

[Published in revised form in *International Journal of Multilingualism*, 9 (3), 272-293.]

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**The development of language and reading skills in the second and third languages of  
multilingual children in French Immersion**

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### **Abstract**

The relationship between first language (L1) typology, defined as the classification of languages according to their structural characteristics (e.g. phonological systems and writing systems), and the development of second (L2) and third (L3) language skills and literacy proficiency in multilingual children was investigated in this study. The sample included 90 children in Grade 4, tested once at the beginning of Grade 4 (T1) and again at the end of Grade 4 (T2). The children belonged to one of three language groups: English monolinguals, multilinguals who were literate in an alphabetic L1, and multilinguals who were literate in a logographic/syllabary L1. The study examined the extent to which the development of L2 and L3 literacy skills varied primarily as a function of orthographic similarities with the L1. Results revealed that multilingual children who were literate in an alphabetic L1 showed advantages in L2 and L3 reading comprehension. However, there were no differences on tasks that measured word reading and pseudoword reading. A more accurate picture of what facilitates L2 and L3 reading development is enhanced when differences in L2 and L3 proficiency were considered as well.

### ***Keywords:***

Multilingualism, reading comprehension, third language acquisition, trilingual competence, crosslinguistic influence, language development.

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Few studies have explored the relationship between first (L1) language typology and the acquisition of a second (L2) and third (L3) language (Bild & Swain, 1989; Cenoz, 2003; Cenoz & Valencia, 1994; Haenni Hoti, Heinzmann, Muller, Oliveira, Wicki, & Werlen, 2011; Munoz, 2000; Sanz, 2000; Swain, Lapkin, Rowen, & Hart, 1990). Language typology is defined as the classification of languages according to their structural characteristics, such as phonological systems, writing systems, and word order (Proctor, August, Snow, & Barr, 2010). Of those studies that examined the effects of L1 typology on L3 development, the majority included bilinguals whose L1 had official status in the community, was the language of instruction, and was typologically similar to the target L3 (Cenoz & Valencia, 1994; Munoz, 2000; Sanz, 2000). By contrast, relatively few studies have examined whether differences in L1 typology influenced the development of oral language proficiency and literacy skills in the L2 and L3 (Swain et al., 1990). Moreover, no studies have examined the relationship between L2 and L3 oral skills and L2 and L3 literacy acquisition. The study of L1 typological differences on L2 and L3 oral skills and reading development will increase our understanding of the effects of different L1s when acquiring a second and third language, especially in environments where the L1 is not directly taught in the classroom and when the L1 is typologically dissimilar to the target L2 and L3.

The question of language typology has been addressed by the script-dependent hypothesis according to which differences in L2 reading development are related to how closely writing systems from different languages share a common orthography (Dressler & Kamil, 2006; Geva & Siegel, 2000; Kats & Frost, 1992). Therefore, L2 reading acquisition in languages with common orthographies (e.g. languages that share an alphabetic writing system) is assumed to be developed more easily than in languages with dissimilar writing systems (e.g. alphabetic and logographic writing systems such as in Cantonese and Mandarin).

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Within the field of L2 acquisition, it has been established that L2 reading acquisition is directly related to L1 typology, whereby the L1 influenced the L2 to a greater extent in languages which shared a common orthographic system (see Jarvis & Pavlenko, 2008 for a survey of cross-language influence). The development of L1 and L2 literacy in terms of word reading, pseudoword reading, and reading comprehension was compared in alphabetic languages (Portuguese, Spanish) with that of orthographically dissimilar languages (Cantonese). Generally in cases when the two languages were orthographically similar (Durgunoglu, Nagy, & Hacin Bhatt, 1993; Royer & Carlo, 1991) L1 reading ability significantly predicted L2 reading ability. By contrast, studies that examined reading skills between typologically-different languages have consistently reported weak or no correlations across languages (Arab-Moghaddam & Sénéchal, 2001; Biaystok, Luk, & Kwan, 2005; Gottardo, Yan, Siegel, & Wade-Woolley, 2001).

The role of language typology has also been examined in understanding how L1 oral skills, such as vocabulary, influence the acquisition of L2 oral skills and L2 reading proficiency. Studies of bilingual children with orthographically similar languages, such as Spanish, German, and Portuguese, have demonstrated limited evidence of positive transfer in vocabulary comprehension (Durgunoglu et al., 1993; Garcia, 1991; Ordonez, Carlo, Snow, & McLaughlin, 2002). Moreover, L1 and L2 vocabulary knowledge has been positively associated with L2 reading comprehension when the two languages are alphabetic, e.g., Spanish (L1) and English (L2) (August, Carlo, Dressler, & Snow, 2005; Dressler & Kamil, 2006; Jimenez, Garcia, & Pearson, 1996; Miller, Heilmann, & Nockerts, 2006; Proctor, August, Carlo, & Snow, 2006). Only one study to date has examined this relationship in languages that are typologically distant. Koda (1989) examined the acquisition of L2 Japanese in two groups of young adults (mean age of 21 years): English and Spanish monolinguals (alphabetic L1) and Chinese monolinguals (non-

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alphabetic L1 that uses logographic characters) at the beginning and end of university term. The Japanese writing system uses both Kanji (logographic characters similar to Chinese) and Kana (syllabary sound based writing system). The author hypothesized that a stronger and positive relationship between L2 vocabulary and L2 reading comprehension would be observed in the Chinese L1 group because of the common orthographies in the writing systems. The results confirmed the hypothesis; stronger L2 vocabulary was observed in the Chinese L1 group and, in turn, L2 vocabulary was positively associated with L2 reading comprehension in the Chinese L1 group only.

What is less known in multilingual development, is how L1 typology relates to the development of L2 and L3 oral languages skills and reading development. Bild & Swain (1989), Cenoz, (2003) and Swain et al. (1990) have shown that when the L1 was typologically related to the L3, multilingual children acquired high levels of vocabulary and writing skills in the L3. Yet, only one study (Swain et al., 1990) focused on the L3 reading development of individuals from orthographically dissimilar L1s. The authors found that L1 typology influenced the development of L3 (French) writing, auditory and reading comprehension skills of two different groups of school-age multilingual children; in one group the multilingual children had alphabetic L1s, and in the other group, the multilingual children had non-alphabetic L1s. All students had received five years of English instruction (Kindergarten to Grade 4) and three years of bilingual English-French instruction (Grades 5 through 7). Therefore, all students shared a common alphabetic L2, English. The students whose L1s were Romance languages (i.e., also alphabetic) scored higher on a written vocabulary task, a global understanding index of auditory comprehension, and on a fluency measure of oral French. There was a trend for students with a Romance L1 to perform better on the reading comprehension measure than the non-Romance

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group, but the difference was not statistically significant. Taken together the results from this study suggested that in these groups of multilingual children L1 typology may have influenced the acquisition of certain L3 skills; by contrast, language typology did not appear to affect reading comprehension.

