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► **To cite this version:**

Cathy Cohen. Relating input factors and dual language proficiency in French-English bilingual children. *International Journal of Bilingual Education and Bilingualism*, 2014, pp.To be announced. 10.1080/13670050.2014.982506 . halshs-01134505

HAL Id: halshs-01134505

<https://shs.hal.science/halshs-01134505>

Submitted on 23 Mar 2015

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This is an Accepted Manuscript of an article published by Taylor & Francis in the *International Journal of Bilingual Education and Bilingualism* available online at:

<http://www.tandfonline.com/doi/abs/10.1080/13670050.2014.982506#.VRAIr0ve5g0>

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Relating input factors and dual language proficiency in French-English bilingual children

Abstract

The input factors that may cause variation in bilingual proficiency were investigated in 38 French-English bilinguals aged six to eight, of middle to high socio-economic status, attending an international state school in France. Data on children's current and cumulative language exposure and family background were collected through questionnaires given to parents and children. Language proficiency was measured using the standardised French and English versions of the Peabody Picture Vocabulary Test and the Student Oral Language Observation Matrix, a rating scale of oral competence, completed by children's French and English teachers.

The results indicated significant correlations between the language proficiency measures and current amount of overall exposure to each language, as well as current input and output quantity. Cumulative length of exposure was also a significant predictor for all the language proficiency measures. Furthermore, the child's dominant language was a reliable indicator of variables related to language use, including the child's preferred language for speaking and reading, and the language used with peers in the school playground. The implications of these findings are discussed, highlighting particularly the need to find ways of promoting the child's weaker language.

Keywords

Childhood Bilingualism, Bilingual Acquisition, Language Proficiency, Input Factors, French, English

It is widely recognised that numerous factors can account for children's balanced dual language acquisition. Analysis of the roles played by these factors is complicated by the dynamic nature of the bilingual acquisition process. Thus, as children's linguistic environments change over time, the roles different factors play evolve, leading to shifts in balance between languages as children adjust to their changing communicative needs. Input and output clearly play a key role. While dual language acquisition certainly requires exposure to quality models providing opportunities for rich and varied engagement in each language (e.g., Paradis 2011), input quantity, i.e., the absolute amount of exposure to each language, is often cited as the critical factor influencing dual

language acquisition (e.g., De Houwer 2011; Pearson 2007). This is supported by numerous case-studies conducted by linguists investigating their children's bilingual development, who note that if input in one language suddenly reduces, competence in that language seems to decrease, while the contrary occurs when input increases (e.g., Saunders 1988). Data from several large-scale quantitative studies corroborate this. For example, results from a study of English-Spanish second and fifth grade bilinguals in Miami (Oller and Eilers 2002) demonstrate that amount of current exposure to each language was a reliable predictor of test performance in each language, particularly for second graders. So for English, bilinguals from homes where both languages were spoken outperformed bilinguals from Spanish only homes, and children attending English immersion schools outperformed children in two-way bilingual schools. The reverse was true for Spanish.

Several studies, both on babies and young children, indicate that quantity of exposure to each language is a reliable predictor of vocabulary acquisition in each (e.g., David 2004; Pearson et al. 1997; Thordardottir 2011). Pearson and colleagues (1997) worked with children aged eight to 30 months acquiring Spanish and English from birth in Miami, while Thordardottir (2011) studied five year old English-French bilinguals in Montreal. Studies by Gathercole (2002a; 2002b; 2007) point to a relationship between early differences in exposure to each language and the acquisition rate of various structures. However Gathercole (2007) shows that differences between bilinguals gradually diminish, before being eliminated by around age 11, when children should have accumulated a critical amount of input enabling them to extract the rules for each structure. Beyond this point, it does not matter if exposure time is less balanced, as long as both languages continue to be used regularly.

Quantity of bilingual exposure is clearly important but there is no real consensus regarding how much regular contact children need with each language to enable comfortable use of both. Pearson et al. (1997) found that while toddlers continued acquiring vocabulary at below 20 percent exposure, they were unwilling to use the language in an experimental situation. Hoff et al. (2012) showed that with minority language exposure under 40 percent, toddlers' proficiency levels fell below those of matched monolinguals. Thordardottir (2011) found that while bilinguals with 40 to 60 percent exposure had similar results to monolinguals in tests of receptive vocabulary, they required above 60 percent to match monolinguals in productive vocabulary. However, it has been argued that although children may take longer to attain monolingual norms because their waking hours are divided between two languages, they should eventually catch up if language exposure remains constant (Thordardottir et al. 2006).

While balanced exposure is important for dual language acquisition, output frequency is also crucial, as Bohman and colleagues explain, 'using a language forces the learner to process the language in a way that only hearing it does not' (2010:339). Children should feel the communicative need for each language with diverse speakers of different ages in varied social networks (Pearson 2008). Fishman (2001) observes that the more monolingual domains the child moves in, the greater obligation and motivation to speak each language. Furthermore, numerous studies have emphasised the importance of maintaining productive use of the minority language in the home, proficiency levels in that language being closely related to patterns of home language use (e.g., Gathercole 2005; Pearson 2007).

