

# THE IMPACT OF ATTENTION ON ELEMENTARY WORD READING IN FRENCH IMMERSION

Rafailov, S.\*, Shakory, S., Marinova-Todd, S., & Chen, X.

## 01. Introduction

Attention Deficit Hyperactivity Disorder (ADHD) is the most common childhood neuro-developmental disorder, with rates in the general population ranging from 4-12% (Polderman et al., 2007). There is a vast literature regarding the relationship between learning problems and ADHD in elementary school students; factors of inattention and hyperactivity have been correlated to reading achievement, with inattention typically being the stronger predictor across studies (Spira & Fischel, 2005).

Attention falls under one of the three aspects of the Componential Model of Reading (CMR), which compiles the effects of cognitive, psychological, and ecological factors as predictors of reading ability (Aaron et al., 2008; Aaron & Joshi, 2000). Word reading (composed of both accuracy and fluency) is considered a cognitive factor, and attention is classified as a psychological factor (Li et al. 2020).

In reviewing the literature, two relevant theories explaining the link between attention and literacy in children emerged. The first theory links attention to self-regulation and executive functioning in the form of both selective attention and inhibitory control. Selective attention allows for the processing of relevant stimuli in an efficient and focused manner, along with the ability to inhibit distracting or otherwise irrelevant stimuli (Sãoez et al., 2012). The second theory postulates that attention is required for the acquisition of early literacy skills such as phonemic awareness and naming speed; thus, children with attentional difficulties lack a solid foundation of these emergent literacy skills, which affects reading proficiency in later grades (Martinussen et al., 2014).

In Canada, the Early French Immersion (FI) program offers second-language education as early as Senior Kindergarten (SK) (Sinay et al., 2018). This program is characterized by full instruction in French until Grade 4, when partial English instruction is introduced. There is a lack of literature regarding the relationship between attention, word reading, and bilingualism; the effect of ADHD on reading is known and expected to be negative, but it is unclear whether bilingualism causes further deficit in word reading, or if a supposed “bilingual advantage” compensates for, or even improves, attentional skills (Bialystok, 2010; Sorge et al., 2017). Thus, this study investigates the unique impact of attention on literacy among emergent bilinguals.

## 02. Present Study

The purpose of the current study is to evaluate the impact of attention on word reading among elementary French Immersion Students.

The proposed research questions are:

- 1.Do the SWAN variables of inattention and hyperactivity predict word reading beyond the basic model?
- 2.Are there varying effects of attention on reading measures in children’s first language versus their second language?

We hypothesize that attention will predict for word reading in both languages above and beyond the effects of phonological awareness and vocabulary.



