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► **To cite this version:**

Cathy Cohen, Romane Demazel, Agnès Witko. Exploring the Interplay of Language Exposure, Language Skills and Language and Cultural Identity Construction in French-English Bilingual Adolescents: A Longitudinal Case Study. *Languages*, 2024, Research Methods for Exploring the Role of Input in Child Bilingual Development, 9 (7), pp.253. 10.3390/languages9070253 . halshs-04663820

HAL Id: halshs-04663820

<https://shs.hal.science/halshs-04663820v1>

Submitted on 29 Jul 2024

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Exploring the interplay of language exposure, language skills and language and cultural identity construction in French-English bilingual adolescents: A longitudinal case study

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Abstract: Based on Paradis' (2023) presentation of individual differences accounting for bilingual development, we explore dual language acquisition according to three interrelated factors: *child-internal*, *proximal* and *distal*. This five-year longitudinal case study investigates the complex interplay between language exposure, language skills and language and cultural identity construction in three French-English bilingual adolescents (from age 10 to 14), from three different home language backgrounds (French dominant; English dominant; both French and English), attending the same bilingual programme in France. Data were collected annually. Parent questionnaires provided information on children's exposure to French and English from birth, within the family and in school and other social environments. Semi-structured interviews with the children explored their current language exposure and their language practices with close family and friends, and in language-based activities, such as reading. Language skills were assessed in both languages through 1) a narrative task evaluating lexical diversity and grammatical accuracy and, 2) a standard receptive vocabulary task. Identity construction was explored through semi-structured interviews and a language portrait activity. Our findings showed, first, that higher exposure to a language at home and school did not necessarily align with higher level skills in that language. High level skills were also observed in the language where exposure was quantitatively lower, but qualitatively rich. Secondly, despite higher exposure to one language, children sometimes identified more with the language and culture they were exposed to less. We highlight the importance of exploring children's exposure and language biographies in depth to distinguish the sources and types of exposure received from birth. We also show the impact of children's agency on their language investment and language development.

Keywords: language exposure; language skills; identity; individual difference factors; French; English

1. Introduction

Research into language acquisition and use is increasing in contexts where several languages are spoken. Pearson (2007) determines five main criteria influencing the likelihood of children becoming bilingual: language exposure; language status; access to literacy; family language use; community support including schooling. Emphasising the variability of bilingual development, Paradis (2011) explored child-internal factors complemented by environmental factors. Elements such as phonological and short-term memory and analytical reasoning, but also age at onset of acquisition (AOA), first language (L1) structure, length of exposure, and richness of the environment predict variation in bilingual children's language skills. De Houwer (2009) and Unsworth (2013) highlight external factors capturing this variation, including parental choices,

languages present in children's social environments, and language(s) of schooling. Armon-Lotem et al. (2014) underscore the influence of sociolinguistic and language exposure factors on children's language skills, identity perception and sociolinguistic preferences. To account for the interaction of typical bilingual development factors, Paradis (2023) proposes a framework of individual difference (ID) factors on three levels: (1) *child-internal* (second language (L2) AOA; cognitive abilities; socioemotional well-being), (2) *proximal* (cumulative L2 and first language (L1) exposure; L2 and L1 use at home; richness of L2 and L1 environments), and (3) *distal* (literacy and education in L1; parent L2 and proficiency; family socio-economic status (SES); family attitudes/identities).¹

This five-year longitudinal case study explores the interplay between language exposure, language skills and language and cultural identity construction in three French-English bilinguals attending the same bilingual programme in France, from the end of elementary school through middle school. Information on ID factors are provided by retrospective data from parents relating to children's language biographies, and on prospective data from the children and their parents. Data come from the larger INEXDEB project (Cohen, 2015).² We first consider certain ID factors in the literature to clarify our terminology and justify the variables of interest to this study.

1.1. A key child-internal factor: age at onset of L2 acquisition

Among the child-internal factors, L2 AOA is critical for understanding the various domains of language acquisition (phonological, lexical, semantic, morphosyntactic, narrative, pragmatic). The present study focuses primarily on lexical and morphosyntactic skills.

Building on Cohen & Swain (1976) and Meisel (1989), De Houwer (1990) emphasises that bilingual children form a heterogeneous population, regarding their language development trajectories in their first ten years. Meisel (2008) proposes a critical period between age 3 and 8 for acquiring morphology and syntax, and suggests threshold ages. When the AOA of both languages is before 3, referred to as bilingual first language acquisition (2L1), children manage their languages like monolinguals, partly thanks to brain plasticity. Between ages 4 and 8, is child second language acquisition (cL2) with syntax developing like 2L1 children but morphology resembling adult second language acquisition (aL2). Beyond 8, children construct their 2 languages as in aL2. Meisel argues that language domains do not develop over the same age range, and that age 13 is the limit to start acquiring an L2 to attain native-like proficiency.

Using similar benchmarks, De Houwer (2021) proposes three profiles: Bilingual First Language Acquisition (BFLA), assimilated to 2L1; Early Second Language Acquisition (ESLA), with L1 input received like monolinguals before L2 acquisition begins between ages 2 and 5, and before learning to read; and Second Language Acquisition (SLA) with L2 acquisition starting around age 6.

While AOA is important, biographical information shows differences in exposure profiles in children with the same AOA. In Granfeldt's study (2016), two Swedish L1 children began L2 French in a Swedish-French bilingual programme in Sweden, aged 3;6. However, there were differences in: parents' French proficiency; amount of French spoken at home; number of weeks spent annually in a French-speaking country; frequency of contact with French-speakers; access to French television and video games; French reading habits. A combination of exposure patterns and L1 and L2 linguistic structures account for children's (2L1/BFLA or eL2/ESLA) bilingual development. Exposure to each language should therefore be described in detail.

¹ Paradis (2023) uses the term "heritage language". L1 is more appropriate in our study.

² Input et Expérience dans le Développement Bilingue = Project name

1.2. A key proximal factor: language exposure

Since children's environmental factors vary (Pearson, 2007; Thordardottir, 2011; Unsworth, 2013), the support for language and cultural development may differ considerably. Separating these interrelated factors is complex. Exposure is considered the most influential for bilingual acquisition (De Houwer, 2011; Ollers & Eilers, 2002; Pearson, 2007; Thordardottir, 2011; Unsworth, 2013). Following Paradis (2011), we adopt a quantitative and qualitative approach to input, based on numerical factors (exposure frequency reflecting children's language exposure; lexical diversity and grammatical accuracy in a narrative task; raw and standard receptive vocabulary scores), together with descriptions of factors related to the contexts in which children grow up.

1.2.1. Quantitative elements

Current language exposure corresponds to exposure at a specific moment in the present. According to Thordardottir (2011) bilingual children require 40% to 60% exposure time to each language to become proficient. Cumulative exposure, corresponding to the total exposure to each language from birth, is a useful measure since exposure may vary considerably over time (Unsworth, 2013).

Young children's vocabulary development in each language relates to exposure in each language, a key source of variability (Armon-Lotem et al., 2015). Vocabulary in one language may be lower than that of monolinguals, whereas total conceptual vocabulary across languages often equals or exceeds that of monolinguals (Grosjean, 2015; Pearson et al., 1993). Exploring vocabulary in each language contributes to the assessment of children's bilingual skills and to an estimation of language dominance (Armon-Lotem et al., 2015).

Oral narrative tasks are useful for analysing older children's language skills (Armon-Lotem et al., 2015; Heilmann et al., 2010), regarding macrostructure (e.g., story elements) and microstructure (e.g., lexical diversity, morphosyntax) (Tsimplici et al., 2016). Cohen & Ghimenton (in review) studied oral narrative skills in three 6-year-old French-English bilinguals and showed a strong association between language exposure and narrative microstructure skills.

However, the difference between languages may diminish as children age, once they reach a critical mass of exposure to each language (Gathercole, 2007).

1.2.2. Qualitative elements

Language exposure, documented by family language practices, is linked to language biographies (Huver & Molinié, 2009; Perregaux, 2002). Language exposure within the family, at school and with friends contribute importantly to bilingual acquisition (Hoff, 2006), including exposure from daily language-based activities, such as reading (Paradis, 2011; Cohen & Ghimenton, in review). Scheele et al.'s (2010) study of young bilinguals from Moroccan-Dutch and Turkish-Dutch families reveals that the frequency of linguistically rich activities, such as reading, relate to children's receptive vocabulary test scores in Dutch, their L2. Thus, qualitatively rich exposure may compensate for quantitatively lower exposure.