However, in the Swain et al. (1990) study, within the non-Romance group, many languages (e.g. German, Tagalog, Greek, Polish) were alphabetic and orthographically similar to those in the L1 Romance group and related more or less closely to French. Furthermore, it was not clear whether the multilingual children had developed both oral and literacy skills in their L1 or whether the children had acquired only oral skills. Language typology would be expected to influence reading development to a greater extent in children who were literate in their L1 because these children had acquired knowledge of the orthographic system (Cenoz, 2003; Errasti, 2003; Munoz, 2000).

Research on cross-linguistic influence in the acquisition of L3 oral language skills have consistently showed that multilingual children who have an alphabetic and orthographically similar L1 to the target L3 demonstrated increased positive influence in phonology and grammatical ability (Bild & Swain, 1989; Cenoz, 2003; De Angelis & Selinker, 2003; Foote, 2007; Hammarberg, 2003; Leung, 2005; Ringbom, 2003; Swain et al., 1990). Fewer studies, by contrast, have demonstrated evidence of positive influence in L1 and L3 oral skills when the languages were orthographically dissimilar (Leung, 2005; Swain et al., 1989). Leung (2005) compared the acquisition of French (L3) determiner phrases between two groups of multilingual Chinese L1 and Vietnamese L1 young adults, whose L1 typology differed from that of the target language. Results showed that L3 French students with orthographically dissimilar L1 (Chinese L1 – English L2) demonstrated a significantly greater number of grammar errors; whereas, the

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L3 students with common alphabetic L1 (Vietnamese L1 – English L2) performed better on French determiner phrases.

Of the few studies that have examined cross-linguistic influence in L3 development, most have focused on the identification of three common factors that can explain the acquisition of oral language skills and literacy: a) typological distance, b) proficiency in the different languages, such that students who demonstrate greater L1 reading proficiency acquired greater L3 reading skills (Cenoz & Valencia, 1994), and c) factors associated with L1 use (Cenoz, 2003; Foote, 2007; Swain et al., 1990). The focal point of the current study is typology; nonetheless, factors associated with language use (e.g. age of arrival, literacy practice) and SES are important in the acquisition of language and literacy (D'Angiulli, Siegel, & Maggi, 2004; Leseaux & Siegel, 2003) and, thus, will also be considered.

The present study set out to examine the effects of L1 typology on the development of L2 and L3 oral proficiency and L2 and L3 reading skills in two groups of Grade 4 multilingual children who were exposed to English and French as additional languages in an early French immersion program. In particular, the study investigated the hypothesis that exposure to L1 literacy in orthographically similar alphabetic languages, such as Spanish and German, would increase reading skills in additional languages such as English and French. The following three research questions were addressed:

- 1) How does the performance of two groups of multilingual children, one group with an alphabetic L1 and another with a non-alphabetic L1 compare with that of a group of English monolingual children learning French as a second language (FSL) on measures of L2 (English) and L3 (French) language proficiency? In addition, how does the performance between the two

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multilingual groups compare on measures of L2 (English) and L3 (French) language proficiency?

2) How does the performance of two groups of multilingual children compare with that of a group of English monolingual children learning FSL on measures of L2 English and L3 French reading skills? In addition, how does the performance between the two multilingual groups compare on measures of L2 English and L3 French reading skills?

3) Do measures of oral language proficiency in L2 and L3 predict L2 and L3 reading scores differently in children from typologically similar and different L1?

### **Method**

#### ***Participants***

The participants included 90 children in Grade 4 who belonged to one of three groups: 1) 57 English monolingual children studying French as a second language, 2) 20 multilingual children who were literate in an alphabetic L1 (representing 15 different languages), and 3) 13 multilingual children who were literate in a logographic/syllabary L1 (representing 4 different languages). The age of the children in the three language groups at T1 and T2 was equivalent (see Table 1 for participant demographics). All students were enrolled in an early French immersion program and had received French instruction from Kindergarten to Grade 4 and began receiving formal English instruction in Grade 4. Instruction in early French immersion programs consisted of 100% French from Kindergarten to Grade 3, and then 80% French and 20% English from Grades 4 to 7.

Participants were recruited from schools in culturally and linguistically diverse communities in a major metropolitan city in Canada. Background information on SES variables, amount of use in each language in the home and outside the home, as well as the literacy



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activities in all languages used at home was collected to establish that the multilinguals in both alphabetic and non-alphabetic groups and the English monolinguals had similar exposure to English and French. There were no significant differences across the three groups in the level of education attained by mothers, who on average had achieved at least a bachelor's degree across all three groups  $F(2, 86) = .64, p = .53$ , and on the level of education reached by fathers, who on average had achieved at least an associate's degree or trade certification across all groups,  $F(2, 87) = 2.01, p = .14$ .

*Insert Table 1 about here*

Data on home language literacy exposure was obtained through a comprehensive written parent questionnaire with three particular questions: a) how often parents read to their child in each language, b) how often their child read to themselves in each language, and, finally, c) who else read in each language with their child. We included only those children whose parents reported that their child spoke the L1 at home on a daily basis and that the child read in the L1 at least twice per month and this assured that they had generally strong exposure to the L1 and that they were all literate in their L1. The age at which children were first exposed to English, their L2, was equivalent in both the multilingual alphabetic L1 group ( $M = 0;1, SD = 0;5$ ) and the multilingual logographic/syllabary L1 group ( $M = 0;2, SD = 0;7, t(32) = .61, p = .54, d = .01$ ). The average length of residence (in years) in Canada for the multilingual alphabetic L1 group ( $M = 8.75, SD = 0.75$ ) was also equivalent to the the multilingual logographic/syllabary L1 group ( $M = 8.67, SD = .82, t(32) = .27, p = .79, d = .002$ ).

The multilingual children lived in English-dominant communities and they were exposed to English before French in the home; therefore, English was considered as their L2 and French as their L3. Parents reported on their child's literacy exposure in the L2 and L3 by indicating the

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number of times their child read in each language (i.e. on a scale, which ranged from 1 = once or twice per month, 3 = two or three times per week, and 5 = every day). When examining the patterns of literacy use in the multilingual alphabetic L1 group, parents read to their children more often in the L2 ( $M = 3.80$ ;  $SD = 1.36$ ) than in the L3 ( $M = 1.75$ ,  $SD = 1.48$ ),  $t(19) = 4.74$ ,  $p = .001$ ,  $d = .54$ . Similar patterns were observed in the multilingual logographic/syllabary L1 group, where parents read more often in the L2 ( $M = 3.54$ ,  $SD = 1.76$ ) than in the L3 ( $M = 1.38$ ,  $SD = 2.02$ ),  $t(12) = 4.17$ ,  $p = .001$ ,  $d = .59$ ; however, there was no group difference in the amount of exposure to reading in L2 and L3 between the two multilingual groups,  $F(1, 31) = .45$ ,  $p = .51$ ,  $\eta^2 = .01$ , therefore we did not control for this variable in subsequent analyses.