While numerous studies have explored bilingual children's current exposure to each language, exposure patterns over time have not so far been the focus of many

investigations (but see Gutiérrez-Clellen and Kreiter 2003 and Unsworth 2013). However, since there is often considerable variation in exposure to each language within a single bilingual over time, and among bilinguals generally, assessing cumulative exposure may well be a very revealing measure, as Unsworth (2013) has emphasised in her study of simultaneous English-Dutch bilingual children in Holland. She found cumulative exposure length to be a significant predictor for gender-marking on determiners but not on adjectives. Clearly further studies are needed in this domain to determine how cumulative exposure affects acquisition of a broad range of linguistic properties.

As well as exploring bilinguals' productive and receptive use of both languages, experts also recommend close analysis of social contexts to identify factors which may impact on bilingual development (De Houwer 2009).

Socioeconomic status (SES) often measured by parents' level of formal education, has been found to be a robust predictor of children's academic success (see Hoff 2006 for an excellent review of influences of SES on language development). Research suggests that higher SES children may be exposed to richer linguistic environments, receiving more input which stimulates language development. Parent-child interactions in high SES families have been shown to be lexically richer and syntactically more complex (e.g., Hart and Risley 1995; Huttenlocher et al. 2002). More literacy activities, such as shared reading and watching educational television programmes, have also been found in such home environments (Bradley and Corwyn 2002; Linebarger and Walker 2004).

A substantial body of research, conducted principally in monolingual samples, suggests that SES influences language development. For example, several studies show that high SES children have larger vocabularies than matched lower SES infants (e.g. Hoff-Ginsberg 1998), and tend to score higher on measures of syntactic development (Dollaghan et al. 1999) and produce more complex utterances (Snow 1999).

The impact of SES on dual language development has been investigated in several studies (e.g., Hakuta, Butler and Witt 2000; Oller and Eilers 2002). Hakuta and colleagues demonstrated that high SES Spanish-English bilinguals acquired English faster than their lower SES counterparts. In Oller and Eilers' study, higher SES bilinguals performed better in oral language and literacy tests, but only in English. However, these differences might have been caused by the amount of exposure to each language rather than SES (high SES children in Miami tending to have greater exposure to English than lower SES children whose exposure to Spanish was greater). However, despite greater exposure to Spanish, the lower SES children did not outperform the higher SES children in Spanish oral language and literacy tests, perhaps an indication of a possible contribution of SES to language development. Indeed, perhaps the input provided in the high SES families in some way counteracted the strong effect expected for quantity of exposure.

Being able to share the minority language with peers, giving it a special status as 'the language of intimacy and emotional bonding' (Gathercole 2005:340), can influence children's attitudes and be determining in its maintenance, as evidenced by several studies (e.g., Gathercole and Thomas 2005a; Oller and Eilers 2002).

Using the minority language for school instruction can play a critical role in its promotion. Data from Japan (Yamamoto 2001) show that children with one Japanese- and one English-speaking parent, receiving instruction through English, are more likely to use English with their Anglophone parent, compared to children attending Japanese-medium schools who generally become Japanese dominant and more reluctant to use

English. Similar findings are reported with other language pairs with English (e.g., Döpke 1992; Gathercole and Thomas 2005b; Wong Fillmore 1991).

Children's language attitudes can also reliably predict bilingual proficiency. So, if having two languages is considered an asset, proficiency levels in each tend to be higher (De Houwer 2009). Minority language parents opting to use their language consistently with their child send a clear message which will impact positively on the child's attitude to that language (cf. De Houwer's 'impact belief' 1999:83), while not using it systematically may minimise its importance.

Grosjean describes the bicultural's fluid cultural identity, explaining that over the bicultural's lifetime, 'cultures can wax and wane, become dominant for a while before taking a secondary role' (2010:111). Bilingual children may encounter two cultures, either from birth or later in childhood, becoming bicultural through interactions with individuals speaking each of their languages, from different cultural backgrounds. Hamers and Blanc (1989) suggest that by six, children have already acquired some sort of cultural identity. A study in Holland found that Turkish-Dutch bilingual children, with positive attitudes to both cultures, attained higher levels of bilingual competence (Verhoeven 1991).

The input factors discussed above interact differently from one child and one context to another. Each is important and undoubtedly contributes to dual language development, but determining the precise role played by each is not straightforward.