1.3. Distal factors

1.3.1. Parents' choices

According to Schwartz (2010), the family unit shapes linguistic practices and ideologies. The family governs the language choices of its members, who constantly negotiate language practices at home. However, the

family is also exposed to external pressures (e.g., school) that can influence parents (De Houwer, 2006; Nandi, 2018). Pearson (2007) stresses that family attitudes can contribute to valuing or devaluing the home language, thus accelerating or limiting children's use of it, their language investment and their language skills. Following Pease-Alvarez (2003), Cohen and Ghimenton (in review) show how parents' opinions and investment influence children's language attitudes and bilingual and bicultural identity construction; but as children get older, they can decide whether or not to invest in their languages and cultures.

1.3.2. The language(s) of schooling

School offers significant language exposure (Hoff, 2006). The language of schooling is more decontextualised than home language and uses different registers and vocabulary. Pearson (2007) shows that at age 11, schooling in English can counterbalance lower English exposure at home. Children exposed to English and Spanish at home perform only marginally better on English texts than children exposed only to Spanish at home. A study on 49 French-English bilinguals aged 6 to 10 shows that when a bilingual programme encourages students to invest in both their languages and cultures, despite French-medium teaching accounting for 75% of curriculum time compared to 25% for English, and regardless of children's home language background (French-dominant; English-dominant; both French and English), children can attain high level skills in both languages (Ghimenton et al., 2023).

1.3.3. Socio-economic status

Research shows that higher SES parents provide richer linguistic environments than lower SES parents, because the former interact more with their children, use more varied vocabulary and more complex syntax, and have more frequent shared reading practices (Cohen, 2016; Hakuta et al., 2000; Hoff, 2006; Paradis, 2011). Lauro and colleagues (2020) and Hoff (2020) show that the mother's education level significantly predicts Spanish vocabulary in Spanish-English bilinguals from 2;6 to 5 in the USA. Dicataldo and Roch (2020) demonstrate that SES impacts the vocabulary, grammar and working memory of Italian-speaking children, aged 5 on average, in monolingual and multilingual families.

1.3.4. Family language practices

Although children's language exposure is essentially within the family and at school, daily activities such as reading and television also provide language exposure (Singer & Singer, 1998). Reading provides rich qualitative exposure, consolidating language skills and memorisation, and even facilitating skill transfer between languages (Pearson, 2007). Cohen et al. (2021) show that reading offers repeated exposure to low-frequency vocabulary, contributing to lexical enrichment in first and fifth grade French-English bilinguals. Cohen & Ghimenton (in review) show how bilingual acquisition is harnessed by key factors, such as family language practices; home language repertoires; language(s) used for reading, television/films; trips abroad; playdates; and socialisation at home, school and through other activities. A range of actors and factors influence and contribute to children's language trajectories. The family and school environments are crucial for bilingual development, but also for children's cultural identification. Investing in a language can be decisive for language skill development (De Houwer, 2021) and this is undoubtedly even more critical as children enter adolescence.

1.3.5. Bilingual and cultural identity construction

Children's language environments influence their language and cultural identity construction. Bilingual children grow up with two languages, but often also with two cultures, which may lead them to feeling bicultural (Grosjean, 1993). They may develop a mixed identity (Bensekhar et al., 2015; De Gaulejac, 2016) which is dynamic, depending on the environments in which they interact (Fielding, 2015; Vinsonneau, 2002). Having identity traits from two cultures may lead to an identity dilemma (Grosjean, 1993). Fielding (2015) presents bilingual identity negotiation along a continuum, from identity confusion and conflicting development between identities, to identity integration with co-existing identities constituting a bridge between cultures. Pilote et al. (2011) identify different identity configurations in 47 young French-English bilinguals in Canada, resulting from family and school socialisation. Some identify with the continuity of their family culture while others are reformulating their identity, or even breaking away from culture of a parent or an environment. To better understand children's linguistic behaviour and their relationship with their languages and cultures, language history and self-image should be taken into consideration (Grosjean, 1993). Different tools can be used to elicit children's "*identity narratives*" (Ibrahim, 2019, p. 38). To explore identity construction, studies often combine interview-based and visual methods. For example, in the often-used *language portrait* activity (e.g., Busch, 2018), children colour in a human silhouette to show how they perceive their language and cultural identity. A subsequent semi-structured interview then enables them to explain their portrait, leading to a deeper understanding of their identity construction.

This five-year longitudinal case study explores the interplay of language exposure, language skills and bilingual and bicultural identity construction in three French-English bilingual adolescents from different home language backgrounds. Participants' language exposure is studied by exploring their current and cumulative exposure; their language practices with friends; and their language-based activities. Language skills are assessed in both languages using narrative and receptive vocabulary tasks. Language and cultural identity are observed through a language portrait activity (Busch, 2018) and annual semi-structured interviews. Two hypotheses are formulated.

H1. Higher exposure to a language results in stronger skills in that language.

H2. Higher exposure to a language results in stronger feelings of identification towards that language and culture.

2. Materials and Methods

2.1. Context

Data were collected in a state school (henceforth, the School) in France with a bilingual programme, called *Sections internationales* (International sections, henceforth ISs). The School has several ISs (e.g., Polish, Portuguese), each student affiliated to one IS. To attend the English section, students must demonstrate age-appropriate, high level English skills. High level French skills are not obligatory, since support may be provided.

The French Ministry of Education dictates educational policies and curricula. ISs follow the standard French national curriculum taught in French over three-quarters of the week. The remaining quarter, taught at English native-speaker level, covers the British national curriculum language and literature components. From middle-school, part of the history and geography programme (one subject in France) is taught in English.

2.2. Participants

All 50 families of students in the English section in the final year of elementary school were contacted to request consent for their child's participation in the five-year INEXDEB project (Cohen, 2015). Thirty-three families gave written informed consent. In the current study, three case studies (Stake, 1994) were created using purposeful sampling (Patton, 2002), each representing one home language background typically found at the School – French dominant; English dominant; or both French and English. The three students, aged 10 at the study onset, were randomly selected from the larger group of participants with similar home language characteristics based on information in parent questionnaires about home language backgrounds (see 2.3.1). Elin was born in England to *L1 English parents*. First exposed to French when her family moved to France for personal reasons when she was turning 9, she had aL2 (Meisel, 2008). Camille was born in France to *L1 French parents*. First exposed to English aged 5, when her family moved to Australia for three years for professional reasons, she had cL2 (Meisel, 2008). Gabriel was born and raised in France and had 2L1 (Meisel, 2008) from birth from his *L1 English mother* and *L1 French father*.

The students came from two-parent homes and had normal general and language development. They had similar French and English input in lessons, although the language(s) spoken in friendship groups varied. Using parents' years in education (see 2.3.1) as a proxy for SES, we considered that participants came from middle to high SES homes since all parents had a postgraduate qualification. Table 1 provides an overview of participants' backgrounds at the study onset.

Table 1. Participants' backgrounds at the study onset

	Elin	Camille	Gabriel
Age at study onset	10;2	9;11	10;8
Birth country birth	England	France	France
Language exposure before age 3	English	French	French & English
Countries lived in	0-8: England From 9: France	0-5: France 5-8: Australia From 8: France	France
Language(s) of schooling	Preschool: English Elementary: English 3 years Then The School: French & English	Preschool: French 2 ½ years English 1 year Elementary: English 2 ½ years Then The School: French & English	Preschool: French (plus 2 ½ hours English extra-curricular classes/week from age 5) Elementary: French 4 years (plus 2 ½ hours English extra-curricular classes/week) Then The School: French & English

Parents' speaking skills	Mother: French: fair English: native Father: French: good English & Welsh: native	Mother: French: native English: good Father: French: native English: very good	Mother: French: very good English: native Father: French: native English: very good
Language(s) spoken at home	English (rarely French)	Mostly French (sometimes English)	French & English (fairly balanced)
Siblings	Younger sister	Older sister Younger brother	Older sister Younger brother

2.3. Materials

The data analysed came from parent language background questionnaires; student semi-structured interviews on current language use, language preferences and identity; narrative tasks assessing lexical diversity and grammatical accuracy; receptive vocabulary tests; and a language portrait activity. Henceforth, Y1, Y2, Y3, Y4 and Y5 refer to the study years.

2.3.1. Parent language background questionnaires

Parents completed an annual questionnaire requesting information on children's current language exposure; language practices with different interlocutors according to environments (e.g., home; school); and language-based activities. The Y1 questionnaire sought detailed information on: children's yearly language exposure from birth, with different interlocutors and in various contexts; family background; parental language profiles; parents' self-assessment of spoken French and English, from 1 (no knowledge) to 7 (native-like); and countries where children had lived (see Table 1).

