The direct and indirect effects of syntactic awareness on French reading comprehension in French Immersion students

by

Diana Marie Burchell

A thesis submitted in conformity with the requirements for the degree of Master of Arts: Developmental Psychology and Education
Applied Psychology and Human Development
University of Toronto

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Abstract

This study investigated the direct and indirect effects of syntactic awareness on reading comprehension among sequential bilingual and trilingual students in French Immersion programs. We furthermore explored the mediational effects of word reading and vocabulary in both within-language models and cross-language models through structural equation modelling (SEM). Sixty-eight Grade two children (40 female, \( M \) age in months = 94.59, \( SD = 7 \) months) were administered an experimental syntactic awareness task in both English and French. They were furthermore administered a battery of reading-related measures. Results showed that English was a stronger predictor of French reading comprehension than French syntactic awareness due to the students’ oral language exposure in English. French word reading was shown to have a strong mediational effect in all models, while vocabulary had weak-moderate effects. This study confirms that syntactic awareness performance is intrinsically tied to age and development in bilingual children.
Acknowledgments

This thesis was the product of many incredible individuals who made generous and significant contributions to its development. First and foremost, I would like to extend my deepest gratitude to my supervisor, Dr. Xi Chen, whose mentorship and guidance throughout the course of this thesis was invaluable. I would furthermore like to sincerely thank my second reader, Dr. Hélène Deacon, whose insight and feedback throughout this process contributed significantly to our conceptualization of this topic. A special thank you is also extended to Dr. Catherine Mimeau, who was responsible for the creation of the experimental syntactic awareness task in both English and French. Finally, my very humble gratitude is offered to Dr. Poh Wee Koh, who patiently and kindly expanded my knowledge of structural equation modelling.

The scope of this project was ambitious and would not have been possible without several key people. To the research assistants, graduate students, undergraduate students and lab members who assisted with all matters of data collection, I extend my warmest gratitude. This is especially true for the teachers, administrators, students and parents who were gracious enough to grant us precious amounts of their time. Finally, but no less significantly, I would like to thank my parents, family, friends and loved ones who took turns being my rock, sounding board and cheerleaders throughout this process. I am grateful to all of the aforementioned people every day for making this project a reality with me.
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1. Introduction

1.1 Syntactic awareness and reading comprehension.

Reading, and more specifically reading comprehension, is one of the foundational skills required in order build further knowledge. Reading comprehension is defined as a process in which students are “simultaneously extracting and constructing meaning through interaction and involvement with written language” (Snow, 2002, p. 11). Mastering reading comprehension is seen as both an essential development milestone as well as a necessary tool. Furthermore, reading comprehension is a broad skill which encompasses and relies upon many underlying abilities in order to optimally function. One of these abilities, commonly referred to as metalinguistic awareness, is broadly defined as the ability to be cognizant and critical of language structures and therein able to manipulate them (Yeon, Bae & Joshi, 2017; Koda & Zehler, 2008; Nagy, 2007). Some of the skills within this category, such as phonological awareness and morphological awareness, have been studied extensively (Zhang, Chin & Li, 2017; Melby-Lervag, Lyster, & Hulme, 2012; Deacon, Benere, & Pasquarella, 2013; Deacon & Kirby, 2004).

Conversely, syntactic awareness (SA) has not received much empirical attention (Deacon & Kieffer, 2018; Tong & McBride, 2017; Tong et al., 2014). Syntactic awareness refers to the ability to be aware of, reflect on, critically analyze and manipulate the order of words in a sentence (Cain, 2007; Durgunoğlu, 2002). It focuses on the function of the whole word as a unit in relation to the rest of the sentence, or context. While research shows that children as young as five are able to make grammaticality judgements in terms of sentence order (Hakes, 1980; Tsang & Stokes, 2001), syntactic awareness continues to develop at least until the age of seven with certain syntactic awareness skills continuing to develop past that milestone in more complex
contexts, such as compound-complex sentences (Bryant, Nunes, & Bindman, 2000; Magnusson & Nauclér, 1990; Hakes, 1980; Gombert, 1992; Foursha-Stevenson & Nicoladis, 2011). However, the age of acquisition may be different in multilingual populations.

The direct effect between syntactic awareness and reading comprehension has been largely accepted in the field and has been the most studied (Perfetti & Stafura, 2014; Verhoeven & Perfetti, 2008). Recent research, however, has turned to the possible indirect effects that syntactic awareness may have on reading comprehension through other constructs, such as vocabulary and word reading. While this possibility has been explored by some researchers (Deacon & Kieffer, 2018; Cain, 2007), it has not yet been thoroughly explored in young sequential bilingual and trilingual students. This study therefore explores the direct and indirect effects of syntactic awareness on reading comprehension in young children who are sequentially bilingual in English and French. The relationship between syntactic awareness and reading comprehension is examined within English and French, and across the two languages.

1.2 The direct and indirect relationship between syntactic awareness and reading comprehension in monolingual populations.

Within the last decade, there has been an attempt to explore the contributions of syntactic awareness to reading comprehension given that, historically, the link between them has not been robustly examined. Certain permutations have been more scientifically corroborated, such as the direct influence that syntactic awareness has on reading comprehension. As explained by several scholars (e.g., Perfetti & Stafura, 2014), syntactic awareness facilitates reading comprehension through ‘parsing’ or ‘utterance segmentation’ (Deacon & Kieffer, 2018; Verhoeven & Perfetti, 2008). It refers to the process of dividing sentences into smaller portions, such as clauses, based on their syntactic structure. Once these sentences are broken down into smaller components,
which are more easily digestible, it allows students to more easily figure out the portions which are unknown to them. These segments are then recombined once the meaning has been extracted from the smaller portions of the sentence into more broad text-level representations (Farnia and Geva, 2012; Deacon and Kieffer, 2018). For example, the sentence “The light was dim, and the candle was lit.” contains two independent clauses. When looking at the sentence in its entirety, it can be overwhelming for students. However, knowing how to break the sentence down into two distinct parts lessens the cognitive load by allowing students to focus on one portion at a time. Their knowledge of syntax would tell them that each clause contains all the information they would need to decode it when considered in isolation. Afterwards, a sentence can then be quickly recombined to provide the meaning of the sentence as a whole. This theory and example clearly elucidate the role of syntactic awareness in reading comprehension. As will be shown below, however, syntactic awareness is theoretically involved in several models but has been empirically studied far less.