This paper aims to expand on the research conducted to date by investigating how differential exposure patterns affect dual language proficiency in 38 French-English bilinguals, aged six to eight. They attend an international state school in France and are taught through both languages (although English receives considerably less instruction time). They can be classified as elite bilinguals, defined here as children speaking two 'internationally useful languages' (Mejía 2002:x) from middle to high SES families who place a high value on bilingualism, literacy related practices and academic success. Having had different language experiences, the children have attained differing competence levels in each language. Data on family background and current and cumulative language exposure are collected through questionnaires given to children and their parents. Proficiency in each language is measured using a standardised receptive vocabulary test and an oral competence rating scale. We believe that no other study has examined the questions investigated here in English-French bilinguals in an international school in France. Our interest also lies in exploring to what extent our results, in a study population found in what may be considered optimal circumstances, corroborate those already reported in the literature.

The first research question addressed is: (1) What is the strength of the relationship between children's proficiency measures in each language and their overall current and cumulative amount of exposure, as measured by a parental questionnaire?

Given previous research findings, a significant effect of overall current exposure is expected on the language proficiency measures. Concerning the second part of this question, studies exploring how differential amounts of cumulative exposure affect acquisition of different linguistic elements are more limited and have not, to our knowledge, explored the proficiency measures investigated here. Since their initial exposure to English and French, all participants have had continuous contact with each language, although the balance of exposure to each is more variable over time for some children. In other words, the children have never lost contact with one language for long following its introduction into their repertoire. For this reason, we predict a significant

relationship between cumulative exposure and the proficiency measures for each language.

The second research question asks: (2) What is the strength of the relationship between the language proficiency measures in each language and children's current language input and output with their mother, father, sibling(s) and friends in the school playground?

Although numerous studies have examined the relationship between language input and output and the acquisition of diverse linguistic properties, this study is original as it does not depend only on parental reports of overall exposure levels, but also addresses children directly for their perception of factors relating to language use with different individuals who are close to them. If their responses corroborate parental estimations, this will further support the argument that current interaction quantity is a reliable predictor of bilingual proficiency. It will also emphasise that young children are able to provide reliable estimations of current exposure and can thus make a valid contribution to the on-going debate. We predict significant associations between the variables under investigation.

In the third research question, we ask: (3) What is the strength of the relationship between the child's dominant language and several variables related to language use? These are: the language the child finds easier to speak and prefers speaking; the language the child finds easier to read and prefers reading; the child's cultural allegiance; the language used with friends in the school playground; the language the child would choose to use in his perfect school.

While it is intuitively felt that proficiency levels will be reliable indicators of language use variables, we aim to test this by asking the children themselves for their points of view. If the relationships are strong, this could have considerable implications for children who have a clearly dominant language and may avoid using their weaker language as it is less pleasurable, leading to lower performance. To our knowledge, no study has investigated this question in this way.

Method

Setting

The study was conducted in the Anglophone section of an international state school in France (IS), offering a strong form of additive bilingual education (see Baker's 2006 categorisation). The IS accepts children from primary through secondary school. To enter the section, children require at least near-native English proficiency, which they are expected to maintain while they remain in school. The school offers neither English as a Foreign Language (EFL) tuition nor English enrichment programmes. Non-French-speaking children arriving from abroad are removed from normal French classes for French as a foreign language (FFL) tuition for six hours a week over two years. Thereafter, children integrate fully to their French class group.

The standard French national curriculum is covered in 20 hours per week rather than 26 hours in standard French primary schools. Language and literature components of the British national curriculum are taught at native-speaker level for the remaining six hours of instruction, on three separate days. Language boundaries are established in the curriculum, with Anglophone teachers using only English with pupils and Francophone teachers only French.

Children are expected to attain high levels of bilingualism and biliteracy in order to take the French external examinations prepared in secondary school, the *Brevet* (at age 14)

and *Baccalauréat* with an English international option, and the British English Language and Literature General Certificates of Secondary Education.

Participants

Participants were 38 French-English bilinguals (mean age = 7;6, SD = 4 months), in second year of primary. Table 1 provides descriptive statistics for children’s age. Children were exposed only to French and English and had normal general and language development according to their parents.

Table 1. Descriptive statistics children’s age (in months)

	Mean (SD)	Range
Full group (N=38)	90 (4)	82-99
FE (N=19)	90 (4)	82-99
FF (N=11)	89 (4)	82-98
EEa (N=4)	88 (5)	83-94
EEb (N=4)	91 (1)	90-93

Questionnaires showed that both parents were involved in children’s daily upbringing and that all participants came from middle to high SES homes as measured by their parents’ years in education (mean maternal education = 16.1 years, SD = 3.1; mean paternal education = 17.3 years, SD = 2.8). The questionnaires revealed other characteristics typical of higher SES families: many parents (particularly mothers) participated actively in school and helped with homework; shared reading sessions were frequent in both languages at home; and trips were made to English-speaking countries at least annually for most families.

Children’s linguistic family backgrounds fall into four types. The first was composed of 19 families with one Francophone and one Anglophone parent, FE families, with an Anglophone mother in 16 families. The second group of 11 families, FF families, had two Francophone parents who, having lived in an Anglophone environment with their children for between three and five years, had been back in France for between ten and 30 months. Four families constituted the third group, EEa families, with two Anglophone parents who had been in France with their children for more than three years. The last group of four families, EEb families, had two Anglophone parents who had been in France with their children for under 18 months and planned to stay there for between three and five years.