French and English current exposure was calculated annually from parents' estimates of the number of weekly waking hours that their child was exposed to each language, during school time (including weekends) and school holidays. The number of school hours was multiplied by 36 (number of school weeks), while holiday hours were multiplied by 16 (number of holiday weeks). Finally, school and holiday hours were combined per language. Results were converted to percentages to facilitate comparisons between participants.

Cumulative language exposure was estimated yearly from birth to the year preceding the study, using information in the Y1 parent questionnaire about children's language use in different contexts (with each close family member and the child-minder; at daycare, preschool and elementary school). A language exposure percentage was first estimated yearly, then converted to a proportion. For example, a child with 40% English and 60% French exposure in their first year, had proportions of 0.4 and 0.6 respectively (calculation method adapted from Unsworth, 2013). The Y1 current exposure totals were then added, to obtain the total cumulative exposure in years at the study onset. Each subsequent year, current exposure proportions were added to the previous year's cumulative exposure, providing to-date cumulative exposure per language.

2.3.2. Student semi-structured interviews

The students had a yearly semi-structured interview containing the same questions throughout the study. They were asked about their views on their current language use according to context and interlocutor. They also provided information, on a five-point scale (Only French; More French than English; French and English equally; More English than French; Only English) on language practices with friends inside and outside school and on the frequency of language-based activities in each language (reading; TV/films; talking on Skype/Facettime; texting; radio; computer/videogames). Answers were converted to numbers to facilitate comparisons (Table 2). As well as providing yearly information, an overall average was calculated for the study duration, per activity and per language. From Y2, children estimated the number of hours spent reading for pleasure in each language. The semi-structured interviews also enquired as to students' feelings of identity.

Table 2. Readings for language-based activities

	French	English
Only French	1	0
More French than English	0.75	0.25
French and English equally	0.5	0.5
More English than French	0.25	0.75
Only English	0	1

2.3.3. Oral narrative tasks

In Y1, Y3 and Y5, students produced an oral narrative in each language of the wordless picture book, *"Frog, where are you?"* (Mayer, 1969).³ This book has often been used in research on typically developing young monolinguals (Berman & Slobin, 1994) and bilinguals (Akinci & Jisa, 2001; El Abed Gravouil & David, 2016; Montanari, 2004; Pearson, 2002). Replicating Berman and Slobin's (1994) instructions, students were told: *This is the story about a boy, a dog and a frog. First, you're going to look through the pictures. Then you're going to tell me the story while looking through the pictures again.*

The narrative samples were transcribed and coded in the CLAN software (MacWhinney, 2000). All transcriptions and coding were checked by the first author and another trained researcher until 100% agreement was reached. Lexical diversity and grammatical accuracy were explored. *Lexical diversity* was calculated in CLAN using Malvern's D (henceforth, D; Malvern et al., 2004) which assesses the number of unique word types and provides a robust measure, independent of narrative length. Based on lexemes in each language, D provides comparable lexical diversity measures for each language (Miller et al., 2006). *Grammatical accuracy* per year and per language, was calculated as an error rate, by dividing the number of morphosyntactic errors by the number of clauses in the narrative. Errors were coded according to error type: determiners; gender; pronouns; prepositions; verb morphology; adverbs; conjunctions; and number. Following Treffers-Daller (2011), proper names, filled pauses and other hesitation markers, repetitions and elements later reformulated, and metalinguistic markers (e.g., "What's 'grenouille' in English?") were omitted from calculations.

³ A different book was used in Y2 and Y4.

2.3.4. Receptive vocabulary tests

Receptive vocabulary was assessed with the *Echelle de vocabulaire en images Peabody* (Dunn et al., 1993) and *British Picture Vocabulary Scale* (Dunn et al., 1987). We used two complementary measures. *Raw scores* study changes in absolute performance over time. *Standard scores* show children's position in relation to their age norm.⁴ To align with the narrative data collection, scores from Y1, Y3 and Y5 were used. The test manual divides standard scores into six categories (Table 3).

Table 3. Peabody standard score distribution

Score range description	Scores
Extremely low	40-70
Moderately low	70-85
Low average	85-100
High average	100-115
Moderately high	115-130
Extremely high	130-160

2.3.5. Language portrait activity

In addition to the annual semi-structured interviews which included questions on feelings of identity, students also coloured a *language portrait* (Busch, 2018; see 1.3.5) in Y3. They were told first to list the languages and cultures that were important to them. Then, they had to choose a different colour for each item listed. They were then instructed to colour the portrait, however they wished, using their chosen colour code, to show the role of each language and culture in their life. They then explained how they had coloured the portrait, before answering questions exploring their language and cultural identity. Following Melo Pfeifer (2015; 2018) and Castellotti and Moore (2010), the portraits were analysed according to several criteria: for example, the language/culture most represented quantitatively or the body parts chosen.

2.3.6. Procedure

The INEXDEB project (Cohen, 2015) received ethical approval from the *Service Protection des Données* at the *Centre National de la Recherche Scientifique* in France. From September 2016, parents gave annual written informed consent for their child's participation, having gained their child's assent. Students were given a pseudonym. All data were collected by the first author, a highly proficient English-French bilingual. Data collection sessions were recorded using a digital audio recorder. From Y1 to Y3, students were tested individually in a quiet classroom. Y4 and Y5 were conducted using videoconferencing because of the COVID pandemic. Since the first author had already established a friendly trust relationship with the students, the online and earlier in-person sessions were comparable. Students had two research sessions per year, one for each language. In Y1, Y3 and Y5, the English activities were given to these students in the first session and the French activities in the second session.⁵ The semi-structured interview was included in one yearly session. The language portrait activity (Y3 only) was added to the other. Three weeks separated each session, to avoid students remembering their first narrative. They received a book each year thanking them for participating.

⁴ Similar validation and norming processes for the different language versions of the Peabody tests facilitate score comparisons (Umbel et al., 1992). Although the psychometrics are not exactly equivalent, we only compare scores as approximate measures.

⁵ Testing order was reversed in Y2 and Y4, not reported here.

The annual semi-structured interviews and language portrait interview (henceforth, the interviews) were coded using thematic analysis (Braun & Clarke, 2006) to explore the main themes of the study. In addition, fine-grained textometric analyses were conducted using TXM open-source software (Heiden, 2010) which provides tools for qualitative and quantitative content analysis of text corpora. We explored specific linguistic markers reflecting students' feelings towards their languages and cultures. Full lists of verbs, adjectives, adverbs and pronouns were obtained, to identify how students used affective verbs, positive and negative adjectives, adverbs, and pronouns towards their languages and cultures (see Appendix A).

3. Results

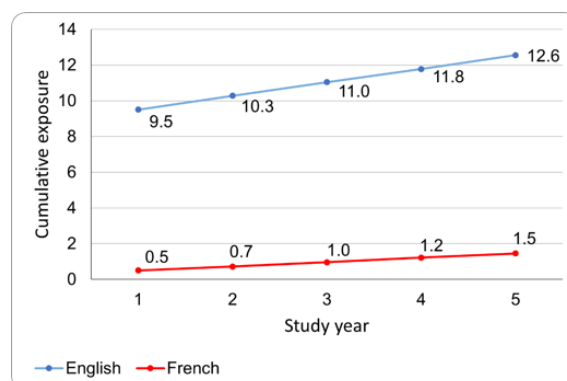
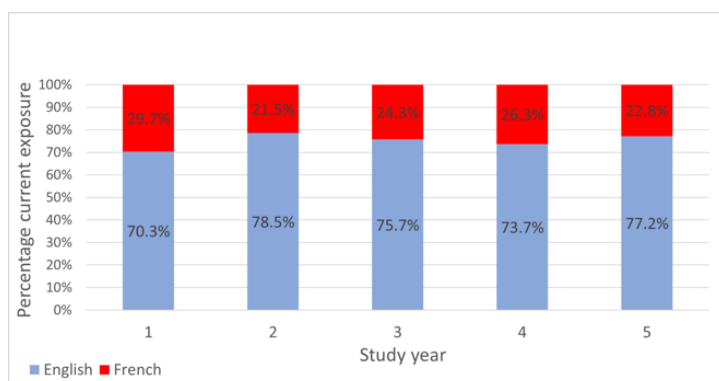
Data analysis was the same for each student. First, language exposure and language practices are presented. Current and cumulative exposure and language practices with friends and in different language-based activities are explored. Secondly, we investigate language skills: lexical diversity and grammatical accuracy in the narratives; raw and standard receptive vocabulary scores. Thirdly, a qualitative analysis of language and cultural identity is conducted in students' interview discourse.⁶ Finally, a synthesis explores the interplay between language exposure, language skills and language and cultural identity construction. Verbatim from the interviews is used to give voice to the children.⁷

3.1. Elin

3.1.1. Language exposure and language practices

Elin's English exposure from birth was considerably higher than her French exposure. The parent questionnaires and student interviews indicated almost exclusively English practices with close family. Elin and her sister largely spoke English together although by Y5, French was used occasionally, as Elin explained, "*she [her sister] used to be not confident about speaking French but she's got more confident so we'll speak in French*".