Several empirical studies have supported the direct effect of syntactic awareness on reading comprehension. For example, in a concurrent study of fifth-grade children, Mokhtari & Thompson (2010) reported a strong correlation between syntactic awareness and reading comprehension, as well as a moderate correlation between syntactic awareness and reading fluency. In another concurrent study, Cain (2007) reported a direct relationship between syntactic awareness and word reading in 8 and 10-year-old children. This hierarchical multiple regression controlled for both vocabulary knowledge and memory (digit recall). However, reading comprehension was not investigated within this study. Given that word reading and reading comprehension diverge as separate skills around the end of Grade 3 (Chall, 1983), it is also important to be aware of the correlation between syntactic awareness and word reading in the
early primary grades. Pursuant to the Cain study (2007), the relationship between syntactic awareness and reading comprehension was examined in a longitudinal study by Deacon & Kieffer (2018), who followed students from Grade 3 to Grade 4. Syntactic awareness measured in Grade 3 was found to contribute to reading comprehension in the same grade and gains in reading comprehension over time. In contrast, this study did not find evidence of mediation via word reading. This was attributed to the age and monolingual status of students as they would have already bypassed the need to actively decode while doing reading comprehension activities.

In addition to the direct effect, several researchers posit that syntactic awareness is also related to reading comprehension because it supports skills such as word reading by decoding. (Tumner, Herriman & Nesdale, 1988; Bowey, 1986). Word reading by decoding, especially when phonological awareness is not fully mastered, places significant strain on children’s cognitive capacity (Tumner, Herriman & Nesdale, 1988). When children struggle to read single words, they do not leave sufficient cognitive resources for higher level skills such as semantic processing, inferencing, monitoring, reading strategies, which then leads to a poor comprehension of the piece overall (Hagtvet, 2003). According to Tumner (1988), syntactic awareness allows students to understand words in the context of their sentences by reducing the choices for a word dependent on its place in the sentence, thus narrowing the choices and improving fluency.

Syntactic awareness provides parameters within which the phonological recoding takes place, thus lessening the cognitive load. Consequently, children can direct more resources to aid their comprehension. In other words, improving the ability to accurately and fluently read words aids with reading comprehension because it lightens demand on cognitive resources and therefore allows children to focus more attention on semantic processing. After the sentence has
been deconstructed to more easily decipher meaning, it can then be quickly reconstructed to provide the meaning of the sentence as a whole. As an example, in the sentence “I vacuumed the house,” it may be difficult for children to phonologically or morphologically interpret a word like “vacuumed.” However, if they are aware that a verb must follow the pronoun “I,” and that this action occurs in the house, they will search in the mental lexicon until they find the correct verb.

A further permutation of the relationship is the possibility of an indirect relation between syntactic awareness and reading comprehension via word reading. An example of this occurs in the paper written by Tumner et al. (1988), which explored the possibility of indirect effects by examining grade one ($n = 118$) monolingual children. A longitudinal analysis, which measured their performance three times throughout the course of the year, shows that the relationship between syntactic awareness and reading comprehension is mediated at least in part by word reading when controlling for phonological and pragmatic awareness. While this effect was a partial mediation as opposed to full mediation, it nevertheless shows a relationship between these three constructs. These results were directly contradicted by the mediation analyses conducted by Deacon & Kieffer (2018). Monolingual students in grades three and four ($n = 100$) were administered measures of word reading, syntactic awareness and reading comprehension. While a direct effect was found between syntactic awareness and reading comprehension, there was no indirect effect via word reading. Given what we know about reading development over time, it is likely that the discrepancy of these results is due to age. While students in grade one rely heavily upon word reading via decoding, by grades three and four monolingual students mainly rely on larger concepts such as receptive vocabulary and syntactic awareness as they no longer need to decode every word.
A second mediation effect may be present through vocabulary, which brings in students’ oral language knowledge. Compared to decoding, even less is known about vocabulary as a mediator in the relationship between syntactic awareness and reading comprehension. In past studies, vocabulary has been included as a control variable as opposed to a mediator (Geva & Farnia, 2012; Deacon & Kieffer, 2018). However, studies on vocabulary have demonstrated that it is an important predictor of reading comprehension (Verhoeven & Leeuwe, 2008; Ouelette, 2006). At this age, children are at the bridge between decoding and receptive vocabulary in that younger children use decoding and older children use vocabulary. For example, when dealing with oral comprehension, once children have broken down sentences into smaller pieces (e.g. “I love to play soccer” and “with a soccer ball and cleats.”), they can then use their knowledge of vocabulary to help figure out unknown words. Furthermore, due to the irregularity of its orthography, English contains many homographic words which can be difficult for beginning readers to differentiate (Demont & Gombert, 1996). As an example, the sentences “I learned to bow to guests,” and “I learned to tie a bow” contain what appears to be the same word logographically, albeit used as a verb and a noun in separate contexts. However, children have most likely learned these words through oral language. They may have heard the noun “to bow” from reading fairy tales, and the noun “bow” through frequenting celebrations with their families. This oral language knowledge, combined with the ability to syntactically decouple the sentence in order to leverage the context as a resource, can significantly aid children in learning to read irregular patterns such as homographic words.

1.3. Syntactic awareness in bilinguals.

While syntactic awareness acquisition has been discussed in maternal languages (Hakes, 1980; Tsang & Stokes, 2001), it is more difficult to pinpoint second language populations (Magnusson
Studies have examined syntactic awareness in bilingual populations from diverse linguistic backgrounds. That said, many scholars have focused on the interplay of English and the romance languages (Foursha-Stevenson & Nicoladis, 2011; Bialystok, 2001; Cormier & Kelson, 2000). This is due to the similarities between romance languages. For example, Foursha-Stevenson & Nicoladis (2011) compared English syntactic awareness, measured with a grammaticality judgement task, between monolingual and simultaneous bilingual (French-English) primary-age children ($M = 4.4$ years). They found that bilingual children outperformed their monolingual counterparts on grammaticality judgement, especially in regard to sentences that had identical structures between the two languages. As predicted, bilingual children were more easily able to manipulate syntax in both the English and French measures than their monolingual peers. This is because bilingual children are more commonly exposed to decisions regarding syntax (e.g. picking the French or English structure) and are therefore more aware of the permutations of syntax. The effects of this strengthened ability have not been rigorously studied in relation to reading skills, which gave rise to this study.

To our knowledge, only a couple of studies have examined the relationship between syntactic awareness and reading comprehension in bilingual children. Geva and Farnia (2012) found that English syntactic awareness explained a unique amount of variance in English reading comprehension in grade 5 children who were English Language Learners after controlling for non-verbal reasoning, working memory, phonological processing, phonological awareness, naming speed and receptive vocabulary as well as syntactic awareness in the second grade. These results corroborate the direct effects found by Deacon and Kieffer (2018) in their monolingual study. However, this study did not examine the indirect effects of syntactic
awareness on reading comprehension through word reading. We are only aware of one study, by Sohail et al. (submitted), that examined both the direct and indirect effects of syntactic awareness on reading comprehension. This study focused on English-French emergent bilingual children in Grade 1. French syntactic awareness did not have a direct effect on French reading comprehension. However, there was an indirect effect present through French word reading. As students have only been exposed to French for two years at this point, this is explained by the fact that students rely heavily on decoding as opposed to higher-level skills such as vocabulary or syntactic awareness.