According to parent questionnaire data, exposure to French and English inside and outside the home had remained stable for several years for many children. This was the case for all FE and EEa children. EEb children had been in contact with only English until the family moved to France. There was more variation for FF children whose French exposure since returning to France was increasing, while English exposure was decreasing proportionately.

Procedure

Parents gave written consent for their child’s participation. The three data collection sessions were conducted by the researcher who was a native English speaker and a highly proficient French speaker. The language of testing was English for English sessions and French for French sessions. Children were tested individually in school during lunch hour in their English classroom. The first session consisted of the English receptive vocabulary test, followed three weeks later by the French equivalent. In the

final session, once children were comfortable with the researcher, the children's questionnaire was given orally.

Measures and questionnaires

French and English proficiency were assessed using a standardised receptive vocabulary test and an oral language assessment grid. Two questionnaires in English, one completed by parents at home and the other given to children, probed issues relating to children's family background and language experiences and parents' educational, professional and language backgrounds.

Receptive vocabulary

French vocabulary was assessed by L'Echelle de Vocabulaire en Images Peabody (EVIP; Dunn, Thérault-Whalen and Dunn 1993) and English vocabulary by The British Picture Vocabulary Scale (BPVS; Dunn et al. 1987), both standardised adaptations of the Peabody Picture Vocabulary Test (Dunn and Dunn 1981). The same standard instructions were followed for each. The researcher read a word and the child indicated which of the four pictures on the plate best corresponded to it. Raw scores were converted to standardised scores using age-corrected monolingual norm tables.¹ A monolingual child scoring between 85 and 115 is considered to have age-appropriate development.

These scores were used in research questions 1 and 2. For research question 3, a variable called *Dominance Peabody* was created. The EVIP score was subtracted from the BPVS score, a result below zero showing French dominance, and above zero, English dominance. A child's language skills were considered fairly balanced if the difference was 15 or under, 15 being the standard deviation on the Peabody tests. Once the difference exceeded 15, we concluded that the child had a dominant language. So the variable *Dominance Peabody* had three possible readings: 1. English dominant; 2. Balanced; 3. French dominant.

Student Oral Language Observation Matrix (SOLOM)

The SOLOM (available at <http://www.cal.org/twi/EvalToolkit/appendix/solom.pdf>), developed by the San José Area Bilingual Consortium, is a criterion-referenced rating scale. The children's English teachers completed the English version and a French translation was given to French teachers. Having observed their pupils in different school situations, teachers matched children's language performance in five domains – comprehension, fluency, vocabulary, pronunciation and grammar – to descriptions on a five-point scale, giving a total score ranging from five to 25. According to the SOLOM designers, children scoring 19 and above should be able to participate fully in academic oral tasks at age-appropriate level. Like the Peabody tests, SOLOM scores were compared to indicate an approximate degree of language balance. These scores were used for research questions 1 and 2. The variable *Dominance SOLOM* was created for research question 3 using a similar procedure to that employed for the Peabody tests. In this case, it was decided that children were dominant in one language if the difference between their scores exceeded three.

¹ Although the psychometrics of the two Peabody tests are unlikely to be exactly equivalent, since comparisons of children's scores were used only as an approximate measure, any differences probably made little difference.

Questionnaires

Two measures relating to children's language exposure were sought in the parent questionnaire. First, a representation of overall current language exposure was sought for research question 1 by asking parents to estimate the total number of waking hours per week that their child was in contact with each language first, during term-time and, second during school holidays. These figures were converted to percentages to allow for comparisons of participants' readings. Second, using information provided by parents about children's language contact with close family members, at daycare and school, on a yearly basis from birth to the present, we estimated the cumulative amount of exposure children had had to each language. So, for instance, if in one particular year a child was estimated to have had 60 percent English exposure and 40 percent French, the readings would be 0.6 and 0.4 respectively (this calculation method is adapted from Unsworth 2013). Summing up yearly readings for a seven year old child, if exposure to each language remained constant, we might arrive at cumulative amount of exposure of 4.2 years for one language and 2.8 years for the other. These readings not only take into account exposure variations over time but also children's different ages. Although such estimations rely on parents' retrospective representations of children's language exposure, certain studies show that parents can provide reliable reports of this kind (e.g., Paradis, Emmerzael and Duncan 2010).

For research question 2, children's perception of the amount of input they received and output they produced with their parents, siblings and friends in the playground was measured on a five-point Likert scale: 1. always French; 2. French more than English; 3. French and English equally; 4. English more than French; 5. always English. These interlocutors were chosen as we felt that they were closest to the children, spending considerable time interacting with them very regularly.² Given their age, we considered that the children would be unable to provide percentage input and output estimates. To investigate the relationship between language input and output, and proficiency measures using the Pearson correlation, responses were converted to interval data by attributing a percentage score to each reading. So, for example, a child claiming to speak more French than English to his mother, would have a reading of 75 for French and 25 for English. If he said he spoke French and English equally, each language would receive 50, and if he claimed only to speak in one language, he would have 100 for that language and zero for the other.³

For research question 3, the children were asked a number of 3-point multiple choice questions on topics concerning their everyday language use, as shown in Figure 1. Their answers were then related to the variables *Dominance Peabody* and *Dominance SOLOM*, using the Spearman rho correlation coefficient.