Elin's English current and cumulative exposure was much higher than French (Figures 1a and 1b). From Y1, Elin was consistently exposed to over 70% English current exposure. Having been in an exclusively English-speaking environment from birth to age 9, by Y5 her English cumulative exposure was equivalent to 12.6 years compared to 1.5 years for French. Elin almost always used more English with friends inside and outside school (Figure 2).



⁶ Elin and Gabriel included in their portraits the languages they studied as foreign languages at school (Spanish and Chinese for Elin; German and Spanish for Gabriel). In view of the subject of this paper, these results are not discussed here.

⁷ To facilitate reading, fillers, filled pauses, hesitation markers and reformulations were removed from the cited verbatim.

Figure 1a. Percentage yearly current exposure Elin

Figure 1b. Cumulative exposure in years Elin

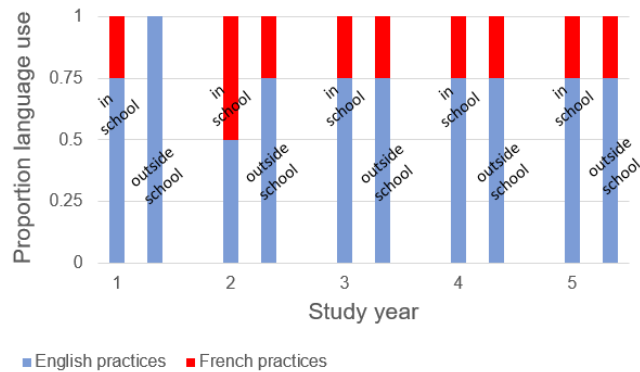


Figure 2. Yearly language practices with friends Elin

Elin almost always chose English predominantly for language-based activities (Figure 3a). For example, she used English 90% of the time on average over the five years for reading and social-networking (Figure 3b). Up to Y4, she read exclusively in English. While French reading increased in Y5, she emphasised that this was, “usually for school”, and that she found French books “kind of boring” because of “how they’re written”.

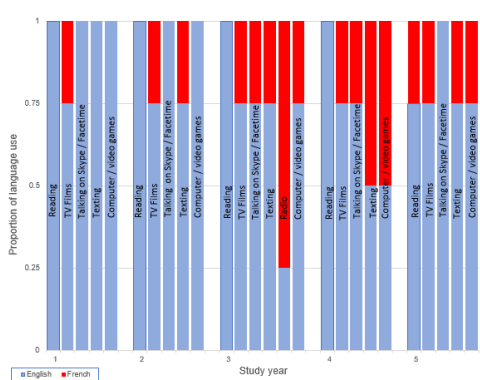


Figure 3a. Proportion of yearly language use for language-based activities Elin⁸

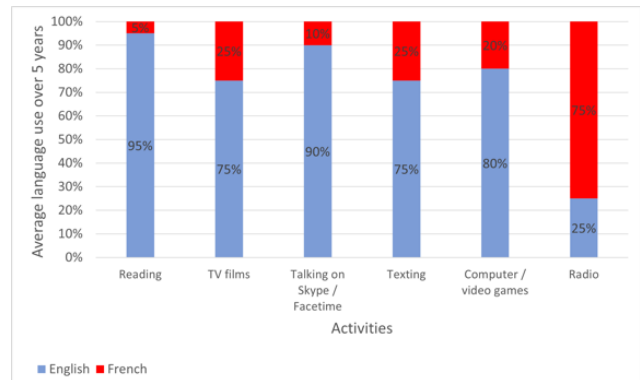


Figure 3b. Average 5-year language use for language-based activities Elin

Reading for pleasure was predominantly in English (Figure 4). This reduced in Y5 because reading for school took considerable time.

⁸ If students reported not doing a particular language-based activity in either language (e.g., radio) in a given year, the activity is not shown in the graph.

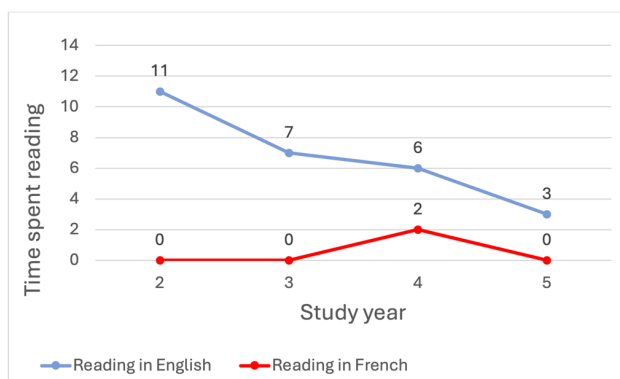


Figure 4. Hours spent reading for pleasure per language, per week Elin

3.1.2. Language skills

Oral narratives

Table 4 shows Elin’s oral narrative scores. Her English lexical diversity scores remained stable. In contrast, her French scores showed more variation with the highest in Y3 and lowest in Y5. English scores always exceeded French scores by at least 10 points, the gap widening to nearly 15 points in Y5.

Table 4. Narrative assessment scores Elin

	French Y1	English Y1	French Y3	English Y3	French Y5	English Y5
Lexical diversity (D)	18.3	28.28	20.37	29.43	15.41	29.85
Number of errors	22	1	8	2	2	1
Number of clauses	32	50	26	36	21	41
Error rate	.69	.02	.31	.06	.09	.02

Cross-linguistic comparisons of grammatical accuracy revealed few English errors compared to French. For example, in Y5, Elin made a single verb inflection error, “*the boy got *bit on the nose*” (bitten). However, Elin’s French error rate dropped considerably from Y1 to Y5. Her most frequent Y1 French errors were on gender (10 errors). Most concerned incorrect definite and indefinite articles and pronouns related to “*grenouille*” (frog; feminine). She made other gender errors on high frequency words, such as “**le/*un maison*” (the/a house; feminine). Four errors related to prepositions, where the French construction was modelled on the English construction, for example, “*il cherche *pour *le grenouille*” (he looks for the frog), where no preposition is required after “*chercher*”. She made a similar error with the verb “*crier*” (to shout), “*il a crié *pour *le grenouille*” (he called for the frog). She also omitted the reflexive pronoun “*se*” before the verb in, “*quand le garçon *réveille*” (when the boy wakes up), rather than “*se réveille*”. In Y3, while she made four gender errors, related to either “*grenouille*” or “*maison*”, gender was generally correct on these and other items. The verbs “*crier*” and “*chercher*” were usually used correctly without a preposition. However, Elin again omitted the reflexive pronoun in “*la grenouille *a échappé*” (the frog escaped), rather than “*s’est échappée*”. By Y5, there were no gender errors. There was just one prepositional error, after “*chercher*”, as in Y1, “*le garçon et le chien commencent à chercher *pour la grenouille*” (the boy and the dog start looking for the frog), but Elin also formed a correct construction in, “*ils cherchent la grenouille*” (they look for the frog). While the reflexive pronoun was used correctly in “*quand le garçon et le chien *s’endort*” (when the boy and the dog fall asleep), the verb was conjugated incorrectly in the singular. However, other reflexive constructions were correct, for example, “*la grenouille s’échappe*” (the frog escapes); “*ils réalisent que la grenouille s’est échappée*” (they realise that the frog has escaped) and “*le cerf se cache*” (the deer is hiding).

Receptive vocabulary

Table 5 shows Elin's receptive vocabulary scores. Her raw scores increased yearly for both languages. In French, her Y1 standard score was in the extremely low range, passing to the high average range in Y3 and the moderately high range in Y5. In contrast, her English standard scores showed less variability, almost identical in Y1 and Y5 in the high average band, with a peak in Y3 in the moderately high band. Thus, by the study end, her French standard score exceeded her English score.

Table 5. Raw and standard vocabulary scores Elin

	French Y1	English Y1	French Y3	English Y3	French Y5	English Y5
Raw scores	40	112	133	132	153	134
Standard scores	40	112	107	119	124	113

3.1.3. Language and cultural identity construction

Elin's language portrait (Y3) can be read vertically (Figure 5), from the most important languages at the top, to the least important at the bottom.

