readers. Participants were each administered the Kaufman Test of Educational Achievement – Third Edition (KTEA-3; Kaufman & Kaufman, 2014) Letter Word Recognition subtest (decoding), the Weschler Intelligence Scale for Children – Fifth Edition (WISC-5; Wechsler, 2014) Digit Span and Picture Span subtests

(WM), and the Gates-MacGinitie Reading Tests – Fourth Edition (GMRT-4; MacGinitie, 1978) Comprehension subtest (RC). Four measures of MW were administered: the trait-based Mind Wandering Questionnaire (MWQ; Mrazek et al., 2013); two task-based (or state-dependent) retrospective reporting (TBRR) questionnaires (Matthews et al., 2002), and a researcher-generated single-item task-based retrospective report administered after four tasks. Correlations and regression were utilized to evaluate the relationships among predictor variables, and with regard to RC, including how predictors moderate one another.
Results: All three key predictors demonstrated a significant relationship with RC both via zero-order correlations and main effects in the context of interactive relationships. WM and decoding demonstrated positive relationships with RC and MW demonstrated a negative relationship with RC, though only when one (MWQ) measure of MW was used, rather than the TBRR measure. There was a significant interaction of decoding and MW as measured by the TBRR questionnaires on the outcome of RC. Other interactions were not significant.
Conclusions: These results clarify the interactive relationships of these three key predictors on the important academic achievement outcome of RC, ultimately suggesting that intervention strategies for achievement problems in areas such as RC should consider MW in conjunction with decoding abilities in order to implement effective strategies that capitalize on individual children's strengths and build on their particular weaknesses.

Categories: Learning Disabilities/Academic Skills
Keyword 1: academic achievement
Keyword 2: reading (normal)
Keyword 3: attention
Correspondence: Abigail Farrell University of Houston afarrell2@uh.edu

---

44 Shared Cognitive Predictors of Achievement

Paul T Cirino[1], Cassidy M Salentine[1], Abigail Farrell[1], Marcia A Barnes[2], Greg Roberts[3]
[1]University of Houston, Houston, Texas, USA.
[2]Vanderbilt University, Nashville, Tennessee,

USA. [3]University of Texas at Austin, Austin, Texas, USA

Objective: Reading and math are related generally, and comorbidly at the level of disability. Language, working memory (WM), processing speed (PS), and attention are four domain-general processes important for reading and math separately (Floyd et al., 2003; Fuchs et al., 2010; McDougal et al., 2022). Research of shared cognitive predictors is rarer (e.g., Cirino et al. 2018; Peterson et al., 2017). Therefore, the present study aims to evaluate these factors' shared contribution to both reading and math (both timed and untimed) among middle school students. We hypothesized that each of the four cognitive domains would relate significantly to all academic outcomes, and that together, they would account for the relationship between math and reading performance. We also expected that language and attention would be more relevant for reading than for math; that WM would be more relevant for math than for reading, and that PS would be more relevant for timed than for untimed measures.

Participants and Methods: Two-hundred-eighteen Hispanic middle school students completed cognitive assessments on visual attention, visual search, objective attention, behavioral attention, phonological awareness, rapid automatized naming, vocabulary, WM, and PS. Timed and untimed reading and math were measured using the KTEA-3 (Kaufman & Kaufman, 2014). Latent variables were formed, and analyses were conducted via path analyses.

Results: A measurement model delineated language, attention, WM, and PS with nine latent variables with 20 indicator variables, with good model fit. Variables from each of the four domains significantly correlated with both reading and math outcomes. However, for untimed (overall $R2 = 47.8\%$) and timed reading (overall $R2 = 56.8\%$), language and behavioral attention were the only unique predictors. For untimed math (overall $R2 = 51.8\%$), WM, PS, and behavioral attention were unique predictors. Finally, for timed math (overall $R2 = 26.1\%$), WM was the only unique predictor. Reading and math were correlated with one another, whether untimed ($r = .43$) and timed ($r = .40$). Although the set of predictors reduced these correlations, the residual relation between reading and math remained significant, for both untimed ($p = .002$) and timed ($p = .037$) outcomes. When specific paths were constrained, language was found to

be more important for untimed reading than untimed math but was similarly important for timed outcomes. WM was more important for math than reading, whether timed or untimed. Attention and PS were similarly important for achievement outcomes.

Conclusions: The present work supported prior work documenting the relation of reading and math, and the relation of language, attention, WM, and PS to both types of achievement. However, unique contributions were much more sporadic, and some, but not all, cognitive domains showed differential prediction. These results highlight the role of shared variance among predictors (Cirino et al., 2018; Cirino et al., 2019), and raise questions as to other sources of the overlap between reading and math, whether timed or untimed. The nature of the sample also raises interesting replicability and generalizability issues but advances our understanding of the relation between cognitive and achievement skills.

Categories: Learning Disabilities/Academic Skills
Keyword 1: academic achievement
Keyword 2: attention
Keyword 3: learning
Correspondence: Cassidy Salentine, University of Houston, csalentine@uh.edu

---

45 Gender Differences in Mathematics and its Cognitive and Non-Cognitive Predictors in Community College Students.

Cristina E Boada, Paul T Cirino
University of Houston, Houston, TX, USA

Objective: Historically, numerous studies have supported a male advantage in math. While more recent literature has shown that the gender gap is either decreasing or non-significant, a gender difference remains for higher level math (high school and college) (Hyde et. al. 1990; Casey et. al. 1995). It is known that both cognitive and non-cognitive factors influence math performance. There is little evidence for gender differences in working memory (Miller & Bichsel, 2004), which is a key predictor for mathematics. There is, however, evidence for gender differences in the non-cognitive domain, including math anxiety, with females having