1.4 Cross-language transfer of syntactic awareness and reading comprehension.

According to the linguistic interdependence hypothesis, there is a common underlying proficiency between languages in addition to the divergent skills unique to each language (Cummins, 1979). This underlying proficiency is commonly referred to as cross-language transfer, which is a significant factor in second language learning (Gass & Schacter, 1989). While there is still an attempt underway to reify the specific mechanisms through which this process occurs, we have evidence which shows that transferred metalinguistic skills from a child’s first language at least partially explains their decoding performance in their second language (Hamada & Koda, 2008). According to this hypothesis, knowledge of syntax in the first language is transferred to the second language. However, once the knowledge has been transferred, it must then be adjusted to fit with the second language (Hamada & Koda, 2008). The degree of this adjustment depends on the degree of similarity between the two languages. This transfer may be stronger if the second language has structures similar to the first language. English and French have some commonalities in their syntactic structures, but they also have some structures which are divergent. As an example, one of the most advantageous similarities
between French and English is the basic clausal structure. Both use an SVO (subject-verb-object) structure which allows for the foundational layout of sentences to transfer easily between the two. However, it is also true that some smaller, more specific constructs have differences between them. For example, the placement of adjectives within a sentence is difficult. In English, as a rule, the adjective is always placed before the noun (e.g., the red car). In French, there are some adjectives which are placed before the noun (e.g., la bonne voiture) but the majority are placed after (e.g., la voiture rouge). The discrepancies show the adjustments that would need to happen when transferring syntactic awareness from one language to another.

To our knowledge, only two studies have examined cross-language transfer of syntactic awareness in bilingual children. In a study involving Chinese-English bilinguals (ages 6-7 and 8-9), Siu & Ho (2015) found evidence of transfer between syntactic awareness in their first and second languages. More specifically, Chinese syntactic awareness was a strong predictor of reading comprehension using English syntactic awareness as a mediator. Given that Chinese and English have highly divergent language structures, this emphasizes syntactic awareness’ status as a feature that transfers between languages. As English and French are relatively similar, there is a clear rationale for transfer in sequential bilinguals where one language is clearly stronger than the other during the beginner and intermediate stages. In this context specifically, English is the stronger language for the learners in the study. In the paper by Sohail et al. (submitted), similar cross-language transfer results were found in a French-English sequential bilingual sample. These researchers found that English syntactic awareness had a direct effect on French reading comprehension. As English syntactic awareness is more developed in young sequential bilingual children, it is the skill they rely upon when dealing with new texts. Furthermore, syntactic awareness was also partially mediated through French word reading. This shows that syntax aids
in decoding as well as reading comprehension, as evidenced in monolingual studies. However, this novel finding needs to be corroborated and studied in more detail.

1.5 The present study.

The purpose of the current paper was to study the development and transfer of syntactic awareness in young bilingual and trilingual children enrolled in French immersion programs. These are publicly-funded programs offered throughout Canada with a specific focus on French culture, language and literacy. They are primarily for non-Francophone students. As the goal of these programs is to produce citizens who can speak two (or more) languages, programs begin at a fairly early age, somewhere between 4 to 10 years. In this study in particular, students began upon their entrance to school (age 5-6; Kindergarten). For the first several years, teaching is conducted primarily in French (approximately 80%) with a select few subjects in English. As children progress through the program, their instruction in English increases. By secondary school, most students receive instruction in each language about 50% of the time. Given the diversification of Canada, these programs increasingly include a proportion of students with a first language other than English (Sohail, submitted), meaning that these programs include bilingual and multilingual students. However, for the purpose of this paper, we will be referring to the students as “English-French bilingual children” as this is a reference to their schooling practices as opposed to their home environment.

We chose to focus on emergent English-French bilingual children in second grade because children are expected to be near mastery level in decoding at this age. Furthermore, third grade is the last year children “learn to read” before transitioning to “reading to learn”, otherwise known as content learning, in grade 4. It is therefore essential to accurately assess and intervene with students before they reach the fourth grade, and this study would give us the necessary
assessment which could inform interventions for third-grade children. We utilized structural equation modelling (SEM) to model the pathways from syntactic awareness to reading comprehension, with word reading and receptive vocabulary as mediators. In order to assure the assessment of a unique contribution, non-verbal reasoning and working memory were included as control variables. Specifically, we asked four research questions:

1. **French Within Language**: Is there a direct effect between French syntactic awareness and French reading comprehension?

2. **French Within Language**: Is there an indirect effect between French syntactic awareness and French reading comprehension mediated through word reading and vocabulary?

3. **Cross-Language Transfer**: Does English syntactic awareness, as the more developed version of this metalinguistic skill, directly affect French reading comprehension?

4. **Cross-Language Transfer**: Does English syntactic awareness also have an indirect effect on French reading comprehension mediated through French syntactic awareness, French word reading, and French vocabulary?

We hypothesize that, based on previous within-language results (Sohail et al., submitted), the effects of French syntactic awareness may not be direct due to the level of French language development at such an early age. We furthermore hypothesize that this model may have poor fit because French syntactic awareness may not be the primary underlying metalinguistic skill that aids the development of French reading comprehension at this point in time for French Immersion students. However, due to the age of the participants and the results seen by Tumner et al. (1988), we do expect to see a mediational effect through word reading. There is less evidence for the role of vocabulary at this age, but we expect that their may begin to be an effect
through mediation. In the cross-language models, we explore the presence of direct and indirect effects on reading comprehension through English syntactic awareness in addition to French syntactic awareness. Due to prior findings of transfer between languages in regard to syntactic awareness, we expect to see a direct effect from English syntactic awareness to French reading comprehension (Siu & Ho, 2015, Geva & Farnia, 2012). We furthermore expect to confirm the indirect effect of English syntactic awareness on French reading comprehension found by Sohail et al. (submitted).


2.1 Participants.

A total of 68 children in the French Immersion program were recruited from 7 publicly-funded schools in a linguistically and culturally diverse urban area of Canada. The participants were all in the second half of their academic year, in the second grade. Parents completed a demographic questionnaire, which resulted in a rich overview of the participants’ backgrounds.

The French Immersion sample contained 6 ELL students and 62 EL1 students, as determined by language exposure at home and the student’s first language. These languages were, in order of frequency: Cantonese (n = 1), Yomba (n = 1), Arabic (n = 1), Gujrati (n = 1), Tamil (n = 1) & Vietnamese (n = 1). The average age of these students was 94.59 months, or 7.9 years, $SD = 7$ months. Within the French Immersion stream participants, 13 of the students had a known or suspected exceptionality based on their parental reports. These exceptionalities were, in order of frequency: Hearing ($n = 5$), Speech ($n = 4$), Behaviour ($n = 3$) & Learning ($n = 1$). The average level of education between both the guardians of children in this program is split between the college and the university level. This is based on a self-reported education scale filled out by parents.
2.2 Measures.

A battery of measures was administered to all students. The target variable was syntactic awareness and the dependant (outcome) variable was reading comprehension. We also included receptive vocabulary and word reading as mediating variables. In order to assure the assessment of a unique contribution, non-verbal reasoning and working memory were included as control variables. Reliabilities for all measures are reported in Table 1.