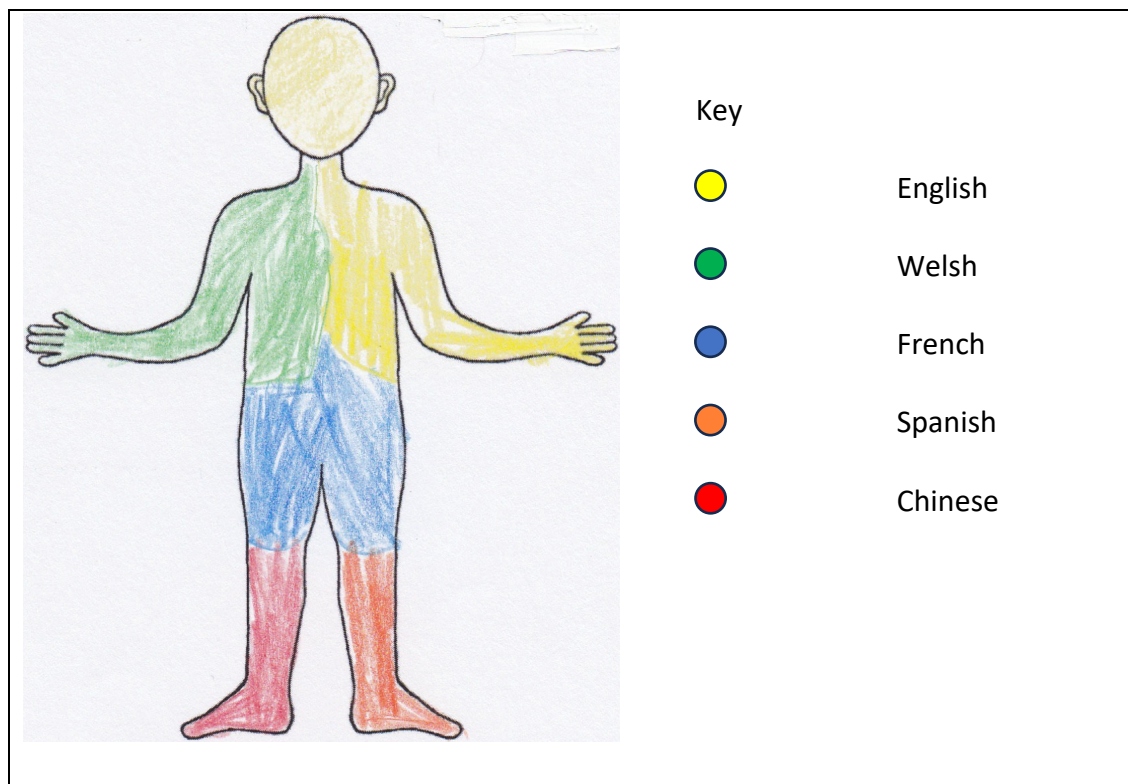


Figure 5. Language portrait Elin

English, associated with English and Welsh culture, covered the largest area, in her head and upper body. Symbolically, these body parts reveal the strongest connection to English and Welsh (Melo-Pfeifer, 2018), as reflected in Elin's discourse, *"I really like to connect to the Welsh culture"*. Elin demonstrated the affective value she attached to English and British culture, observing, *"That's what I am, my nationality, my parents are English and Welsh"*. French language and culture were between her waist and thighs. Elin valued French culture, particularly the traditions and food, *"I really like French culture, like the Fête des Lumières. I also*

really like French food". When asked if one language and culture was more important to her, Elin confirmed her strong roots, "*Probably English and Welsh*".

The linguistic markers in the interviews revealed that the affective verbs *to feel* and *to be* were largely related to English and Welsh language and culture. When associated with French, they were qualified, for example, "*I feel I'm kind of French*" (Y4). Similarly, *to be in contact with*, *to grow up in*, *to be born in*, *to be from* were linked to English language and culture. In contrast, *to like* was frequently attached to French, showing her affection for the French language and especially culture, as shown above (Y3). *To become* appeared in Y3 and was systematically linked to French, for example, "*I have definitely become more French*" (Y3). A year later, she declared, "*some things that I do have become more French... the way I talk also has become more French*" (Y4), revealing the increasing importance of French and an emerging French identity.

The personal pronoun *they* often related to French, for instance, "*French people, they do what they want. If they need to do something, they'll like just do it*" (Y4), suggesting that Elin did not yet fully identify as French. The possessive pronoun *my* followed by nationality demonstrated her allegiance to British people, "*my Welsh side of the family*" (Y4). Negative appreciative adjectives, "*difficult*" and "*complicated*" described French only (Y2 and Y4). Conversely, positive appreciative adjectives were generally used for English, "*English is very natural*" (Y2), or "*I'm a lot more confident when I speak English*" (Y4). The adverb "*more*" largely related to English, indicating higher quantitative English use, for example, "*I usually read more in English*" or "*Instagram, WhatsApp, probably more in English*" (Y4).

In Y5, when asked about her identity, Elin replied, "*I've been here for five years and I'm gonna probably get nationality soon and then I guess I'll be French. I still think that I'm more English slash Welsh but I do feel more French the longer we're here. I think I will always feel more English, just because I was born and raised for the first few years of my life but I still think if someone asked me, I'd say that I'm English and I live in France and that I speak French, rather than I'm French*", demonstrating that having French nationality would enable her to BE French from an administrative point of view, but emotionally she considered that she would always BE English, and would always feel more English.

3.1.4. Synthesis

Elin had greater English quantitative and qualitative exposure from birth and throughout the study within her family, but also in her more frequent choice of English in friendship groups and for language-based activities. Although Elin's lexical diversity was higher in English throughout the study, receptive vocabulary in French was higher than English in Y5. Furthermore, while Elin's French error rate in Y1 was considerably higher than in English, error rates were low in both narratives by Y5. While feelings of French identity were emerging by Y5, Elin's discourse suggested that her British identity would always be stronger. Nevertheless, the linguistic markers in her speech revealed her growing attachment to French culture.

3.2. Camille

3.2.1. Language exposure and language practices

While Camille's interactions with her family were French dominant (Table 1), there was variability over the years. English was used increasingly in family interactions the longer the family remained in Australia. Before returning to France, Camille's language practices with her family were English dominant. While her parents' practices remained French dominant in Australia, sibling interactions were frequently in English. Once in France, French progressively became the dominant family language, although English was still used. In Y2

and Y4, Camille reported dominant English practices with her siblings. In Y5, while practices were fairly balanced with her elder sister, she estimated “60/40 with more French” with her younger brother. Camille’s French current and cumulative exposure was always higher (Figures 6a and 6b) although English current exposure reached almost 40% in Y5. Camille’s higher French cumulative exposure reflected her dominant home language background, despite living in Australia. In Y5, French exposure was equivalent to over 10 years compared to almost four for English (Figure 6b).

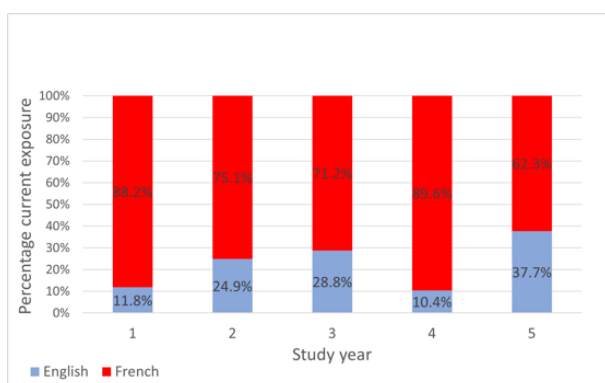


Figure 6a. Percentage yearly current exposure Camille

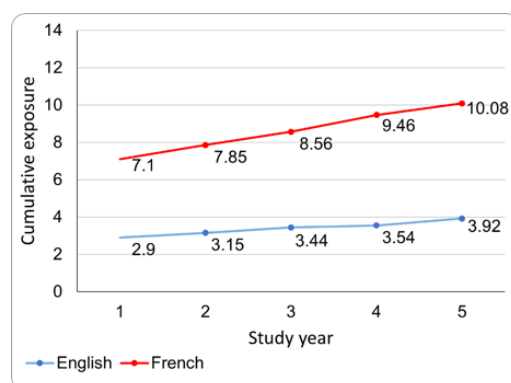


Figure 6b. Cumulative exposure in years Camille

Although Camille interacted with friends inside and outside school in both languages, French was generally more frequent (Figure 7). In Y5, she spoke more English with school friends because she did an English-medium after-school activity, “I do MUN [Model United Nations]. When I do MUN I speak English and so when I go there I have an hour of nothing, no classes before, so during that hour I stay with Anglophones, so I always speak English”.