² We enquired if families employed an au-pair. If they did, these individuals would also have extended contact with children. However, results revealed that just two families had an English-speaking au pair, while none employed a French-speaking au-pair.

³ While it is commonly observed that bilinguals sometimes use, and are exposed to, code-switched or mixed utterances, we considered that it would not be feasible to obtain data on children's estimates of such utterances, in view of their age.

1.
 - a. I find it easier to speak English than French.
 - b. I find it just as easy to speak French and English.
 - c. I find it easier to speak French than English.
2.
 - a. I prefer speaking English.
 - b. I prefer speaking French.
 - c. I have no preference. I like speaking English and French.
3.
 - a. I find it easier to read in French than English.
 - b. I find it just as easy to read in French than English.
 - c. I find it easier to read in English than French
4.
 - a. I have no preference. I like reading in French and English.
 - b. I prefer reading in French.
 - c. I prefer reading in English.
5. Imagine a relation of yours asks you if you feel more French or more English (British, American, etc.), what do you reply?
 - a. I feel more English.
 - b. I feel more French.
 - c. It's the same. I feel French and English.
6. Which language do you prefer to use to play with your friends in the playground?
 - a. French.
 - b. I don't mind.
 - c. English
7. If you could choose the perfect school, which would you choose?
 - a. a school where there is only French.
 - b. a school where there is only English.
 - c. a school like the IS with French and English.

Figure 1. Questions on children's everyday language use

Results

We first take an overview of the data for children's overall current language exposure to English and French, during term-time and school holidays, as reported by parents. Data for both languages are shown in Table 2.

Table 2. Descriptive statistics percentage current weekly exposure to English and French

	English				French			
	Term-time		School-holidays		Term-time		School-holidays	
	Mean (SD)	Range	Mean (SD)	Range	Mean (SD)	Range	Mean (SD)	Range
Full group (N = 38)	42.7 (17.8)	12.8-75	53.7 (26.1)	8.3-100	57.3 (17.8)	25-87.2	46.2 (26.1)	0-91.7
FE (N = 19)	44.1 (11.7)	20.9-61.7	58.7 (15.2)	34.5-96.1	55.9 (11.7)	38.2-79.1	41.3 (15.3)	3.8-65.5
FF (N = 11)	23.5 (7.4)	12.8-35.2	22.5 (7.8)	8.3-33	76.5 (7.4)	64.8-87.2	77.4 (8)	66-91.7
EEa (N = 4)	61.2 (3.6)	58-65	77.4 (18.3)	50-88.9	38.8 (3.6)	35-42	22.6 (18.3)	11.1-50
EEb (N = 4)	70.6 (4.3)	65-75	92.3 (5.2)	89-100	29.4 (4.2)	25-34.9	7.8 (5.2)	0-11

The range of mean percentage weekly exposure to English during term-time for the full group is large, with a standard deviation of 17.8 showing high variability. Term-time exposure shows considerable differences between the four family types. As expected, EEb children’s English exposure is the highest, closely followed by EEa children, with English clearly dominant at home. FE children generally have more contact with English than FF children, with maximum English exposure for FF children at 35.2 percent, approximately a third of children’s waking hours.

The range for language exposure during school holidays for the full group was greater than for term-time. English contact for FE and EEb children increases quite substantially over school holidays, while for EEa children, it is generally higher than in term-time. It reduces slightly in FF children but the fact that the drop is not greater suggests that FF parents may compensate for children not having English in school with alternative English contact.

Since children were exposed only to English and French, the sum of exposure equals 100, with a mirror pattern between the English and French readings, as shown in Table 2. It is striking that there is very little French exposure during school holidays for EEb children, suggesting predominantly English-speaking social networks outside school.

Table 3 provides descriptive statistics of the dependent proficiency variables.

Peabody receptive vocabulary data show that all but one child scored at or above age-appropriate monolingual norms in at least one language. Furthermore, 28 fell within, or exceeded, age-appropriate (monolingual) norms on both. The data also show that all children scored at least 19 on the English SOLOM, while one FF and all four EEb children scored below 19 on the French SOLOM.

The first part of research question 1 investigates the strength of the relationship between proficiency measures and current overall language exposure estimated by parents. Pearson coefficients between English and French proficiency measures and overall exposure to each language during term-time and school holidays are displayed in Table 4.