2.2.1 Reading comprehension.

The Gates-MacGinitie reading comprehension measure was used. This task was originally designed in English and translated for this study by a Canadian Francophone. Children completed this quietly and individually, in a calm environment. It consisted of several age-appropriate texts which would be followed up with several comprehension questions.

2.2.2. Syntactic awareness.

An experimental measure was used. This task was developed in both English and French, and both versions of the task contained 20 items as well as two practice items. For the tasks in both languages, students were asked to correct the order of words in a sentence. As an example, if children were given “the meowed black cat,” they would need to correct it to “the black cat meowed.” These tasks included both structures that were similar between French and English as well as structures which were unique to each language.

2.2.3. Receptive vocabulary.

In order to assess receptive vocabulary, the Échelle de Vocabulaire en Images Peabody (EVIP) was administered. This test involved a stimulus booklet, composed of pages which had four pictures on it. Children were then orally given a word and asked to either point to or name the number for the corresponding picture on a page. Children had to inaccurately identify five
pictures in a set of eight in order to discontinue this task. This test was administered using standardized procedures.

2.2.4. Word reading.

To assess French word reading, the *Lecture de Mots* (word reading) subtest of the Wechsler Individual Achievement Test-Second Edition (WIAT-II; Wechsler, 2005) was utilized. This measure has been standardized using Canadian Francophone children (native French speakers). It was comprised of 84 items, requiring children to sight read words out loud that continued to increase in difficulty throughout the measure. In order to discontinue the task, children would need to inaccurately read seven consecutive words.

2.3. Procedure.

As the students were recruited through their schools, they were also tested at their schools by an extensively trained team of both graduate and undergraduate students. All testers were native speakers of English and near-native speakers of French. All measures were administered as part of a larger battery. However, students completed testing individually with a research assistant in a quiet environment outside the classroom.

3. Results.

3.1. Descriptive statistics.

Table 1 presents the ranges, means, standard deviations and reliability measures (Cronbach’s α) for the five measures included in this analysis: English syntactic awareness, French syntactic awareness, French receptive vocabulary, French word reading, French reading comprehension and French syntactic awareness. The first two measures, syntactic awareness in both French and English, are experimental measures.
The skewness and kurtosis for French syntactic awareness is different than the other measures, with a positive skew that exceeds the +2 criterion proposed by Tabachnick & Fidell (2007). The French syntactic awareness measure was therefore transformed using the log function in SPSS to correct for the skew. As some students had an overall score of 0, the Lg10 (maximum value +1) was implemented. Once transformed, the resulting variable was within acceptable limits and was therefore used in all subsequent analyses. A paired-sample t-test found that students performed significantly better in English syntactic awareness than in French syntactic awareness, \( t_{67} = -17.596, p < .000 \).

When checking for univariate outliers using the boxplot method, 6 moderate outliers were found across all five measures. However, given that our sample includes students with special needs, students who have English as a second language amongst other diversity factors, we chose to keep these outliers in the analysis to show a more representative distribution. Furthermore, a comparison of results both including and excluding outliers revealed no significant changes in patterns. Using Malahanobis distance, the data was also checked for multivariate outliers which were not found.

**Table 1. Descriptive Statistics of the Measures \((n = 68)\)**

<table>
<thead>
<tr>
<th>Measures</th>
<th>Min- Max</th>
<th>M</th>
<th>SD</th>
<th>Cronbach’s ( \alpha )</th>
<th>Skewness</th>
<th>S.E.</th>
<th>Kurtosis</th>
<th>S.E.</th>
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</thead>
<tbody>
<tr>
<td>1 ENG_SA</td>
<td>1-18</td>
<td>9.25</td>
<td>4.262</td>
<td>.754</td>
<td>-.097</td>
<td>.291</td>
<td>-1.046</td>
<td>.574</td>
</tr>
<tr>
<td>2 FR_SA</td>
<td>0-11</td>
<td>2.19</td>
<td>2.326</td>
<td>.772</td>
<td>1.763*</td>
<td>.291</td>
<td>3.718*</td>
<td>.574</td>
</tr>
<tr>
<td>3 EVIP</td>
<td>11-95</td>
<td>46.90</td>
<td>19.458</td>
<td>.954</td>
<td>.529</td>
<td>.291</td>
<td>-2.11</td>
<td>.574</td>
</tr>
<tr>
<td>4 WIAT</td>
<td>0-71</td>
<td>32.12</td>
<td>19.777</td>
<td>.978</td>
<td>.216</td>
<td>.291</td>
<td>-1.104</td>
<td>.574</td>
</tr>
<tr>
<td>5 FR_RC</td>
<td>1-36</td>
<td>20.56</td>
<td>7.399</td>
<td>.959</td>
<td>.030</td>
<td>.291</td>
<td>-.121</td>
<td>.574</td>
</tr>
</tbody>
</table>

\( ENG_{SA} = \) English syntactic awareness; \( FR_{SA} = \) French syntactic awareness; \( EVIP = \) French receptive vocabulary; \( WIAT = \) French word reading; \( FR_{RC} = \) French reading comprehension.

***p < .001; **p < .01; *p < .05.
Most of the measures were highly correlated (Table 2). The highest correlation was between French word reading and reading comprehension. There was also a moderate-strong correlation between English syntactic awareness and French reading comprehension; which was higher than the within-French correlation between French syntactic awareness and French reading comprehension.

French word reading showed significant correlations with French syntactic awareness and with English syntactic awareness. French receptive vocabulary is similarly correlated with both French reading comprehension and with English syntactic awareness. The lower correlations occurred between French receptive vocabulary and French word reading as well as French syntactic awareness. Finally, the two metalinguistic tasks (syntactic awareness in both French and English) were both had a moderate correlation in comparison to the other measures.

<table>
<thead>
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<th>Table 2. Descriptive Statistics ($n = 68$)</th>
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<tbody>
<tr>
<td>Measures</td>
</tr>
<tr>
<td>1 ENG_SA</td>
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<tr>
<td>2 FR_SA</td>
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<tr>
<td>3 EVIP</td>
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<tr>
<td>4 WIAT</td>
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<td>5 FR_RC</td>
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<tr>
<td>6 WM</td>
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<tr>
<td>7 MAT</td>
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</tbody>
</table>

**ENG_SA** = English syntactic awareness; **FR_SA** = French syntactic awareness; **EVIP** = French receptive vocabulary; **WIAT** = French word reading; **FR_RC** = French reading comprehension; **WM** = Working memory; **MAT** = Non-verbal reasoning.