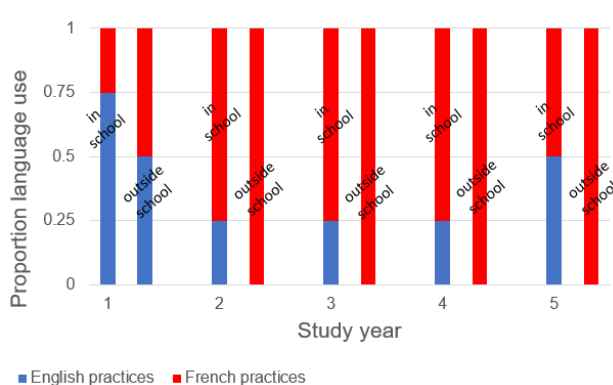


Figure 7. Yearly language practices with friends Camille

Camille had fairly balanced practices from Y1 to Y3 (Figure 8a) for language-based activities. By Y4, English practices had increased. Camille consciously sought balanced reading practices, “I try and make it equal. I try and switch every time. So I read as much in each language”. Similarly, in Y5, she explained, “I’m trying to read a lot in English because since I have classes in French I try and make it equal by reading a lot of English but I do read French.” (Figure 9). In Y5, she enjoyed reading both languages, and was resourceful searching for reading materials, “There is more choice in English but I think it’s just a matter of finding the right books and finding the right places and people to go ask for books. I have 2 friends that read a lot so if I need a book,

I can ask them in French". Texting was English dominant. She preferred watching films, "in the original language", and estimated that film-viewing was, "more English definitely". She also explained that she had started listening regularly to English podcasts ("Radio" in Figure 8a).

Average language use throughout the study showed that, depending on the language-based activity, her practices were either balanced French and English or English dominant (Figure 8b).

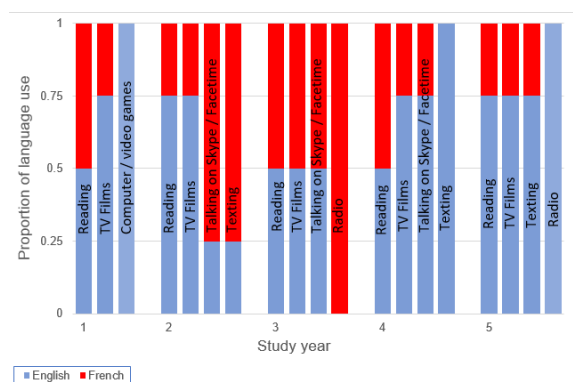


Figure 8a. Proportion of yearly language use for language-based activities Camille

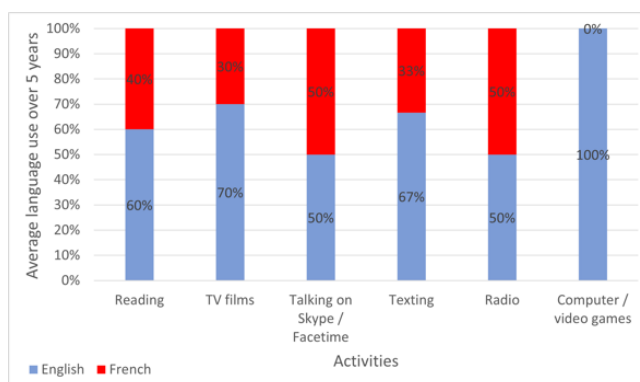


Figure 8b. Average 5-year language use for language-based activities Camille

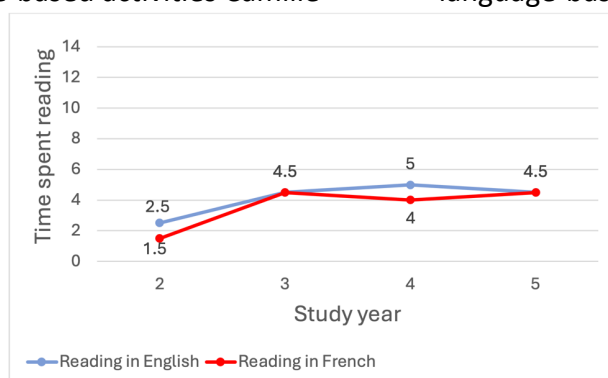


Figure 9. Hours spent reading for pleasure per language, per week Camille

3.2.2. Language skills

Oral narratives

Table 6 shows Camille's oral narrative scores. Her lexical diversity scores were always high in both languages. While scores for French and English were similar in Y5, her English score increased from 34.95 (Y1) to 41.15 (Y5), while her French score decreased slightly over the same period.

Table 6. Narrative assessment scores Camille

	French Y1	English Y1	French Y3	English Y3	French Y5	English Y5
Lexical diversity (D)	43.75	34.95	37.7	36.27	40.28	41.15
Number of errors	4	16	2	7	7	3
Number of clauses	67	66	82	87	97	79
Error rate	.06	.24	.02	.08	.07	.04

Cross-linguistic comparisons of grammatical accuracy show a higher error rate in English than in French in Y1 and Y3. However, by Y5, Camille’s French error rate was marginally higher than English. While her French error rate was similar in Y1 and Y5, her English error rate dropped considerably over that period.

Camille’s English error rate was higher in Y1 than the following two years although her errors were generally unsystematic and isolated. For example, she made one inflexion error on the past simple in, “he **caught* a frog” (caught), over-generalising the regular verb form. She also made one agreement error in, “a mole **bite* him” (bites). Camille’s Y1 errors were not reproduced in Y3, with one exception. She consistently failed to produce the English conjunction “while” in Y1 (5 errors) and Y3 (4 errors), translating literally the French, “pendant que” to “while **that*”, rather than “while”. For example, “while that* the dog is being chased” (Y3). However, by Y5, she consistently produced the correct target structure.

French errors were also generally unsystematic and isolated throughout the study. For example, in Y1, Camille used the masculine subject pronoun once to refer to the frog but made no other gender errors in the study. In Y1, she made one verb inflection error, “il se fait **poursuivi*” (he is followed), rather than “poursuivre”. However, five errors in Y5 concerned the over-use of the preposition “à”, for example, “il appelle **à sa fenêtre*” (he calls at the window), rather than “par” (through); “le petit garçon il est **à terre*” (the little boy is on the ground), rather than “par”. Yet the prepositions for these constructions were correct in Y3.

Receptive vocabulary

Camille’s raw and standard receptive vocabulary scores increased systematically for both languages but the biggest increases were for English (Table 7).

Table 7. Raw and standard vocabulary scores Camille

	French Y1	English Y1	French Y3	English Y3	French Y5	English Y5
Raw scores	143	120	152	139	164	152
Standard scores	132	119	130	130	135	147

While her French standard scores were stable and consistently in the extremely high range, her English standard scores increased considerably between Y1 (moderately high) and Y3 (extremely high), and then again between Y3 and Y5. By Y5, both English and French scores were in the extremely high range, but her standard English score was higher.

3.2.3. Language and cultural identity construction

Camille's identity portrait (Y3) was divided into visually differentiated parts (Figure 10).