### *Materials*

The materials consisted of language proficiency and reading measures, and included equivalent standardized measures in both L2 (English) and L3 (French).

#### *English Proficiency Tests*

The *Peabody Picture Vocabulary Test-III* (PPVT-III, Dunn & Dunn, 1997) is a standardized test of English vocabulary comprehension and provided a general measure of one aspect of the children's English oral language proficiency. The children were asked to identify the picture that correctly corresponds to an orally presented word among four picture alternatives. The test-retest reliability coefficients for this age group were .93.

The *Listening Comprehension* subtest from the *Woodcock Language Battery Proficiency* (WLPB-R, Woodcock, 1991) was used as a measure of auditory comprehension in English. In this standardized task, the experimenter read aloud short sentences which were each missing a word. The task required the children to say a word that is appropriate both in terms of structure (syntax) and meaning (semantics) in the context of the sentence. The test-retest reliability

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coefficient for this age group was .86.

### *French Proficiency Tests*

The *Échelle de vocabulaire en images Peabody* (ÉVIP, Dunn, Thériault-Whalen, Dunn, 1993) is a standardized test of French vocabulary comprehension and was used as one measure of children's French language proficiency. As with the PPVT-III, children were asked to identify from among four pictures the image that correctly corresponds to an orally presented word. The test-retest reliability coefficient for this age group was .90.

The *Compréhension orale* subtest from the *Test de rendement individuel de Wechsler* (WIAT-II, Wechsler, 2007) was used as a measure of auditory comprehension in French. This standardized test is similar to the English WLPB-R, although it also uses a picture elicitation task and includes items that measure vocabulary comprehension and production. The test-retest reliability coefficient was 0.88 for this age group.

### *English Reading Tests*

The following subtests of the WLPB-R (Woodcock, 1991), specifically designed to test for reading ability in English, were administered to the three groups of participants at T1 and again at T2: (1) *Letter-Word Identification*, children were asked to read aloud words that were increasingly more complex; (2) *Word Attack*, children were asked to read pseudowords, for example *yosh* and *thrept*; and (3) *Passage Comprehension*, children were asked to read a short passage with a missing word that required them to produce a word that would be appropriate both in terms of structure (syntax) and meaning (semantics) in the context of the paragraph. The WLPB-R was chosen for this study because of its comprehensive nature, its high degree of reliability (test-retest reliability coefficient of .90 to .94) and validity as reported by the publishers, and its appropriateness for the age groups under investigation.

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### *French Reading Tests*

The following subtests of the WIAT-II (Wechsler, 2007), specifically designed to test for reading ability in French, were administered to all participants at T1 and again at T2: (1) *Lecture de mots [word reading]*, children were asked to read aloud words that were progressively more complex; (2) *Décodage de pseudomots [pseudoword reading]*; and (3) *Compréhension de lecture [reading comprehension]*, in which participants read short stories (aloud or silently) and answered questions relating to the stories. The WIAT-II was chosen because of its high reliability (test-retest coefficient varied between .88 and .94) and validity, as reported by the publishers, and is widely used in research and schools.

### *Procedure*

Identical procedures were followed for each group at T1 and T2. Thus, each participant was tested twice during the school year: at the beginning of Grade 4 from October to November (T1) and, at the end of Grade 4 from mid-April to May (T2). Each child was tested individually in two sessions (one in English and one in French) that lasted approximately 45 minutes each and were separated by 1 to 2 weeks. Native English- and French- speakers administered all tests in the two languages. To counterbalance for order effects, one half of the participants were tested first in English, and the other half were tested first in French.

## **Results**

### *The effect of L1 Typology on L2 and L3 Oral Proficiency*

The *F* tests and descriptive statistics on the English and French measures of language proficiency are provided in Table 2.

*Insert Table 2 about here*

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The relationship between L1 typology and L2 language proficiency was examined for multilingual children from all L1 backgrounds at T1 and T2 and for the English monolingual children. A series of two-way mixed ANOVA for group (3) and time (2) were conducted on the standard scores of the listening comprehension task of the WLPB-R and on the standard scores of the English PPVT-III. There was a group effect on the auditory comprehension task with post-hoc (Bonferonni) analyses demonstrating that English monolingual children and multilingual children with an alphabetic L1 had higher scores than the multilingual children with a logographic/syllabary L1, with no difference between the English monolingual and multilingual alphabetic L1 group. There was also a significant time effect, indicating that children at the end of Grade 4 had higher scores than at the beginning of Grade 4. There was no significant interaction on the listening comprehension task,  $F(2, 89) = .22, p = .80, \eta_p^2 = .005$ .

On the English PPVT-III measure, there was a significant group effect, with follow-up analyses (Bonferroni post-hoc test) showing that the English monolinguals and multilingual children with an alphabetic L1 had higher scores than multilingual children with a logographic/syllabary L1, and no difference between the English monolingual group and the multilingual alphabetic L1 group. There was a significant time effect showing that children had greater vocabulary comprehension at the end of Grade 4. The interaction was not significant,  $F(2, 89) = .90, p = .41, \eta_p^2 = .02$ .

A series of two-way mixed ANOVAs for group (3) and time (2) comparing the performance of oral language skills between T1 and T2 on the French oral measures revealed different patterns in the two tasks: on the auditory comprehension task, there were significant group effects; however, there was no time effect. A Bonferroni post-hoc test showed that

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multilingual children with an alphabetic L1 and the English monolinguals had higher scores on the auditory comprehension measure than multilingual children with a logographic/syllabary L1, and there was no difference between the English monolinguals and multilingual alphabetic L1 group. On the vocabulary comprehension task, the main group effect nearly reached statistical significance ( $p = .054$ ). The multilingual children with an alphabetic L1 and English monolinguals tended to have greater vocabulary comprehension than multilingual children with a logographic/syllabary L1. There was a time effect, where vocabulary was greater at T2 than at T1. Results revealed no significant interactions on any of the tasks that measured French proficiency ( $p > .05$ ).

### ***The effect of L1 Typology on L2 and L3 Reading***

Table 3 shows the *F*-tests and mean scores on all English and French reading measures for the three groups. For these analyses, the performance of the multilingual logographic/syllabary L1 group was compared to that of the multilingual alphabetic L1 group with that of English monolinguals at the beginning and end of Grade 4.