***$p < .001$; **$p < .01$; *$p < .05$.

3.2. Concurrent multiple regression models.

Pursuant to the correlational matrices, a multiple regression was performed, including all independent and control variables. In step one, non-verbal reasoning (MAT) was entered on its own. Next, working memory (WM) was added to the model as the two control variables needed
to be accounted for first. The next step was to add the mediators: receptive vocabulary (EVIP) in step three and word reading (WIAT) in step four. Syntactic awareness, as the final predictor variable, was entered in step five (FR_SA; French) and in step six (ENG_SA; English). As can be seen below in Table 3, receptive vocabulary and word reading both uniquely explained a unique amount of variance when predicting French reading comprehension. The control variables and syntactic awareness all explained less of the variance. French syntactic awareness, in particular, was attributed very little unique variance. This aligns with the correlation table, in which English syntactic awareness was more strongly correlated than the French version.

Table 3. Multiple Regression Analyses Examining the Role of Receptive Vocabulary, Word Reading and Syntactic Awareness on Reading Comprehension (n = 68)

<table>
<thead>
<tr>
<th>Predictors</th>
<th>R²</th>
<th>ΔR²</th>
<th>ΔF</th>
<th>β</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAT</td>
<td>.041</td>
<td>.093</td>
<td>2.830</td>
<td>.203</td>
<td>1.682</td>
</tr>
<tr>
<td>WM</td>
<td>.093</td>
<td>.052</td>
<td>3.738</td>
<td>.229</td>
<td>1.933</td>
</tr>
<tr>
<td>EVIP</td>
<td>.241</td>
<td>.148***</td>
<td>12.463</td>
<td>.388</td>
<td>3.530***</td>
</tr>
<tr>
<td>WIAT</td>
<td>.528</td>
<td>.287***</td>
<td>38.327</td>
<td>.578</td>
<td>6.191***</td>
</tr>
<tr>
<td>FR_SA</td>
<td>.531</td>
<td>.003</td>
<td>.359</td>
<td>.061</td>
<td>.599</td>
</tr>
<tr>
<td>ENG_SA</td>
<td>.559</td>
<td>.028</td>
<td>3.840</td>
<td>.206</td>
<td>1.960</td>
</tr>
</tbody>
</table>

ENG_SA = English syntactic awareness; FR_SA = French syntactic awareness; EVIP = French receptive vocabulary; WIAT = French word reading; FR_RC = French reading comprehension; WM = Working memory; MAT = Non-verbal reasoning.

***p < .001; **p < .01; *p < .05.

Due to this low contribution of French syntactic awareness, a new cross-language model was run (Table 4) without French SA in which English syntactic awareness was the final independent variable. This model therefore imitates the step mentioned for Table 3, with the exception that English syntactic awareness (ENG_SA) was entered in step five as French syntactic awareness was removed from the previous model. In this multiple regression model, English SA explained a significant amount of unique variance and was therefore kept as the final regression model.
Table 4. Multiple Regression Analyses Examining the Role of Receptive Vocabulary, Word Reading and Syntactic Awareness on Reading Comprehension (n = 68)

<table>
<thead>
<tr>
<th>Predictors</th>
<th>$R^2$</th>
<th>$\Delta R^2$</th>
<th>$\Delta F$</th>
<th>$\beta$</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAT</td>
<td>.041</td>
<td>.093</td>
<td>2.830</td>
<td>.203</td>
<td>1.682</td>
</tr>
<tr>
<td>WM</td>
<td>.093</td>
<td>.052</td>
<td>3.738</td>
<td>.229</td>
<td>1.933</td>
</tr>
<tr>
<td>EVIP</td>
<td>.241</td>
<td>.148***</td>
<td>12.463</td>
<td>.388</td>
<td>3.530***</td>
</tr>
<tr>
<td>WIAT</td>
<td>.528</td>
<td>.287***</td>
<td>38.327</td>
<td>.578</td>
<td>6.191***</td>
</tr>
<tr>
<td>ENG_SA</td>
<td>.523</td>
<td>.030*</td>
<td>4.233</td>
<td>.210</td>
<td>2.057*</td>
</tr>
</tbody>
</table>

ENG_SA = English syntactic awareness; EVIP = French receptive vocabulary; WIAT = French word reading; FR_RC = French reading comprehension; WM = Working memory; MAT = Non-verbal reasoning.

***p < .001; **p < .01; *p < .05.

3.3. Concurrent structural equation modelling.

In order to examine the effects of syntactic awareness both within and between languages, AMOS 25 was used to model the relations among English and French syntactic awareness and reading comprehension in French. As this paper is concerned with both French-only models and with cross-language models, several hypotheses were proposed in terms of the effects of syntactic awareness as a meta-linguistic skill on the development of reading comprehension.

We began structural equation modelling with our first hypothesis, which aimed to test the direct effect of French SA on French RC as well as the indirect effects through vocabulary and word reading. As shown below (Figure 1), an examination of the proposed within-French model showed several interesting results. There was a strong mediational effect from French syntactic awareness to French reading comprehension through French word reading, and a moderate mediational effect through French receptive vocabulary. There was no significant direct relation between French syntactic awareness and French reading comprehension, which was an expected outcome as explained in the current study. This model was an acceptable fit for the data: $\chi^2(1) = 8.824$, $p = .266$, CFI = .973, TLI = .942, RMSEA = .062.
In the first model (Figure 1), both indirect pathways (through vocabulary and word reading) were significant. However, the direct effect from French SA to French RC was insignificant, as we originally predicted. Our second hypothesis was therefore developed because the students in this study have only had a maximum of two full years of instruction in French Immersion, which may not have been enough time to master syntactic awareness in their second language. We hypothesize that their intermediary level of French syntactic awareness may indirectly shape their other French skills (word reading, receptive vocabulary) whilst not yet being strong enough to independently predict French reading comprehension. As we hypothesized, the model where the path between French SA and French RC was removed (Figure 2) yielded adequate fit: $\chi^2(2) = 9.196, p = .326, CFI = .982, TLI = .967, RMSEA = .047$.

A chi-square difference test showed that removing the path between French SA and RC did not significantly reduce the fit of the model ($\chi^2_{\text{diff}} = 1.092, df_{\text{diff}} = 1, p > .1$), therefore, model 2 was chosen as the final model depicting the relation between French SA and RC. Accordingly, our final French within-language model (Figure 2) is depicted below with standardized coefficients.
coefficients. The similarities and differences between our first model and our final nested can be found in Table 6, which provides the indirect, direct and total effect estimates.

As shown in Table 6 below, the mediational pathway through French word reading is by far the strongest in both models \(0.465 \leq \beta \leq 0.605, p < .001\). The pathway through French receptive vocabulary shows statistically significant effects, \(0.221 \leq \beta \leq 0.334, 0.05 \leq p \leq 0.01\). While the direct pathway from French syntactic awareness to the reading comprehension is not significant, there are still indirect effects, \(0.359 \leq \beta \leq 0.405\). These indirect effects lead us to the third hypothesis, wherein we explore the influence of other metalinguistic skills.