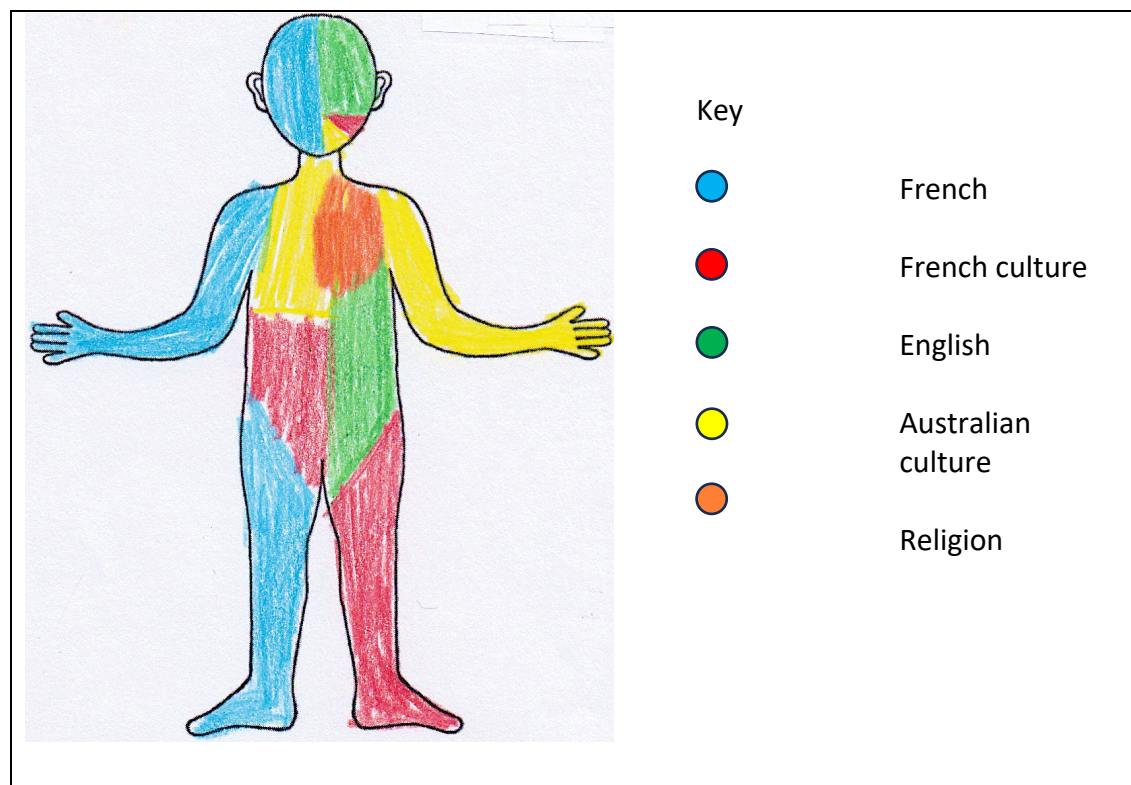


Figure 10. Language portrait Camille

French language and culture accounted for around 75% of her portrait. She justified this referring to family language practices, *"I speak French a lot with my family, less in English"*. However, she acknowledged that English was present, *"I still do a few things for example at school and we do try to speak a bit at home in English and also with some of my friends"*. According to Melo-Pfeifer (2018), legs and arms symbolically represent usefulness and habits. For Camille, they represented French culture and language and Australian culture, as she observed, *"I do a lot of things in French so like hands and legs"*, and then *"I've put one hand in yellow because I still have the habit of doing some things like we would do in Australia"*, providing supporting examples related to outdoor life, *"we try to go outside a lot, we go play outside, we would walk barefoot outside, we'd eat outside often. You do that in France but less. We do quite a few barbecues."* While acknowledging that in future, French and French culture would be, *"a big part of my life"*, she was determined to preserve her Australian culture, *"It will be important for me to have kept part of Australian culture I'll have had"*.

Camille used few affective verbs. For example, in Y1 and Y2, she used *"to prefer"* once and *"to like"* twice, always related to school in Australia. She emphasised the activities and supportive teachers there, *"I really like the type of school I was in"* (Y1) and *"I really liked my school in Australia."* (Y2). *"To be"* was followed by *"French"*, *"I am French because I've never had the Australian nationality"* (Y2). Personal pronouns showed *"they"* referred to Australians while *"you"* referred to the French, *"here if you were away, you have to keep up asking friends but in Australia probably they'll keep you there"* (Y1) and *"they're always smiling"* (Y4). Positive adjectives like *"fun"* or *"important"* were often linked to Australia, for example, school was, *"really fun"* (Y2). Her three years in Australia were, *"really important years when you develop who you think you are"* (Y3). Similarly, she described Australia as, *"an important part"* of her culture and who she was (Y5). The adverb *"more"* was related frequently to French, for example, *"I speak probably more French than English"* (Y1) or *"with my friends, it's practically always more French"* (Y3).

From Y2, she showed uncertainty when answering questions relating to her identity, revealed by her frequent use of “probably” or “perhaps/maybe”. However, on reflection, she consistently claimed to feel more French, for example in Y4, “maybe a bit more French because I haven’t been to Australia for a long time” (Y4). Having French nationality also contributed to how she defined herself, “I’m French because I’ve never had Australian nationality” (Y4). Yet she highlighted her strong bond with Australia (Y3), “I still feel Australian because I grew up there from 5 to 8, the really important years when you develop who you think you are”. Her Y5 response emphasised this linguistic and cultural bond, “I’d say [I come from] France but I’d specify that I grew up in Australia. I feel like it’s a part of who I am and my culture and I think it’s an important part cause, if I’d just lost English I don’t think I would specify it but since I’ve kept the language and go to school with people who speak English. I feel I have the culture or know about it”. Thus, attending a bilingual programme enabled her to maintain English and connect to Anglophone cultures.

3.2.4. Synthesis

Camille’s language practices with family and friends were more French overall. However, English practices were increasing with her siblings and peers by the end. By Y5, to balance her exposure, she consciously chose English, including reading, an after-school activity, and podcasts, providing qualitatively rich English exposure in her language-based activities. By Y5, her language skills were balanced, despite having considerably higher French cumulative exposure. Both narratives were lexically rich and grammatically accurate and receptive vocabulary scores were extremely high. Although she affirmed her French origins, Australia and Australian culture, and English, were clearly integral to her identity.

3.3. Gabriel

3.3.1. Language exposure and language practices

Gabriel was born and raised in France (L1 French father; L1 English mother). Language practices with his father were always in French. Before joining the School, he and his mother usually used English together. Thereafter, they used only English. Before the study, sibling language practices evolved from only English in Gabriel’s early years to more French by the middle of elementary school. Once at the School, Gabriel’s practices with his elder sister were predominantly English, while they were mainly French with his younger brother. However, three-way sibling interactions were generally English.

Up to Y4, French current exposure was systematically higher (Figure 11a). However, in Y5 English current exposure reached almost 60%. French cumulative exposure remained higher throughout the study, equivalent to approximately 60% French and 40% English in Y5 (Figure 11b).

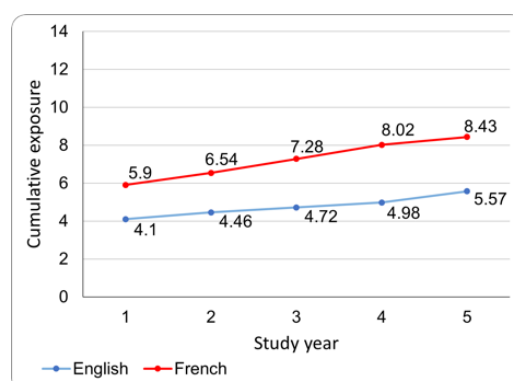
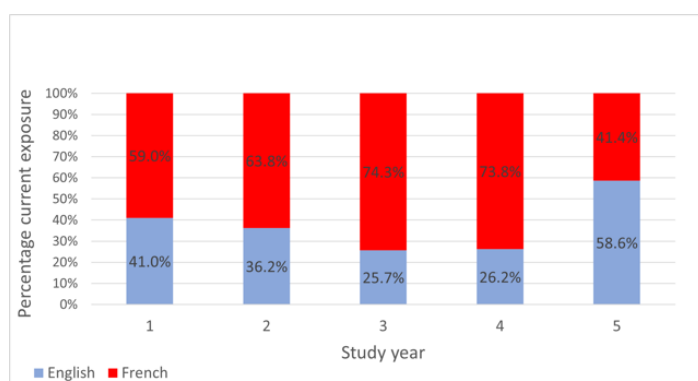


Figure 11a. Percentage yearly current exposure Gabriel

Figure 11b. Cumulative exposure in years Gabriel

While French practices largely dominated with friends from Y2 to Y4, Gabriel’s practices inside and outside school shifted to primarily English in Y5 (Figure 12). Although his school friends generally spoke French, he explained that, “we’re used to speaking English together”.