*Insert Table 3 about here*

A series of two-way mixed ANOVAs for group (3) and time (2) were carried out on the standard scores of the *Letter-Word Identification* (word reading), *Word Attack* (pseudoword reading) and *Passage Comprehension* (reading comprehension) subtests of the WLBP-R as well as two composite scores: *broad reading* (letter-word and passage comprehension) and *basic reading skills* (letter-word and word attack) from the WLPB-R. Findings revealed no main group effect on the *letter-word identification*, *word attack*, or *the basic reading skills* tasks. Conversely, there was a significant main group effect on the *broad reading* task, with post-hoc (Bonferroni) tests confirming that English monolinguals and multilingual children with an

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alphabetic L1 were more proficient in a composite score of word-reading and reading comprehension than the multilingual logographic/syllabary L1 group. The main group effect on the *passage comprehension* task approached, but did not reach, statistical significance ( $p = .06$ ); however, a comparison of means between the two multilingual groups shows that multilingual children with an alphabetic L1 tended to have higher reading comprehension scores than multilingual children from the logographic/syllabary L1 group.

Among all tasks measuring different reading skills in English except reading comprehension, the patterns of results were consistent across the multilingual and monolingual groups: children increased their reading skills in English from the beginning to the end of Grade 4. There was no significant interaction on any of the measures ( $p > .05$ ).

A series of two-way mixed-design ANOVAs for group (3) and time (2) was conducted separately for each French reading task from the WIAT-II. There was a significant effect of group on the reading comprehension task, where Bonferroni post-hoc tests confirmed that the multilingual alphabetic L1 group and the English monolinguals scored higher than the multilingual logographic/syllabary L1 group; however, there was no difference between the multilingual alphabetic and English monolingual groups. In the word reading, pseudoword reading, and broad reading tasks no group difference was found. There was also a main effect for time: L3 reading comprehension increased from the beginning to the end of Grade 4. There were no main effects for time in word reading and pseudoword reading ( $p > .05$ ). Findings showed no significant interactions on any of the tasks that measured L3 reading ( $p > .05$ ).

### ***Comparisons between L2 and L3 Oral Proficiency and L2 and L3 Reading***

In order to compare the performance on the language proficiency and reading tasks in each of the L2 and L3 of the multilingual children, the scores from the two groups of

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multilingual children were examined separately. A series of 12 paired sample *t* tests, with Bonferroni correction for multiple tests ( $p < .004$ ) were conducted for each measure of language proficiency and reading outcomes at T2 in order to examine the children's performance after a full year of formal reading instruction in both English and French. The mean scores and *t* test comparisons are presented in Table 4. The patterns of results were consistent across the children from both multilingual alphabetic and multilingual logographic/syllabary L1 backgrounds: their L2 (English) skills and reading proficiency scores were higher than their L3 (French) skills and reading proficiency on all tasks related to language and reading ability. Thus, all children, regardless of L1 typology, had stronger L2 than L3 skills in domains related to language and literacy.

*Insert Table 4 about here*

### ***The effect of oral proficiency in the L2 and L3 on reading in L2 and L3***

Correlations between L2 and L3 oral proficiency scores and L2 and L3 reading scores were examined for each of the multilingual alphabetic and non-alphabetic L1 groups separately (see Table 5). The findings showed that the L2 and L3 auditory comprehension scores were consistently correlated with L2 and L3 reading comprehension and L2 and L3 broad reading tasks within- and across-languages in both L1 literacy groups (the Pearson correlation coefficients on all tasks varied between  $r = .54, p = .04$  and  $r = .91, p < .008$ ). Correlations between L2 and L3 auditory comprehension scores as well as L2 and L3 vocabulary comprehension and L2 and L3 word reading and L2 and L3 pseudoword reading were generally low in both L1 literacy groups, with the exception of L2 vocabulary comprehension being more highly correlated with L2 word reading and L2 pseudoword reading in the L1 multilingual alphabetic group ( $r = .78$  and  $r = .72, p < .001$ ). By contrast, the L2 and L3 vocabulary



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comprehension scores were more strongly correlated with L2 and L3 reading comprehension in the L1 multilingual alphabetic group ( $r = .72$  to  $r = .91$ ,  $p < .001$ ) than the L1 multilingual non-alphabetic group ( $r = .48$  to  $r = .52$ ,  $p > .05$ ).

*Insert Table 5 about here*

Based on the correlation analyses, we further investigated the third research question addressing whether L2 and L3 oral skills (and vocabulary in particular, since only the correlations with the vocabulary comprehension measures were significant in the two multilingual groups) predicted L2 and L3 reading comprehension differently with respect to L1 typology. A series of hierarchical multiple regression models were tested in order to examine whether L1 typology (multilingual alphabetic L1 and multilingual non-alphabetic L1 group) significantly moderated the predictive relationship between L2 and L3 vocabulary (at T1 and T2) and L2 and L3 reading comprehension (also at T1 and T2). Vocabulary in L2 or L3 (predictor) was centered then entered as the predictor in the first step of the regression, then the interaction term between vocabulary and L1 typology (moderator) was entered in the second regression step. This procedure identified whether the interaction contributed unique variance to the overall model, determined by the statistical significant change in the  $R^2$  between the first and second model (Frazier, Tix, & Barron, 2004).

The results of all the regression models (see Table 6) showed a significant moderator effect for L3 French vocabulary on both English ( $R^2$  change = .23,  $F = 11.24$ ,  $p = .001$ ) and French reading comprehension ( $R^2$  change = .21,  $F = 12.93$ ,  $p = .001$ ) at T1. Similarly, at T2, French vocabulary measured at T1 moderated both L3 French reading comprehension at T2 ( $R^2$  change = .29,  $F = 16.34$ ,  $p = .001$ ) and L2 English reading comprehension at T2 ( $R^2$  change = .18,  $F = 8.92$ ,  $p = .006$ ). In follow-up analyses, we computed predicted values for the outcome

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variables (English and French reading comprehension) at T2 for the two multilingual groups based on their French vocabulary scores at T1 (at the mean and 1 standard deviation above and below the mean score of French vocabulary). The predicted values obtained from these analyses were then used to create the figures summarizing the moderating effect of French vocabulary scores (see Figure 1 and Figure 2, respectively). Findings revealed that the association between vocabulary skills and reading comprehension was different in the different language groups. French vocabulary at the beginning of Grade 4 did not significantly predict English and French reading comprehension respectively at the end of Grade 4 in the children with a logographic/syllabary L1. However, in the multilingual alphabetic L1 group, increase in French vocabulary was associated with an increase in French reading comprehension.