Figure 2. The Final French within-language model with standardized coefficients

\(FR_{SA} = \text{French syntactic awareness}; EVIP = \text{French receptive vocabulary}; WIAT = \text{French word reading}; FR_{RC} = \text{French reading comprehension}.\)

***\(p < .001\); **\(p < .01\); *\(p < .05\).
As shown below (Figure 3), we first explored the possible direct effects from English syntactic awareness to French syntactic awareness. The first cross-language model shows promising results for the metalinguistic skill transfer hypothesis. While all the French variables retain their original relationships and significances, there is an additional link between French and English syntactic awareness that suggests the existence of an underlying common proficiency in syntactic awareness that transcends individual languages. As shown in the literature review, however, the metalinguistic nature of syntactic awareness suggests that there may be a moderate-strong correlation between English SA and French RC. This theory is further made plausible due to the poor model fit statistics despite the strong link between English and French syntactic awareness: \( \chi^2(5) = 25.772, p < 0.05, \text{CFI} = .865, \text{TLI} = .781, \text{RMSEA} = .121 \).

In the next model, additional correlations will be inserted to see whether the influence of English syntactic awareness is more widespread that would appear in the first model.
Figure 3. The First Cross-Language Transfer model with standardized coefficients

EN_SA = English syntactic awareness; FR_SA = French syntactic awareness; EVIP = French receptive vocabulary; WIAT = French word reading; FR_RC = French reading comprehension.

***p < .001; **p < .01; *p < .05.

Table 6. Direct, Indirect and Total Effects for Cross-Language Model 1

<table>
<thead>
<tr>
<th>Path</th>
<th>Direct Effects</th>
<th>Indirect Effects</th>
<th>Total Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN_SA → FR_SA</td>
<td>.418***</td>
<td>-</td>
<td>.418**</td>
</tr>
<tr>
<td>EN_SA → WIAT</td>
<td>-</td>
<td>.194*</td>
<td>.194*</td>
</tr>
<tr>
<td>EN_SA → EVIP</td>
<td>-</td>
<td>.139**</td>
<td>.139**</td>
</tr>
<tr>
<td>FR_SA → WIAT</td>
<td>.465***</td>
<td>--</td>
<td>.465*</td>
</tr>
<tr>
<td>FR_SA → EVIP</td>
<td>.334**</td>
<td>-</td>
<td>.334*</td>
</tr>
<tr>
<td>EN_SA → FR_RC</td>
<td>-</td>
<td>.154*</td>
<td>.154*</td>
</tr>
<tr>
<td>FR_SA → FR_RC</td>
<td>-</td>
<td>.368*</td>
<td>.368*</td>
</tr>
<tr>
<td>EVIP → FR_RC</td>
<td>.235**</td>
<td>-</td>
<td>.235*</td>
</tr>
<tr>
<td>WIAT → FR_RC</td>
<td>.605***</td>
<td>-</td>
<td>.605*</td>
</tr>
<tr>
<td>WM → FR_RC</td>
<td>.123</td>
<td>-</td>
<td>.123</td>
</tr>
<tr>
<td>MAT → FR_RC</td>
<td>.063</td>
<td>-</td>
<td>.063</td>
</tr>
</tbody>
</table>

EN_SA = English syntactic awareness; FR_SA = French syntactic awareness; EVIP = French receptive vocabulary; WIAT = French word reading; FR_RC = French reading comprehension; WM = Working memory; MAT = Non-verbal reasoning.

***p < .001; **p < .01; *p < .05.

Note: All values above are reported using standardized weights.

For the fourth hypothesis, we examined the influence of English syntactic awareness on our two French mediation pathways. Figure 4 shows that English syntactic awareness has an effect
on both French mediators: word reading ($\chi^2 = .34, p < 0.01$) and receptive vocabulary $\chi^2 = .33, p < 0.01$). The addition of two significant pathways clearly has an effect on the overall efficacy of the model, increasing the model fit statistics: $\chi^2(3) = 10.165, p = .516, \text{CFI} = 1.00, \text{TLI} = 1.017, \text{RMSEA} = .000$. A chi-square difference test showed that adding two pathways from English SA to French word reading and vocabulary significantly increased the fit of the model ($\chi^2_{\text{diff}} = 15.607, df_{\text{diff}} = 2, p < 0.001$), therefore, cross-language model 2 was chosen as the better model depicting the relation between English SA and RC. However, given the high correlation between English SA and French RC, supported by evidence of cross-language transfer in the field, a final model was run to explore the possibility of a direct relationship between English syntactic awareness and French reading comprehension.

**Figure 4.** The Second Cross-Language Transfer model with standardized coefficients

EN_SA = English syntactic awareness; FR_SA = French syntactic awareness; EVIP = French receptive vocabulary; WIAT = French word reading; FR_RC = French reading comprehension.

***$p < .001$; **$p < .01$; *$p < .05$. 

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Table 7. Direct, Indirect and Total Effects for Cross-Language Model 2

<table>
<thead>
<tr>
<th>Path</th>
<th>Direct Effects</th>
<th>Indirect Effects</th>
<th>Total Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN_SA → FR_SA</td>
<td>.418***</td>
<td>-</td>
<td>.418**</td>
</tr>
<tr>
<td>EN_SA → WIAT</td>
<td>.338**</td>
<td>.135*</td>
<td>.473*</td>
</tr>
<tr>
<td>EN_SA → EVIP</td>
<td>.328**</td>
<td>.082*</td>
<td>.410*</td>
</tr>
<tr>
<td>FR_SA → WIAT</td>
<td>.323**</td>
<td>--</td>
<td>.323*</td>
</tr>
<tr>
<td>FR_SA → EVIP</td>
<td>.197</td>
<td>-</td>
<td>.197*</td>
</tr>
<tr>
<td>EN_SA → FR_RC</td>
<td>-</td>
<td>.377*</td>
<td>.377*</td>
</tr>
<tr>
<td>FR_SA → FR_RC</td>
<td>-</td>
<td>.239*</td>
<td>.239*</td>
</tr>
<tr>
<td>EVIP → FR_RC</td>
<td>.232*</td>
<td>-</td>
<td>.232*</td>
</tr>
<tr>
<td>WIAT → FR_RC</td>
<td>.597***</td>
<td>-</td>
<td>.597*</td>
</tr>
<tr>
<td>WM → FR_RC</td>
<td>.121</td>
<td>-</td>
<td>.121</td>
</tr>
<tr>
<td>MAT → FR_RC</td>
<td>.062</td>
<td>-</td>
<td>.062</td>
</tr>
</tbody>
</table>

EN_SA = English syntactic awareness; FR_SA = French syntactic awareness; EVIP = French receptive vocabulary; WIAT = French word reading; FR_RC = French reading comprehension; WM = Working memory; MAT = Non-verbal reasoning.

***p < .001; **p < .01; *p < .05.

Note: All values above are reported using standardized weights.