Table 3. Descriptive statistics Peabody vocabulary and SOLOM

		Mean (SD)	Range		Mean (SD)	Range
Full group (N=38)	BPVS	96.3 (12.1)	73-126	E SOLOM	22.6 (2.2)	19-25
	EVIP	109.8 (19.4)	51-140	F SOLOM	21.3 (4.2)	9-25
FE (N=19)	BPVS	96.8 (12.9)	73-126	E SOLOM	22.7 (2.1)	19-25
	EVIP	117.2 (13.9)	77-140	F SOLOM	22.2 (3.9)	14-25
FF (N=11)	BPVS	89.8 (8.6)	79-105	E SOLOM	20.5 (1.1)	19-22
	EVIP	113.1 (10.7)	97-128	F SOLOM	22.5 (3)	17-25
EEa (N=4)	BPVS	96 (6.4)	91-105	E SOLOM	24.8 (0.5)	24-25
	EVIP	106.3 (11.9)	90-118	F SOLOM	20.8 (0.9)	20-22
EEb (N=4)	BPVS	112 (5.6)	107-119	E SOLOM	25 (0)	25-25
	EVIP	69 (18.7)	51-93	F SOLOM	14 (3.8)	9-17

Table 4. Pearson correlations proficiency measures and current language exposure estimates

N = 38	BPVS	English SOLOM	EVIP	French SOLOM
% English term	.58**	.77**		
% English holidays	.51**	.73**		
% French term			.37*	.49**
% French holidays			.38*	.43**

* $p < .05$ ** $p < .01$

For English, there was a significantly strong relationship between all the language exposure and proficiency variables. French results were either moderate or strong. So performance in each language is closely related to the amount of children's current exposure to each, as predicted. These results are consonant with previous studies discussed above (e.g., Oller and Eilers 2002).⁴

In the second part of research question 2, we investigate the effect of cumulative language exposure on the proficiency measures. Descriptive statistics are shown in Table 5.

The data show that cumulative exposure to each language varies considerably for the full group, with wider variation within FE and FF children, mirroring results for current overall exposure.

Pearson coefficients between cumulative language exposure and the proficiency measures are displayed in Table 6.

⁴ Interestingly, there is a strong association between Peabody scores for each language and the SOLOM vocabulary section for English ($r = .46$, $N = 38$, $p < .01$), and French ($r = .73$, $N = 38$, $p < .01$).

Table 5. Descriptive statistics cumulative exposure to English and French from birth (in years)

	English		French	
	Mean (SD)	Range	Mean (SD)	Range
Full group (N = 38)	3.7 (1.8)	.9-7.7	3.4 (1.8)	.2-6.2
FE (N = 19)	3.8 (1)	2-5.4	3.2 (1)	1.6-5.1
FF (N = 11)	1.7 (.7)	.9-2.9	5.5 (.6)	4.1-6.2
EEa (N = 4)	5.2 (.5)	4.5-5.8	1.8 (.5)	1.3-2.5
EEb (N = 4)	7.1 (.4)	6.7-7.7	.4 (.3)	.2-.8

Table 6. Pearson correlations proficiency measures and cumulative language exposure estimates

N = 38	BPVS	English SOLOM	EVIP	French SOLOM
Cumulative exposure English	.41*	.67**		
Cumulative exposure French			.53**	.48**

* $p < .05$

** $p < .01$

The prediction of an effect of cumulative exposure to each language on the proficiency variables is borne out. For English, correlations are slightly weaker than those reported for current exposure, whereas for French, the correlation is stronger for the EVIP but similar for the French SOLOM. In addition, current and cumulative exposure measures for each language were found to correlate strongly as displayed in Table 7.

Table 7. Pearson correlations current and cumulative language exposure estimates

N = 38	English term-time	English holidays	French term-time	French holidays
Cumulative English	.81**	.81**		
Cumulative French			.81**	.81**

** $p < .01$

Research question 2 examines the relationship between proficiency measures in each language and children's estimates of current language input and output with their mother, father, sibling(s) and friends in the school playground. Table 8 shows the Pearson correlations.

Table 8. Pearson correlations proficiency measures and children's language input and output estimates

N = 38	BPVS	English SOLOM	EVIP	French SOLOM
Mother to child	.28*	.42**	.19	.17
Child to mother	.35*	.62**	.16	.12
Father to child	.55**	.52**	.42**	.43**
Child to father	.52**	.58**	.4*	.36*
Sibling(s) to child (N = 30)	.34*	.49**	.38*	.43**
Child to sibling(s) (N = 30)	.44**	.56**	.34*	.53**
Friends in school to child	.25	.4*	.24	.28*
Child to friends in school	.24	.45**	.24	.28*

* $p < .05$

** $p < .01$

There are numerous moderate or strong results for English, emphasising the strong association between quantity of English input and output and corresponding language proficiency. Comparing input and output results for each interlocutor, in all but two cases output correlations are higher, implying that output quantity might be a slightly more reliable predictor of language performance than input quantity. A much larger sample of children would be required to confirm this tendency, however.