*Insert Table 6 about here*

*Insert Figure 1 and Figure 2 about here*

### **Discussion**

This study set out to explore the extent to which the acquisition of oral language and literacy skills in the second and third languages of multilingual children can be represented in terms of orthographic similarities to the L1. In addressing the first research question, similar to previous research in L2 (Koda, 1989) and L3 (Leung, 2005; Swain et al., 1990) development, results from the current study demonstrated that vocabulary and auditory comprehension skills in the sequential acquisition of L2 and L3 are influenced by the typology of the L1. The English monolinguals and the multilingual alphabetic L1 group had stronger English and French oral skills than the multilingual logographic/syllabary L1 group. Moreover, the English monolinguals and the multilingual alphabetic L1 group also both had better English and French reading comprehension skills. A large body of research has revealed that the relationship

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between vocabulary and reading comprehension is a reciprocal one, where vocabulary growth takes place through reading, and that children with larger vocabularies tend to better comprehend written text (McKeown, Beck, Onanson, & Perfetti, 1983; Stanovich, 1986). Reading is a significant contributor to the development of vocabulary (Nagy & Anderson, 1984) and, by extension, higher proficiency of L2 and L3 reading comprehension in the multilingual alphabetic L1 group may have also led to an increase in their L2 and L3 vocabulary size. Therefore, L1 typology per se may not have explained group differences in L2 and L3 oral skills; rather, increased proficiency of L2 and L3 reading comprehension is likely to have influenced higher L2 and L3 vocabulary comprehension skills in the multilingual alphabetic L1 group. Alternatively, it is possible that the multilingual children with logographic/syllabary L1 had greater amount of home language exposure and to a smaller degree English and French exposure when compared to the multilingual children in the alphabetic L1 group. This increase in L1 support could have contributed to weaker L2 and L3 oral proficiency because the multilingual children with logographic/syllabary L1 used English and French less frequently than the multilingual children with an alphabetic L1. However, the children in the current study had equal exposure to English (L2) and French (L3) in terms of the number of people around them who spoke to them in the L2 and L3. Therefore, in future research a more detail account of the language exposure children had in their home language, as well as in the school languages should be provided and researchers should directly measure the oral language proficiency in the L1.

The second objective of this study was to explore how L1 typology influenced the development of L2 and L3 literacy skills. In line with previous research on L2 literacy acquisition (e.g., Bialystok et al., 2005; Dugunoglu et al., 1993; Gottardo et al., 2001), we expected that L1 typology would be associated with literacy skills in the L2 *as well as* in the L3

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of multilingual children. The effects of L1 typology on the development of reading proficiency in L2 and L3 can be influenced by factors such as language of literacy instruction, home literacy practice, length of residency in the country where L2 and L3 are acquired, age of acquisition, the degree of similarity of orthography between languages, and SES. Since participants in the present study were acquiring their L2 and L3 at equivalent ages, had the same language of literacy instruction (French from Kindergarten to Grade 3; then English in Grade 4), were raised in households with similar SES, and received equivalent L2 and L3 literacy instruction in school, it seems plausible that the one factor that could explain their performance was the degree of typological similarity in terms of orthography between their L1 and the target L2 and L3.

The present findings provided further support to the script-dependent hypothesis showing consistent effects of L1 typology on the development of literacy skills in the L2 and L3. When the multilingual children were compared based on how closely their L1 writing system matched the orthography of the L2 and L3, the multilingual alphabetic L1 group performed just as well as the monolingual children on all measures of L2 and L3 reading; and it was only the multilingual children with a logographic/syllabic L1 who had much weaker proficiency in L2 reading comprehension. Moreover, it was found that the weaker performance of the multilingual logographic/syllabic L1 group was present not only in L2 reading comprehension, but also in the L3. The multilingual children with alphabetic L1 may have benefited from sharing a common writing system with the target L2 and L3 based on a shared knowledge of the alphabetic principle which leads to greater efficiency when decoding text (Adams, 1990; Akamatsu, 1999; Bialystok et al., 2005).

However, according to the script-dependent hypothesis it was expected to find group differences in all aspects of literacy, including word reading and pseudoword reading. The

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results failed to show any group differences in L2 or L3 word-level reading skills. One possible explanation could be that the students were old enough and were already fluent in decoding skills (decoding scores on L2 word reading and L2 pseudoword reading were well within and above the expected age range for the groups in this study); and they were now developing their reading comprehension skills.

Our final objective was to examine whether L1 typology influenced the relationship between L2 and L3 vocabulary and L2 and L3 reading comprehension. Findings showed that for the multilingual alphabetic L1 group, an increase in French vocabulary was associated with an increase in English and French reading comprehension; whereas, in the multilingual logographic/syllabic group an increase in the French vocabulary skills was not associated with an increase in their English and French reading comprehension. These results are in line with previous research by Koda (1989) and August et al. (2005) whose findings showed that L2 vocabulary knowledge was positively associated with L2 reading comprehension in languages that share a common alphabetic system. Conversely, when the target language is typologically dissimilar from the L1, transfer of oral skills is less likely and children show less advanced proficiency in reading comprehension (Koda, 1989). However, in the present study, only French vocabulary skills were associated with reading comprehension in both English and French, and the children's French vocabulary skills were lower than their English skills. It is possible that as a result of the more intense formal academic instruction in French in the first four years of French immersion, children had acquired vocabulary in French that consisted of words that are more commonly used in school, i.e., in the context of an academic discourse. And those were also words that are helpful with comprehension of academic texts. On the other hands, even though their English vocabulary was larger, it is possible that it consisted of words that are not

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essential for classroom discourse, and thus less likely to assist in the comprehension of academic texts.

An alternative explanation for group differences in the development of French vocabulary skills related to L2 and L3 reading comprehension is that the multilingual alphabetic L1 group may have benefited from shared vocabulary cognates between their L1 and French; whereas, the multilingual children from the logographic/syllabic L1 group may not have had the opportunity to develop cognate awareness because their L1 and French did not share any cognates (i.e. languages that shared alphabetic knowledge also benefitted from cognate awareness) (Carlo et al., 2004; Chen, Ramirez, Luo, Geva, & Ku, 2011; Jarvis & Pavlenko, 2008). Cognates are vocabulary words in two languages that are similar both orthographically and semantically and that share a common historical origin (Holmes & Guerra Ramos, 1995). Chen et al. (2011) have demonstrated that cognate awareness only develops in an L2 when the first language is orthographically related to the target second language. Future studies should aim to include groups with more homogenous L1s (such as Finnish and Swedish multilingual children learning English in Odlin & Jarvis, 2004) and this would provide additional evidence in order to be able to separate the effect of cognate awareness from language typology in the reading development of multilingual children.

The data presented here supported the research by Leung (2005) and Swain et al. (1990) who also found that L1 typology influenced the development of skills in the L3 to a greater extent when languages were orthographically similar. Furthermore, we improved upon the Swain et al. (1990) study by comparing multilingual children who had distinct L1 typologies (alphabetic and non-alphabetic) and by including only multilingual children who were literate in their L1 and thus allowing us to be more confident about the effect of L1 typology, particularly

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in terms of orthography, on L2 and L3 reading proficiency. Based on the alphabetic similarities between the L1 and the target L2 and L3, it is now apparent that L1 typology is likely to influence the development of reading comprehension in both the second and third language.