Finally, we investigated the possibility of a direct relationship between English Syntactic Awareness and French Reading Comprehension. Figure 5 shows that English syntactic indeed has a direct effect on French reading comprehension ($\chi^2 = .22, p < .05$). This final hypothesis, shown to be the most novel and therefore interesting, also has the best model fit: $\chi^2(2) = 5.058, p = .887$, CFI = 1.00, TLI = 1.110, RMSEA = .000. A chi-square difference test showed that adding one pathway from English SA to French reading comprehension significantly increased the fit of the model ($\chi^2_{diff} = -5.107, df_{diff} = 1, p < .05$), therefore, model 3 was chosen as the final model depicting the relation between English SA and RC. There are no other possible correlations that would fit with our understanding of language development in this model, allowing us to use this as the final model.
Figure 5. The Final Cross-Language Transfer model with standardized coefficients

EN_SA = English syntactic awareness; FR_SA = French syntactic awareness; EVIP = French receptive vocabulary; WIAT = French word reading; FR_RC = French reading comprehension.

***p < .001; **p < .01; *p < .05.

3.4. Total model statistics.

Using the 25th edition of AMOS, direct, indirect and total effects were run to estimate the overall effects of the dependent variables (French vocabulary, word reading, syntactic awareness and English syntactic awareness) on the independent variable (French reading comprehension), in conjunction with the two control variables (working memory and non-verbal reasoning). The total effects of model 3, the final cross-language model, are shown below in Table 9. The overall effect of English syntactic awareness through the three French mediators on French reading comprehension (Standardized Effect = .530, p > .01), reflects the strong significance of English SA on French RC. Furthermore, the total effect of French syntactic awareness through the two French mediators on French reading comprehension (Standardized Effect = .200, p > .05), shows that there is an indirect effect from French syntactic awareness to French reading comprehension.
Table 8. Direct, Indirect and Total Effects for Cross-Language Model 3

<table>
<thead>
<tr>
<th>Path</th>
<th>Direct Effects</th>
<th>Indirect Effects</th>
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</tr>
</thead>
<tbody>
<tr>
<td>EN_SA → FR_SA</td>
<td>.418***</td>
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<td>.418*</td>
</tr>
<tr>
<td>EN_SA → WIAT</td>
<td>.338**</td>
<td>.135*</td>
<td>.473*</td>
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<tr>
<td>EN_SA → EVIP</td>
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<td>.082*</td>
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<td>FR_SA → EVIP</td>
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<td>.197*</td>
</tr>
<tr>
<td>EN_SA → FR_RC</td>
<td>.216*</td>
<td>.313*</td>
<td>.530*</td>
</tr>
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<td>FR_SA → FR_RC</td>
<td>-</td>
<td>.200*</td>
<td>.200*</td>
</tr>
<tr>
<td>EVIP → FR_RC</td>
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<td>.170</td>
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<td>.515***</td>
<td>-</td>
<td>.515**</td>
</tr>
<tr>
<td>WM → FR_RC</td>
<td>.091</td>
<td>-</td>
<td>.091</td>
</tr>
<tr>
<td>MAT → FR_RC</td>
<td>.065</td>
<td>-</td>
<td>.065</td>
</tr>
</tbody>
</table>

EN_SA = English syntactic awareness; FR_SA = French syntactic awareness; EVIP = French receptive vocabulary; WIAT = French word reading; FR_RC = French reading comprehension; WM = Working memory; MAT = Non-verbal reasoning.

***p < .001; **p < .01; *p < .05.

Note: All values above are reported using standardized weights.

4. Discussion
The purpose of this study was to conduct an empirical evaluation of the relationships, both direct and indirect, between syntactic awareness and reading comprehension in emergent English-French bilingual speakers. Within this framework, we specifically sought to investigate the within-language effect between syntactic awareness and reading comprehension in French as well as transfer of syntactic awareness to reading comprehension from English to French. As we predicted based on the research conducted by Sohail et al. (submitted), French syntactic awareness did not have a significant direct effect on French reading comprehension. However, we found an indirect effect between French syntactic awareness and French reading comprehension mediated through both French word reading and French receptive vocabulary. Notably French word reading was a stronger mediator than French receptive vocabulary. With respect to cross-language results, we confirmed the direct effect of English syntactic awareness on French reading comprehension found by Sohail et al. (submitted). We also observed an
indirect effect from English syntactic awareness to French reading comprehension mediated through French word reading and French syntactic awareness.

Our first question concerned the direct relationship from French syntactic awareness to French reading comprehension. The results showed that French syntactic awareness was not a significant predictor of French reading comprehension in Grade 2. Notably, children in the present study performed poorly on the French syntactic awareness measure. On average, they only scored two out of 20 items correctly. Given that our participants lived in an English dominant environment and had only had French instruction for a little over two years, their French syntactic awareness was not yet well developed in Grade 2. Notably, Sohail et al. (submitted) who focused on French immersion children in Grade 1 also did not observe a direct effect of French syntactic awareness on French reading comprehension. Thus, it may take longer for French immersion children who live in an English dominant environment to build up their syntactic awareness in French. Future studies should examine this relationship in order children to fully evaluate the gains in syntactic awareness between these grades as well as their respective effects on reading comprehension.

As an extension of our investigation into within-language effects, our second question explored the indirect effects of French syntactic awareness on French reading comprehension through French word reading and receptive vocabulary. Contrary to the nonsignificant direct effects, the indirect pathway from French syntactic awareness to French reading comprehension was moderately significant. Specifically, French syntactic awareness was mediated by both word reading and receptive vocabulary in the relationship to French reading comprehension. This fits with our hypothesis as children at this age still depend on decoding for reading comprehension in their L2. According to Tumner, Herriman and Nesdale (1988), syntactic awareness facilitates
word reading by allowing students to employ syntactic parsing. In addition to recognizing simple words in a sentence, syntactic awareness, in conjunction with other skills such as morphological awareness, can help children read irregular and complex words.

In addition to French word reading, French receptive vocabulary also mediated the relationship between French syntactic awareness and French reading comprehension in the within language model. Here an interesting developmental shift emerges when we compare our results with those of Sohail et al. Sohail et al. (submitted) showed that vocabulary was not a significant mediator in the first grade, but this mediating effect became significant in Grade 2 in our study. Thus, the mediating role of vocabulary likely increases with grade level. However, as the children in our study were still beginning readers in French in Grade 2, the mediating effect of vocabulary was weaker than that of word reading. We expect the mediating role of vocabulary to continue to increase as children encounter more complex texts in higher grades.

Our third question investigated the direct effect of English syntactic awareness on French reading comprehension in a cross-language model. In contrast to our first question, there was a unique and significant direct relationship between English syntactic awareness and French reading comprehension. This confirms previous findings from Sohail et al. (submitted), who also found a direct effect from English syntactic awareness to French reading comprehension in the first grade. Since French immersion children are exposed to English at home and in the community, their syntactic awareness is more developed in English than French in the early primary grades. This direct effect is consistent with the notion that the effect of syntactic awareness on reading comprehension varies according to children’s developmental levels (Deacon & Kiefer, 2018; Sohail et al., submitted). Deacon and Kiefer (2018) propose that, when reading comprehension is in its infancy, there may be an indirect relationship between syntactic
awareness and reading comprehension through word reading. However, as reading development becomes an established skill, the relationship with syntactic awareness turns into a direct relationship. Extending Deacon and Kiefer (2018) to bilingual children, our study suggests that the direct effect is mainly determined by the level of syntactic awareness. Although children’s French reading comprehension is still low in Grade 2, they are able to use syntactic awareness developed in the stronger language to bolster reading comprehension in the L2.