## 03. Methodology

### Participants

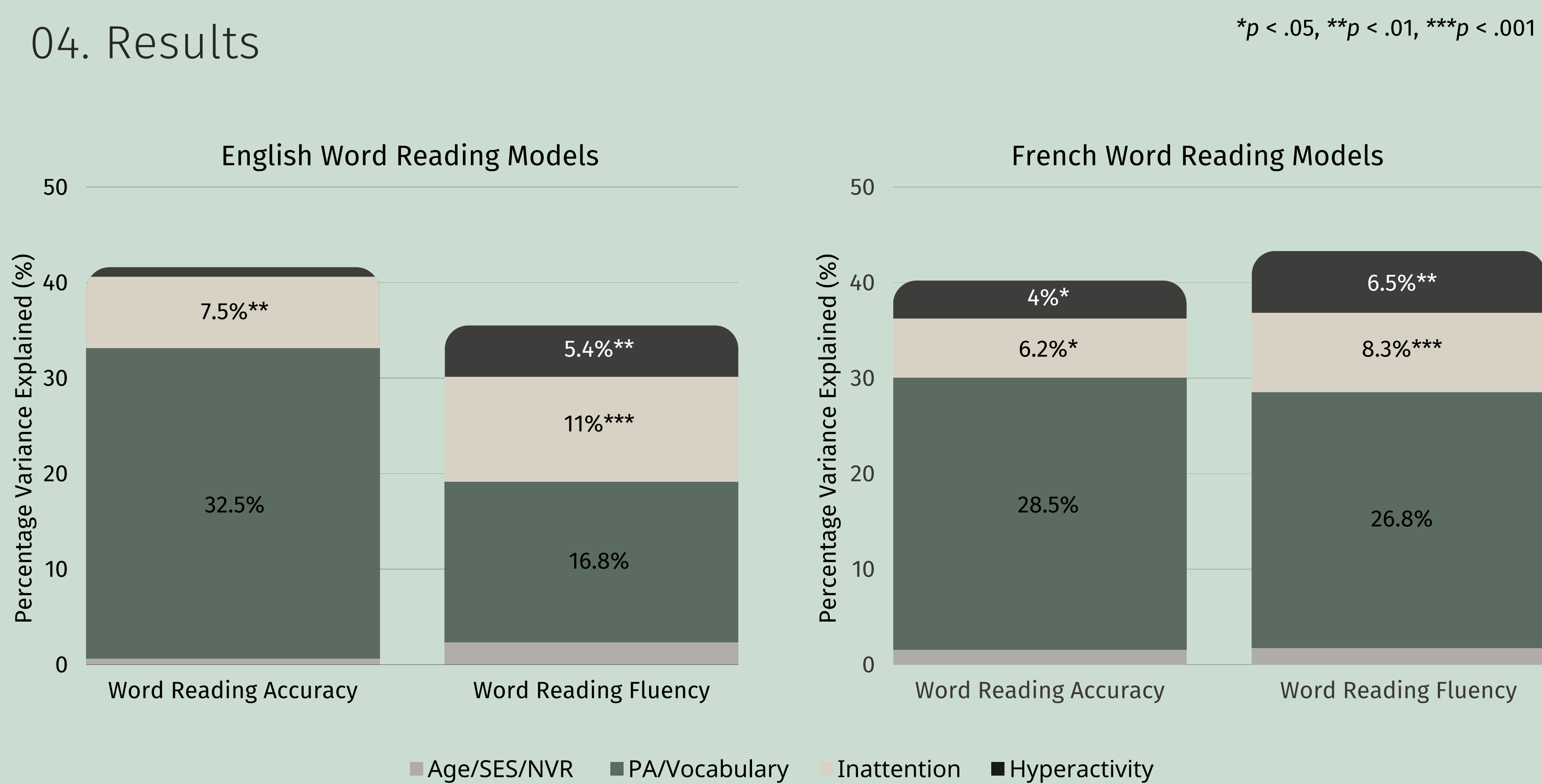
Variable	Measure	
	English	French
Age	Demographic Questionnaire	
SES		
Non-Verbal Reasoning	MAT	
Vocabulary	PPVT	EVIP
Phonological Awareness	CTOPP-2	CTOPP-2 (translated)
Word Reading Accuracy	WJ-III	WIAT-II
Word Reading Fluency	TOWRE	TOWRE (translated)
Attention	SWAN	

### Measures

Gender	Grade	N	Age (M)		
			Min-Max	Mean	SD
Male	3	58	98.30-121.70	106.67	4.22
	4	15	111.96-123.46	116.58	3.42
Female	3	68	98.70-111.90	105.79	3.67
	4	44	103.50-123.26	117.68	4.04
Total		185			

The participants of the present study consist of FI students from both Vancouver and Toronto who were in grades three or four in the 2018/19 school year. Data was collected from the fourth year of a longitudinal study that ran from 2015-2019, except for MAT (only administered in Grade 1) and PA (only administered up to year three of the study). Students met with researchers for one-hour sessions on a weekly basis to complete the tests. The SWAN and demographic questionnaire were completed by parents.

## 04. Results



- Inattention significantly predicted WRA in English ( $R^2 = .406$ ,  $F(6, 85) = 9.698$ ,  $p = .002$ ) and French ( $R^2 = .361$ ,  $F(6, 94) = 8.868$ ,  $p = .003$ ), plus WRF in English ( $R^2 = .301$ ,  $F(6, 89) = 6.399$ ,  $p < .001$ ) and French ( $R^2 = .368$ ,  $F(6, 93) = 9.017$ ,  $p < .001$ ).
- Hyperactivity significantly predicted WRA in French ( $R^2 = .340$ ,  $F(6, 94) = 8.054$ ,  $p = .019$ ), and WRF in English ( $R^2 = .245$ ,  $F(6, 89) = 4.808$ ,  $p = .014$ ) and French ( $R^2 = .349$ ,  $F(6, 93) = 8.317$ ,  $p = .003$ ).
- Hyperactivity did not significantly predict WRA in English.