An effort was made to assure that all children were literate in their L1 because this was essential for our research design; however, future studies should also gather more detailed information regarding the children's use of the different languages in their homes. Due to the diversity of L1s represented in our sample (representative of the L1s in the school demographics in this Western Canadian city), we were not able to formally measure L1 oral skills and literacy proficiency in all the languages. As an initial study, we were only able to gather information on literacy activity in the L2 and L3 and, ideally, future studies should aim to include children with the same L1 background and directly measure their L1 oral skills and L1 literacy ability.

Children whose L1 is typologically similar to the target L2 and L3 seem to develop stronger oral language skills and reading proficiency in their L2 and L3. Furthermore, acquisition of oral language skills in additional languages, particularly vocabulary comprehension, appears to influence reading comprehension in L2 and L3 to a greater extent when the L1 is typologically similar. Although these results have been well described in a European context (Brohy, 2001; Cenoz, 2003; Cenoz & Valencia, 1994; Griessler, 2001; Haenni Hoti et al., 2011; Munoz, 2000; Sanz, 2000), our study examined the acquisition of literacy skills of immigrant children in the North American context, which has not been studied as much.

In light of these main findings, specifically to address the gap in English and French reading proficiency of multilingual children with typologically dissimilar L1s, many educational strategies could be adopted by teachers to increase the English and French reading skills of all multilingual children. First, educators should focus on strengthening the English and French oral

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language proficiency, particularly vocabulary, which, in turn, could lead to increased English and French reading comprehension skills. Secondly, auditory comprehension skills in English and French were strongly correlated within and across English and French reading comprehension in both multilingual groups; therefore, teachers should continue to foster these skills in both languages.

Educators, researchers, and policy-makers have identified the need to explore whether multilingual children in French immersion programs develop the same level of language skills and literacy proficiency as English monolingual children in French immersion programs (Genesee & Jared, 2008; Swain & Lapkin, 2005). In contrast to the well-documented success of English monolingual children in French immersion programs (Genesee, Holobrow, Lambert, Cleghorn, & Wallig, 1985; Turnbull, Lapkin, & Hart, 2003), the present findings suggest that multilingual children with an orthographically dissimilar L1 may experience difficulties in L2 and L3 reading after 5 years of French instruction and 1 year of formal English instruction. Therefore, it is important to foster the development of oral language skills in both English and French of multilingual children to ensure continued academic success of all learners.



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Table 1. Demographic information on the two multilingual L1 groups and the English monolingual group.

Group	Multilingual Alphabetic L1	Multilingual Logographic/Syllabary L1	English monolingual
N	20	13	57
L1	Afrikaans, Amharic, Croatian, Czech, Danish, Fanti, German, Greek, Hungarian, Korean, Polish, Serbian, Spanish, Tagalog or Vietnamese	Cantonese, Japanese, Mandarin, Shanghainese	English
Age at T1 and T2	9;3 / 9;9	9;4 / 9;10	9;4 / 9;9
Degree of maternal education (SD)	7.45 (1.61)	6.93 (1.81)	7.11 (1.23)

Note: The number '7' in degree of maternal education indicates that mothers had achieved at least a bachelor's degree and '6' indicates that mothers had achieved at least some college education or trade school training.



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Table 2. Mean scores and *F* test comparisons according to L1 typology on L2 (English) and L3 (French) proficiency tests.

L2 tests	Alphabetic	Logographic/ syllabary	English monolinguals	<i>df</i>	<i>F</i>	<i>p</i>	$\eta_p^2$
<b>Listening Comprehension</b>							
Time 1	108.70 (20.52)	94.57 (16.08)	114.37 (17.54)				
Time 2	113.85 (17.57)	104.21 (15.58)	121.47 (15.46)				
Within subjects				1, 89	9.06**	.001	.09
Between subjects				2, 89	10.33**	.001	.19
<b>PPVT-III</b>							
Time 1	107.85 (15.88)	98.07 (11.57)	110.76 (10.48)				
Time 2	114.10 (16.47)	102.85 (10.83)	112.39 (16.21)				
Within subjects				1, 89	5.67*	.01	.06
Between subjects				2, 89	5.01*	.01	.10
<b>L3 tests</b>							
<b>Listening Comprehension</b>							
Time 1	98.70 (12.88)	86.00 (14.63)	93.51 (15.03)				
Time 2	99.95 (12.87)	85.26 (11.40)	94.43 (11.17)				
Within subjects				1, 81	.08	.79	.002
Between subjects				2, 81	5.36*	.007	.18
<b>ÉVIP</b>							
Time 1	83.25 (21.97)	69.64 (30.39)	86.96 (17.49)				
Time 2	89.80 (16.72)	78.27 (16.63)	87.64 (18.33)				
Within subjects				1, 81	4.11*	.04	.04
Between subjects				2, 81	3.03	.06	.05

Note: Standard deviations are in parentheses; \**p* < .05; \*\**p* < .001.

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Table 3. Mean scores and *F* test comparisons according to L1 typology on L2 (English) and L3 (French) reading tests.

L2 Tests	Alphabetic	Logographic/ Syllabary	English monolinguals	<i>df</i>	<i>F</i>	<i>p</i>	$\eta_p^2$
<b>Word Reading</b>							
Time 1	115.85 (15.29)	109.71 (14.21)	118.16 (13.03)				
Time 2	127.10 (15.59)	114.21 (11.30)	121.64 (19.17)				
Within subjects				1, 89	11.84**	.001	.12
Between subjects				2, 89	2.26	.11	.05
<b>Pseudoword</b>							
Time 1	108.35 (14.36)	104.85 (16.97)	107.98 (16.04)				
Time 2	119.35 (13.33)	111.07 (14.80)	115.85 (17.03)				
Within subjects				1, 89	27.40**	.001	.24
Between subjects				2, 89	.69	.51	.02
<b>Reading Comp</b>							
Time 1	113.90 (13.18)	104.93 (14.66)	108.85 (16.14)				
Time 2	113.85 (9.77)	104.85 (9.93)	113.34 (10.28)				
Within subjects				1, 89	.78	.38	.01
Between subjects				2, 89	2.75	.07	.06
<b>Broad Reading</b>							
Time 1	116.40 (12.70)	107.71 (15.14)	115.50 (11.20)				
Time 2	123.50 (12.15)	111.14 (10.43)	121.24 (12.15)				
Within subjects				1, 89	25.43**	.001	.22
Between subjects				2, 89	4.15*	.01	.09
<b>Basic Reading</b>							
Time 1	114.30 (14.06)	108.43 (16.32)	113.83 (15.06)				
Time 2	125.90 (14.90)	114.50 (13.61)	120.53 (19.11)				
Within subjects				1, 89	21.35**	.001	.19
Between subjects				2, 89	1.43	.24	.03
<b>L3 tests</b>							
<b>Word Reading</b>							
Time 1	90.11 (11.26)	82.64 (15.36)	86.15 (13.74)				
Time 2	91.84 (13.42)	83.27 (12.84)	88.34 (15.05)				