The English results with friends in the playground, particularly for the BPVS, were generally lower than those with different family members. Nevertheless, despite spending proportionately less time with friends than with family members, there was still a significant relationship between the English SOLOM and language performance readings for interaction with friends.

In view of these results, we conclude that on the whole, higher levels of English input and output with close family and friends, result in higher English performance levels, as predicted.

For French, although 10 of the 16 correlations reach statistical significance, the relationships are generally weaker than for English. The most striking difference concerns mother-child results, which were not statistically significant. This can perhaps be explained by considering the amount of French in mother-child interactions. Indeed, as reported earlier, English was used more or less exclusively in all EE families. In FE families, 16 of the 19 mothers were native English speakers so more likely to interact in English with their children. The questionnaires reveal that mother-child interaction in over three quarters of the FF families included both languages. So overall, the mother was not the principal French input source for most children.

With the exception of the mother-child results, children's current French input and output are significant predictors for French proficiency measures, as hypothesised.

Table 9 shows the Spearman coefficients between the child's dominant language based on the proficiency scores (possible readings: English dominant – Peabody and SOLOM, N = 13; Balanced – Peabody and SOLOM, N = 9; French dominant – Peabody and SOLOM, N = 16) and the language use variables, investigated in research question 3.

Table 9. Spearman correlations child's dominant language and language use variables

N = 38	Language easier to speak	Language prefers speaking	Language easier to read	Language prefers reading	Dominant culture	Language friends in playground	Language perfect school
Dominance Peabody	.7**	.46**	.33*	.46**	.52**	.59**	.43**
Dominance SOLOM	.74**	.39*	.3	.46**	.5**	.49**	.45**

* $p < .05$

** $p < .01$

Significant moderate to strong correlations were found between proficiency variables and all language use variables, except between *Dominance SOLOM* and *Language easier to read*, which fell just short of significance. Concerning the language which participants claim to find easier to speak and to prefer speaking, results show that children are generally able to identify their dominant language if they have one (rho's at .7 and .74 are considerably higher than others), but also that they find speaking their weaker language less pleasurable. Children with a dominant language tend to find it easier and more gratifying to read in that language, and are more likely to feel closer to the culture of that language. A more balanced bilingual is likely to feel bicultural, a finding consistent with Verhoeven's (1991) study. Finally, children with a dominant language

prefer playing in the playground with children using that language and would prefer to attend a school in which they can use their dominant language. There is a strong association between the variables *Dominance Peabody* and *Dominance SOLOM* ($\rho = .83$, $N = 38$, $p < .01$).

To sum up, the results for research question 3 offer strong support that the language proficiency measures are reliable predictors of the language use variables.

Discussion

Like other studies in the literature, this study has shown that proficiency in a language is proportional to exposure to that language. Not surprisingly, given the important contribution of language in the home for young children, families with the highest English contact and highest English proficiency were those with two Anglophone parents, followed by those with one Anglophone parent, and then with two Francophone parents, whereas the reverse was true for French.

For research question 1, current and cumulative amount of exposure to each language were found to be significant predictors for receptive vocabulary and oral language proficiency. While numerous studies show the strong relationship between current exposure and acquisition of different linguistic features, the current study adds to the small, but growing, body of research which explores how cumulative exposure relates to diverse elements of language proficiency in young bilinguals. Our participants had had differing language experiences and varied exposure patterns over time and these differences were reflected quite closely in their proficiency scores. Future studies are needed to determine how cumulative exposure affects other linguistic areas, across a wider age span, with larger samples, from differing social backgrounds and with different language pairs and different language contact patterns (including children who may have lost contact with one of their languages for a lengthy period).

The strong association between exposure and proficiency was supported further when the relationship between language proficiency measures and input and output were explored in research question 2, with the English variables showing particularly strong associations. We indicated that the majority of the IS curriculum was taught in French. So to maintain and develop English, children had to feel a real need for this language in domains beyond the English classroom. It was therefore essential for them to be exposed to good quality input and to have plenty of one-to-one interaction with native English speakers outside school. Clearly, when children are young, their main interlocutors are close family members and, to a lesser degree, friends. So the English contact with these people was likely to determine their English proficiency. If substantial good quality English was not present at home, maintaining and developing English would be harder, a finding consistent with studies discussed earlier (e.g., Pearson 2007).

In contrast, all participants were exposed to French through school and to varying degrees through the wider community, even if French contact was limited at home. French input and output readings were not, therefore, representative of children's total French contact, whereas English readings were more representative of their total English contact. We argue therefore that, in this study, the English correlations relating to interaction with family and friends were more precise indicators of the relationship between input and output frequency and proficiency measures, than they were for French.

Stronger relationships were found between English output and proficiency measures, underlining how crucial it was for children to have multiple opportunities to use the

minority language productively with a range of native-speaking interlocutors (cf. Bohman et al. 2010), particularly if minority language use was limited in the home, as was the case for certain FF children.