Our fourth and final question, which addressed the indirect effect of English syntactic awareness on French reading comprehension through French word reading and French receptive vocabulary, furthermore yielded significant results. English syntactic awareness had an indirect effect on French reading comprehension mediated through French word reading. This cross-language finding mirrors the within-language one as word reading was a significant mediator in both models. These findings are expected due to the developmental stage of the bilingual participants in the present study (Foursha-Stevenson & Nicoladis, 2011). Given that students are still beginning readers of French in Grade 2, their reliance on word decoding fits with their current developmental stage. In contrast, dissimilar from the within-language results, the mediational pathway through receptive vocabulary was not significant in the cross-language model. A possible reason is that there were more mediators in the cross-language model than the within-language model. The already weak mediation effect of French vocabulary in the within-language model became insignificant when French syntactic awareness was added to the cross-language model.

Finally, French syntactic awareness served as an additional mediator in the relationship between English syntactic awareness, French word reading, and French reading comprehension. Despite children’s low levels of French proficiency, syntactic awareness was related across
English and French. Transfer of syntactic awareness at the construct level has been reported by previous research. For example, Foursha-Stevenson & Nicoladis (2011) observed a higher level of syntactic awareness in French-English bilingual students ($M$ age = 4;4) as opposed to monolingual students and attributed this advantage to transfer from English to French. Our findings that English syntactic awareness was connected with not only French reading outcomes but also French syntactic awareness suggest that transfer of syntactic awareness occurs at the both reading and construct levels. These findings extend theories of cross-language transfer (Cummins, 1979; Koda, 2007) to syntactic awareness, an aspect of metalinguistic awareness that has not been systematically examined by previous studies. To some extent, this transfer can be attributed to the high degree of overlap in syntactic structures between English and French. However, similar transfer has been reported by Siu and Ho (2015) between Chinese and English, pointing to the possibility that at least some underlying mechanisms of syntactic awareness are language universal.

This study specifically builds upon the English monolingual model proposed by Deacon and Kiefer (2018) as well as the French-English bilingual model proposed by Sohail et al. (submitted). Both models posit that the effects of syntactic awareness on reading comprehension vary as a function of children’s developmental stages. In the monolingual population, at Grades 3 and 4, we see a direct within-language relationship from English syntactic awareness to English reading comprehension without any mediation through word reading. This shows that most students in these grades have surpassed the need to rely on decoding to achieve reading comprehension. At the same time, indirect effects of syntactic awareness on reading comprehension mediated through decoding are reported in studies that involved younger monolingual children, such as Tumner et al. (1988, 1989). Therefore, the reliance upon decoding
in Grade one in Sohail et al. (submitted) and Grade two in the present study extends this theory to English-French bilinguals. Furthermore, in Grade two we begin to see a partial mediation through vocabulary when looking at the within language results. At this developmental stage, it appears that we have captured the transitional phase from decoding to whole word reading through vocabulary. Future studies need to examine the relationship between syntactic awareness and reading comprehension in French-English bilinguals in Grade 3 and above.

With respect to educational implications, the low level of French syntactic awareness demonstrated in the present study may be related to the teaching practice of French immersion programs. The current program does not have specific requirements in terms of the content of teaching. As a result, there is a reliance upon teachers to decide which grammar points are relevant and how these points are presented in lessons. Our results suggest that explicit and systemic instruction of syntactic knowledge may enhance syntactic awareness, which in turns contributes to reading comprehension. It is also important to develop proper instructional techniques for grammar and syntax, so that the instruction is engaging to young children. Furthermore, our results have implications on assessment. As some aspects of syntactic awareness may be universal and young French immersion students’ French skills are in their infancy, it may be beneficial to assess syntactic awareness initially in English. This is significant because it now provides a framework for the optimal age of syntactic awareness assessment, as well as the language of assessment, in order to obtain accurate results and implement efficient intervention if necessary.

4.1. Limitations and future directions.

One limitation of this study is the floor effect shown in the French syntactic awareness measure. In order to ensure that performance across the English and French experimental measures would
be comparable, they were designed using the same difficulty level across all items. However, the
French measure was too complex for children’s current level of development. In order to account
for these varying levels of proficiency across languages, more items should be included in future
studies to give a more comprehensive breadth of their skills. A further limitation of this study is
the lacuna of diversity present in our population. While efforts were made to include English
Language Learners in this study, there were not enough available for them to be a comparable
sub-group in these analyses. Further studies would benefit from seeking more diverse
populations that include students with various language backgrounds.

There are two components of this study that especially warrant further exploration. The
first is that the results of this study are contingent upon the age and development of the
participants. As young language learners, students’ understanding, and mastery of components is
constantly changing. While English syntactic awareness is a strong predictor of French reading
comprehension at this age, French syntactic awareness may become a strong predictor as
children develop a higher level of French proficiency. It would therefore be beneficial to
replicate this study with children of later grades to see whether there is a shift in their
development. Second, it would be beneficial to conduct a more fine-tuned analysis to evaluate
the mastery of different syntactic features. For example, students would most likely be able to
manipulate simple sentences first (e.g. I like apples) and complex-compound sentences last (e.g.
While I like apples, I recently tried bananas, and I enjoyed them just as much). While our study
included sentences of varying complexity, it would be beneficial in the future to ensure that there
is a broad range of sentence structures in future measures.
4.2. Summary.

In sum, our study demonstrates a link between syntactic awareness and reading comprehension in monolingual populations. A few studies have examined the cross-language effects of syntactic awareness in bilingual populations (Geva & Farnia, 2012; Sohail et al., submitted), but this study provides a more comprehensive overview by including within and cross-language effects in addition to novel mediators. Generally speaking, syntactic awareness in both French and English uniquely predicts French reading comprehension through a combination of direct and indirect effects. However, syntactic awareness is more developed in English than French at this age and English syntactic awareness has a direct effect on French reading comprehension. With respect to mediation effects, word reading is a stronger mediator than vocabulary both within French and across English and French for bilingual children in the beginning stages of reading development.
5. References


Hagtvet, B. E. (2003). Listening comprehension and reading comprehension in poor decoders: Evidence for the importance of syntactic and semantic skills as well as phonological skills. *Reading and Writing, 16*(6), 505-539.


Mokhtari, K., & Thompson, H. B. (2010). How problems of reading fluency and comprehension are related to difficulties in syntactic awareness skills among fifth graders. *Reading Research and Instruction, 46*(1), 73-94.


https://tspace.library.utoronto.ca/bitstream/1807/68117/1/Pasquarella_Adrian_D_201406_PhD_thesis.pdf