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Within subjects				2, 80	.73	.39	.01
Between subjects				2, 80	1.53	.22	.04
Pseudoword							
Time 1	90.55 (11.58)	89.64 (10.15)	89.09 (13.21)				
Time 2	94.80 (11.24)	90.09 (12.36)	89.87 (13.25)				
Within subjects				1, 81	3.46	.07	.04
Between subjects				2, 81	.52	.60	.01
Reading Comp							
Time 1	94.79 (8.36)	87.82 (6.71)	94.00 (6.96)				
Time 2	99.73 (12.76)	91.09 (8.38)	95.79 (9.35)				
Within subjects				1, 80	12.33**	.001	.13
Between subjects				2, 80	3.31*	.04	.08
Broad Reading							
Time 1	89.84 (10.55)	83.37 (10.80)	87.85 (11.07)				
Time 2	94.11 (12.89)	85.91 (11.38)	89.15 (11.30)				
Within subjects				1, 80	9.26*	.003	.10
Between subjects				2, 80	1.65	.20	.04

Note: Standard deviations are in parentheses; \* $p < .05$ ; \*\* $p < .001$ .

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Table 4. Mean scores and *t* test comparisons in each of the L2 and L3 tests of oral proficiency and reading tasks at T2: Multilingual alphabetic and logographic/syllabary L1 groups.

Alphabetic L1						
Tasks	L2	L3	<i>df</i>	<i>t</i>	<i>p</i>	<i>d</i>
Listening Comp	113.86 (17.57)	99.95 (12.87)	19	3.86**	.001	.43
Vocabulary	114.10 (16.47)	89.80 (16.72)	19	6.63**	.001	.70
Word Reading	127.10 (15.59)	91.84 (13.42)	19	14.87**	.001	.92
Pseudoword	119.35 (13.33)	94.80 (11.24)	19	9.48**	.001	.83
Reading Comp	113.85 (9.77)	99.73 (12.76)	19	6.15**	.001	.67
Broad Reading	123.50 (12.15)	94.11 (12.89)	19	11.38**	.001	.87
Logographic/syllabary L1						
Listening Comp	104.21 (15.58)	85.26 (11.40)	12	4.61**	.001	.64
Vocabulary	102.85 (10.83)	78.27 (16.63)	12	5.00**	.001	.68
Word Reading	114.21 (11.30)	83.27 (12.84)	12	9.91**	.001	.89
Pseudoword	111.87 (14.80)	90.09 (12.36)	12	5.03**	.001	.68
Reading Comp	104.85 (9.93)	91.09 (8.38)	12	4.75**	.001	.65
Broad Reading	111.14 (10.43)	85.91 (11.38)	12	8.30**	.001	.86

Note: Standard deviations are in parentheses. Scores on language proficiency and reading tests are at T2. \* $p < .05$ ; \*\* $p < .001$ .

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Table 5. Correlations between L2 and L3 reading tasks and L2 and L3 proficiency measures at T2 for the literate multilingual alphabetic L1 (N = 20) and the literate multilingual logographic/syllabic L1 (N = 13) groups.

	1	2	3	4	5	6	7	8	9	10	11
Alphabetic L1											
1. L2 Listening Comp	-										
2. L2 PPVT-III	.62**	-									
3. L2 Word Reading	.57**	.78**	-								
4. L2 Pseudoword	.37	.72**	.63**	-							
5. L2 Reading Comp	.61**	.91**	.78**	.66**	-						
6. L2 Broad Reading	.58**	.82**	.94**	.56*	.84**	-					
7. L3 Listening Comp	.47*	.72**	.56**	.68**	.66**	.60**	-				
8. L3 ÉVIP	.54*	.51*	.59**	.43	.52*	.61**	.58**	-			
9. L3 Word Reading	.45*	.55*	.75**	.57**	.62**	.65**	.47*	.65**	-		
10. L3 Pseudoword	.26	.48*	.45*	.57**	.51*	.35	.28	.33	.76**	-	
11. L3 Reading Comp	.54*	.64**	.53*	.56**	.60**	.56*	.91**	.72**	.56**	.36	-
12. L3 Broad Reading	.50*	.66**	.67**	.69**	.68**	.61**	.68**	.68**	.91**	.82**	.79**
Logographic/Syllabic L1											
1. L2 Listening Comp	-										
2. L2 PPVT-III	.54*	-									
3. L2 Word Reading	.57*	.49	-								
4. L2 Pseudoword	.69**	.52	.70**	-							
5. L2 Reading Comp	.63*	.52	.50	.65*	-						
6. L2 Broad Reading	.69**	.59*	.89**	.81**	.83**	-					
7. L3 Listening Comp	.43	.88**	.64*	.68*	.63*	.75**	-				

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8. L3 PPVT-III	.52	.56*	.58*	.65*	.31	.57*	.45	-			
9. L3 Word Reading	.73**	.53	.70**	.76**	.34	.66*	.53	.59*	-		
10. L3 Pseudoword	.54	.38	.63*	.57*	.18	.53	.35	.56*	.91**	-	
11. L3 Reading Comp	.66*	.66*	.62*	.74**	.68*	.76**	.69**	.48	.79**	.62*	-
12. L3 Broad Reading	.70**	.59*	.70*	.75**	.44	.71**	.57*	.62*	.97**	.91**	.87**

Note: \* $p < .05$ ; \*\* $p < .001$ .

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Table 6. Language regression equations predicting English and French reading comprehension at T1 and T2.

Language of measure (reading comprehension)	Predictors	R	Adjusted R <sup>2</sup>	R <sup>2</sup> change	F change	<i>p</i>
T1 English	T1 ÉVIP, group	.41	.11			
	T1 ÉVIP, group, interaction	.64	.34	.24	11.24**	.001
	T1 PPVT, group	.81	.63			
	T1 PPVT, group, interaction	.81	.63	.008	.71	.41
T1 French	T1 ÉVIP, group	.55	.26			
	T1 ÉVIP, group, interaction	.73	.47	.22	12.93**	.001
	T1 PPVT, group	.67	.42			
	T1 PPVT, group, interaction	.68	.40	.006	.30	.59
T2 English	T1 ÉVIP, group	.52	.22			
	T1 ÉVIP, group, interaction	.67	.39	.018	.8.87*	.006
	T1 PPVT, group	.76	.54			
	T1 PPVT, group, interaction	.76	.53	.001	.001	.97
	T2 ÉVIP, group	.59	.30			
	T2 ÉVIP, group, interaction	.60	.29	.01	.70	.42
	T2 PPVT, group	.82	.65			
	T2 PPVT, group, interaction	.82	.65	.007	.65	.43
T2 French	T1 ÉVIP, group	.48	.18			
	T1 ÉVIP, group, interaction	.72	.47	.29	16.34**	.001
	T1 PPVT, group	.72	.49			
	T1 PPVT, group, interaction	.72	.47	.001	.001	.97
	T2 ÉVIP, group	.69	.44			
	T2 ÉVIP, group, interaction	.72	.47	.04	2.63	.12
	T2 PPVT, group	.67	.41			
	T2 PPVT, group, interaction	.67	.39	.001	.002	.96

Note: \* $p < .05$ ; \*\* $p < .001$ .