Although the correlations between English use with friends and English performance measures were weaker than for those with family members, they were nevertheless statistically significant, emphasising the potential of friends for promoting the minority language (e.g., see Gathercole and Thomas 2005a). We suspect that the quality and intensity of interaction with friends in school compensated for the reduced time spent in their company. Perhaps acquisition was facilitated in such motivating situations because children were interacting with people they wished to emulate (cf. Pearson and Amaral, to appear). Furthermore, negotiating meaning and making themselves understood in play situations probably required considerable effort, particularly when interacting in large groups. While children are young, they generally spend more time with close family than with friends, hence the importance of minority language contact in the home. However, as they grow up, progressively more time is spent interacting with friends and less time with family. Therefore, social networks outside the home become increasingly significant sources for minority language interaction. While this clearly holds true for the FF children where English contact at home was perhaps minimal, it may also have been the case for FE and EEa children in France on a long-term basis. Therefore, having highly competent English-speaking peers could be determining for English maintenance and development.

The information gathered from parents for research question 1 on overall current exposure and, from children for research question 2 on input and output quantity with different interlocutors, was not identical. Part of the motivation for asking for exposure estimates from both sets of individuals, albeit on slightly different aspects, was to assess whether young children could provide reliable estimates of interaction routines. The closeness of our results suggests that they could, a useful finding for future studies.

While the results for the relationship between the child's dominant language and variables related to language use in research question 3 did not indicate causality, they showed fairly convincingly that the dominant language was a reliable indicator of the language use variables investigated. We posit that when children had a clearly dominant language with which they felt more comfortable, they would naturally seek to increase contact with it, thereby decreasing exposure to the weaker, less favoured language which required greater effort and concentration. Notably, this could have been the case for certain FF children who had limited English contact outside school and who found English increasingly challenging. It may also have been the case for certain EEb children in the early stages of acquiring French who felt frustrated and embarrassed at their inability to express themselves with the same ease and fluency as they did in English. So if specific measures are not taken to help promote the child's weaker language, it could gradually be lost, especially if it is the minority language, available in only limited domains and, consequently, having fewer potential interlocutors.

These middle to high SES children were in what may be considered optimal conditions for dual language acquisition (i.e., highly educated parents, dual language instruction, two prestigious languages). Yet even in these favourable circumstances, it appears that for these children whose language skills were still developing, if quantity of exposure was reduced, they may have struggled to maintain and develop their weaker language. These findings mirror those from studies conducted in much less favourable environments, in which there are considerably more external pressures to abandon the minority language, such as children from immigrant backgrounds trying to maintain an

ethnic language (e.g., see Scheele, Leseman and Mayo 2010), or situations of language endangerment (e.g., see Pearson and Amaral, to appear).

What are the implications of these results for the children in this study? While FE, EEa and EEb children should have access to substantial amounts of English outside school, because at least one parent is an Anglophone and, therefore, probably moves in English-speaking social networks, FF children are more likely to lack opportunities to use English on returning to France, with French exposure increasing rapidly while English contact decreases proportionately. These six to eight year old children are more vulnerable to language loss, as they are not yet old enough to have accumulated a critical mass of data (Gathercole 2002b) in each language to allow for a substantial drop in exposure to one language. Since English enrichment programmes are not provided in school for those children who could benefit periodically from additional English support, it is particularly difficult for certain FF children to maintain competence in English once contact is limited principally to classroom interactions. In fact a certain proportion of FF children who return to France early in primary fail to complete their studies at the IS, unable to maintain adequate levels of spoken and written English to cope with curriculum demands.⁵

For EE children, although much of the school curriculum is in French, if they are not motivated to learn it, time spent using French productively may be minimal, since they can establish solely English-speaking friendship groups inside and outside school, slowing down French acquisition considerably. Once FFL tuition is withdrawn after two years, certain EE children struggle to keep pace with their French-speaking peers, resulting in two unfortunate outcomes: either families are advised by the school to withdraw their children and send them to a standard French school to oblige them to acquire French; or they are made to repeat the school year regardless of their English competence. Similar scenarios have been described in European Schools when children fail to meet educational grade goals (see Mejía 2002). Thus, although the IS has very ambitious linguistic objectives, it does not provide the necessary support to children lacking exposure to one language, to enable them to develop and maintain balanced bilingual proficiency throughout schooling.

A longitudinal study is currently being undertaken at the school to investigate similar research questions to those in the present study, following a larger cohort of children, from their arrival in primary through secondary school. The study has two aims. First we explore how shifting language exposure patterns through childhood and adolescence impact on the acquisition of diverse linguistic properties, and we examine how the relationship between these variables evolves as children grow up. Secondly, we investigate how specific measures taken by the school and by families might help children who have a more weakly developed language. It is hoped that this study will add to our knowledge and understanding of how two languages are acquired, developed and maintained in an international school setting.

⁵ The information provided here, on particular trends for the different family types within the school, was given to the researcher during informal discussions with IS teachers and parents.

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