## 05. Discussion

The results of this study further existing theories of attentional effects on early literacy. In both languages, we see a greater effect of inattention; this links to theories of executive function and selective attention, as a lack of inhibition towards distracting stimuli leads to less focus on, and memory of, relevant material being taught. However, hyperactivity was predictive of WRF, which is a timed task, and would thus impact results more greatly. In addition, we see the significant effect of early literacy skills (such as phonological awareness) in both languages; attentional deficits affecting this portion of the model can affect word reading. This is further supported by the dual-route model of reading, which states that early readers utilize the more attention-demanding sublexical route to decode unfamiliar words – therefore, early attention difficulties could affect this critical step in reading development (O’Neill et al., 2016).

This study confirms the effectiveness of the CMR, as we controlled for ecological variables (age, SES, NVR) and cognitive variables (phonological awareness and vocabulary) before inputting our psychological variable of attention (inattention or hyperactivity). Thus, as the final model was the best fit for our data, we can confirm that accounting for all three domains of the CMR rather than just the cognitive domain allows for a significant and more robust predictive model.

## 06. Implications & Future Directions

The findings of this study reveal the impact of psychological factors such as attention on the development of literacy in early bilingual children. Findings imply that additional measures are needed to ensure FI students with ADHD are not falling behind in literacy compared to monolingual peers.

Future studies could further investigate the effect of teaching practices (ex. developing self-regulated attention) as well as environmental distractors that might contribute to attention scores. In addition, future studies can model the relationship between attention and reading comprehension, and whether word reading mediates this relationship.

## 07. References

• Aaron, P. G., Joshi, R. M., Gooden, R., & Bentum, K. E. (2008). Diagnosis and Treatment of Reading Disabilities Based on the Component Model of Reading: An Alternative to the Discrepancy Model of LD. *Journal of Learning Disabilities*, 41(1), 67-84. <https://doi.org/10.1177/0022219507310838>

• Bialystok, E. (2010). Global-local and trail-making tasks by monolingual and bilingual children: Beyond inhibition. *Developmental Psychology*, 46(1), 93-105. <https://doi.org/10.1037/a0019566>

• Elm, J.-H., Kerner, A., Kerner, J., Gavriliu, C., Hasselhorn, M., & Schmiedek, F. (2016). The association of ADHD symptoms and reading acquisition during elementary school years. *Developmental Psychology*, 52(9), 1445-1456. <https://doi.org/10.1037/dev0000186>

• Li, M., Koh, P. W., Geva, E., Joshi, R. M., & Chen, X. (2020). The componential model of reading in bilingual learners. *Journal of Educational Psychology*, 112(8), 1532-1545. <https://doi.org/10.1037/edu0000909>

• Martinussen, R., Grimbs, T., & Ferrari, J. L. S. (2014). Word-Level Reading Achievement and Behavioral Inattention: Exploring Their Overlap and Relations with Naming Speed and Phonemic Awareness in a Community Sample of Children. *Archives of Clinical Neuropsychology*, 29(7), 680-690. <https://doi.org/10.1093/arclin/aru040>

• O’Neil, S., Thornton, V., Marks, D. J., Rajendran, K., & Halperin, J. M. (2016). Early language mediates the relations between preschool inattention and school-age reading achievement. *Neuropsychology*, 30(4), 398-404. <https://doi.org/10.1037/neu0000247>

• Polderman, T. J. C., Derks, E. M., Hudziak, J. J., Verhulst, F. C., Posthuma, D., & Boomsma, D. I. (2007). Across the continuum of attention skills: A twin study of the SWAN ADHD rating scale. *Journal of Child Psychology and Psychiatry*, 48(11), 1080-1087. <https://doi.org/10.1111/j.1469-7610.2007.01781.x>

• Sãoez, L., Folsom, J. S., Al Otaiba, S., & Schatschneider, C. (2012). Relations Among Student Attention Behaviors, Teacher Practices, and Beginning Word Reading Skill. *Journal of Learning Disabilities*, 45(5), 418-430. <https://doi.org/10.1177/0022219511413243>

• Sinay, E., Presley, A., Amson, S., Tam, G., Ryan, T., Burchell, D., & Barron, C. (2018). French as a Second Language Program Review: Summary of Findings. Toronto District School Board, 17.

• Sorge, G. B., Toplak, M. E., & Bialystok, E. (2017). Interactions between levels of attention ability and levels of bilingualism in children’s executive functioning. *Developmental Science*, 20(1), e12408. <https://doi.org/10.1111/desc.12408>

• Spira, E. C., & Fischel, J. E. (2005). The impact of preschool inattention, hyperactivity, and impulsivity on social and academic development: A review. *Journal of Child Psychology and Psychiatry*, 46(7), 755-773. <https://doi.org/10.1111/j.1469-7610.2005.01466.x>