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Figure 1. Interaction of language group by French vocabulary scores at T1 on English reading comprehension at T2.

Figure 2. Interaction of language group by French vocabulary scores at T1 on French reading comprehension at T2.



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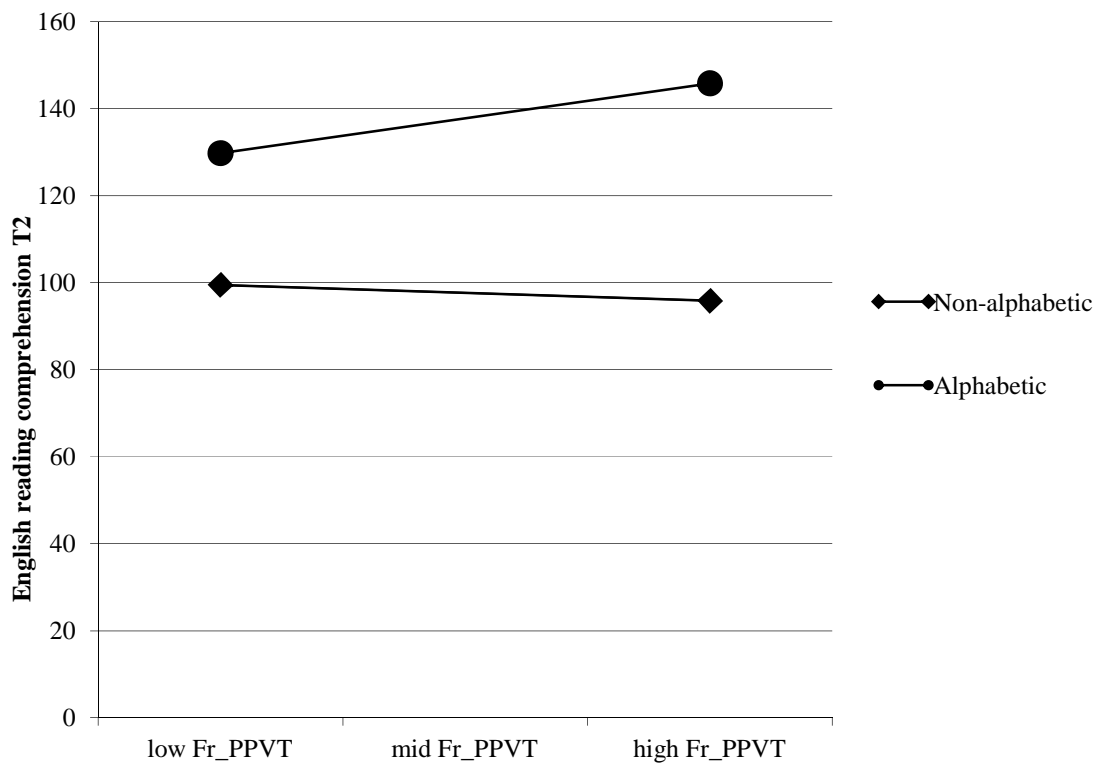


Fig. 1.

## LANGUAGE AND READING SKILLS IN MULTILINGUAL CHILDREN

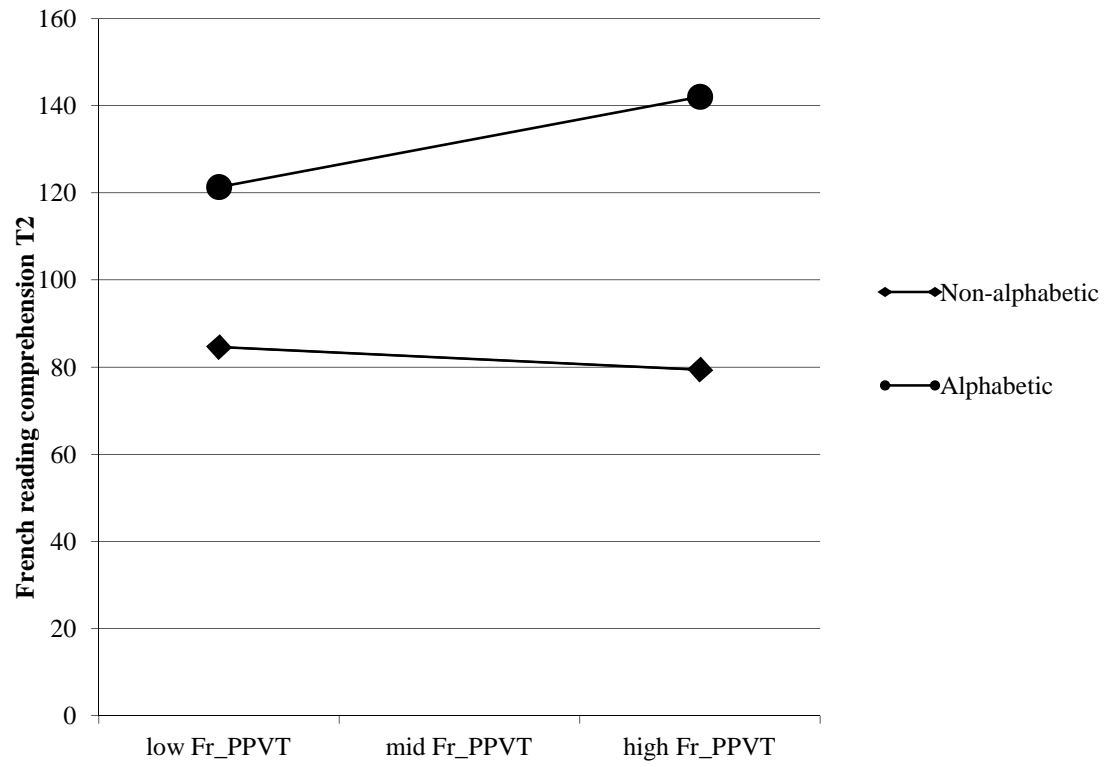


Fig. 2.