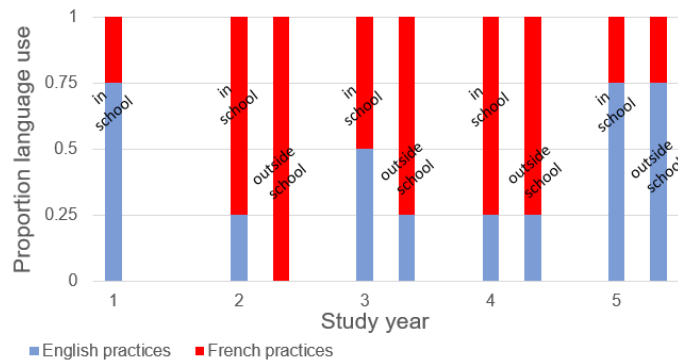
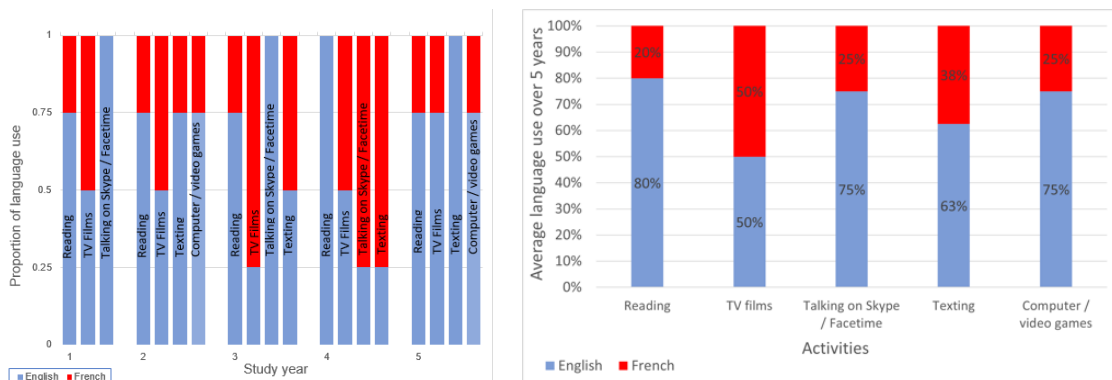


Figure 12. Yearly language practices with friends Gabriel⁹

For yearly language-based activities (Figure 13a), Gabriel’s practices were either quite balanced or English dominant, apart from French dominant texting and talking on social media in Y4. By Y5, practices shifted to dominant English.

Examining activity averages throughout the study (Figure 13b), reading and online social networking were mainly English. In Y5, Gabriel used social media regularly, “definitely in English, basically, all the time”. Similarly, he chose English for video games, because “it just sounds better in English as it’s made in English”. While Gabriel was a keen reader throughout the study, he spent considerably more time reading English (Figure 14). In Y3, English reading was, “more enjoyable”, and English books were, “easier to read”. Elaborating, he explained that, “the language and also the authors write for kids so it’s more appropriate”. Similarly, in Y5, he found English books “easier and more entertaining”. French reading, in contrast, was “exclusively for school” (Y4). In Y5, he was more explicit, “I don’t read in French. I had to read a book for French. I don’t like reading in French”. French reading was, thus, obligatory for school but when asked if he enjoyed the books, his reply was categorical, “Rarely, very rarely”.



⁹ Gabriel reported in Y1 that he had not yet made friends outside school because his family had very recently moved to the town where the study was conducted.

Figure 13a. Proportion of yearly language use for language-based activities Gabriel

Figure 13b. Average language use over 5 years for language-based activities Gabriel

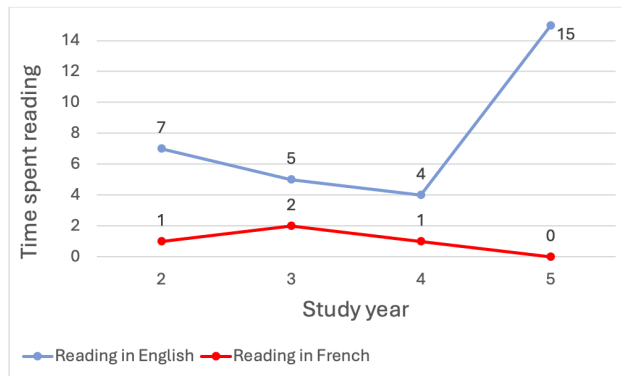


Figure 14. Hours spent reading for pleasure per language, per week Gabriel

3.3.2. Language skills

Oral narratives

Gabriel’s French narratives became lexically richer throughout the study. His score increased sharply between Y3 and Y5. While English lexical richness increased between Y1 and Y3, it stabilised between Y3 and Y5. By Y5 his French score exceeded his English score by over ten points (Table 8).

Table 8. Narrative assessment scores Gabriel

	French Y1	English Y1	French Y3	English Y3	French Y5	English Y5
Lexical diversity (D)	30.76	24.05	31.08	30.52	42.49	30.17
Number of errors	1	2	2	0	0	2
Number of clauses	85	67	54	45	88	88
Error rate	.01	.03	.04	0	0	.02

Gabriel’s error rate was very low in both languages, with isolated and unsystematic errors throughout the study. For example, in French, in Y3, he used the masculine subject pronoun once to refer to the frog but this was his only gender error in the study. Similarly, in English, in Y1, he made one preposition error, “*the dog is barking *after the reindeer*” (at), but all other prepositions were correct throughout the study.

Receptive vocabulary

Table 9 shows Gabriel’s receptive vocabulary scores. His raw vocabulary scores increased for both languages over time. His French standard scores remained stable, in the moderately high range. His English standard scores were extremely high in Y1 and Y3, with a slight drop into the moderately high range in Y5. In Y5, his French and English standard scores were comparable.

Table 9. Raw and standard vocabulary scores Gabriel

	French Y1	English Y1	French Y3	English Y3	French Y5	English Y5
Raw scores	140	136	150	144	155	146
Standard scores	124	132	124	134	123	129

3.3.3. Language and cultural identity construction

Gabriel chose to colour his language portrait minimally (Y3). Apart from the heart area corresponding to religion, he coloured only parts of his head (Figure 15). The ears corresponded to languages heard. The nose corresponded to smells related to English and French food. The mouth represented eating English, French and Italian food.

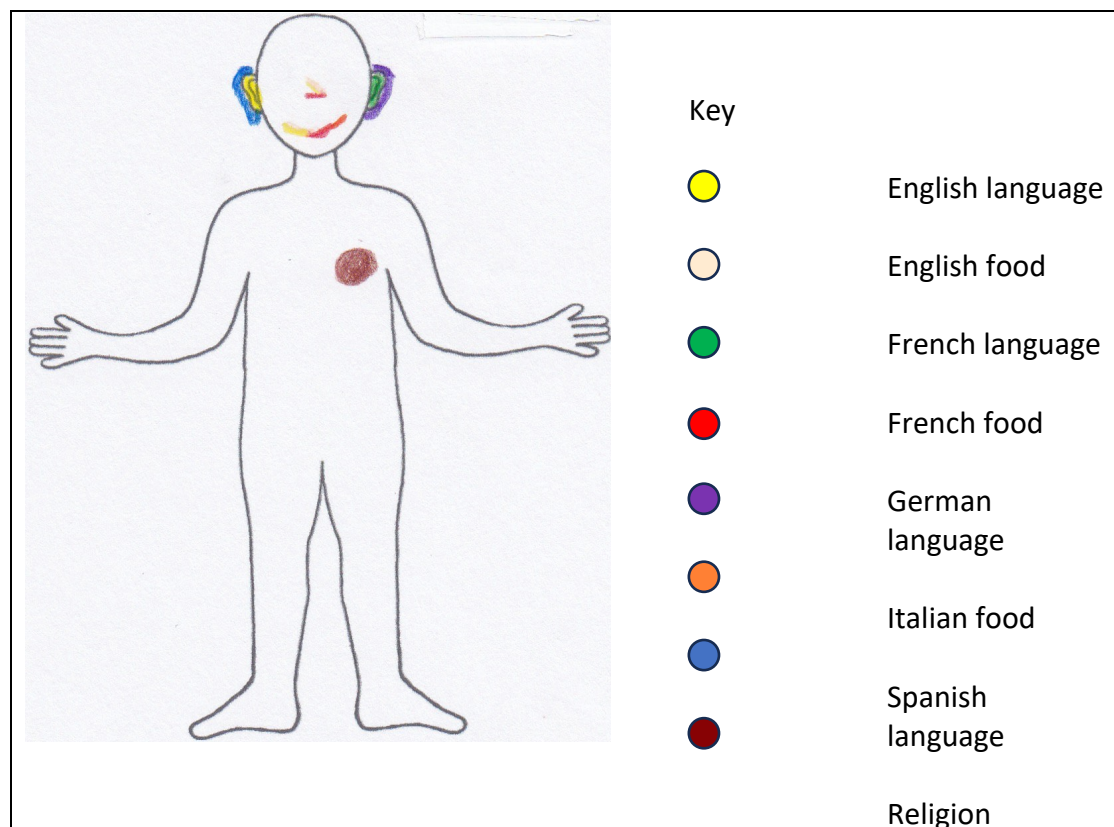


Figure 15. Language portrait Gabriel

English covered slightly more than French on his mouth, because, "*I prefer English food*". When asked if one language or culture was more important, Gabriel asserted that it was, "*probably English*" because, "*I prefer English*".

The affective verbs, "*to feel*" and "*to prefer*" were consistently associated with English. Gabriel always claimed to prefer English and to prefer speaking English. "*To prefer*" was used just once, in the past tense, linked to French (Y4), "*Before 6^{ème} [Y2] I preferred French but then I also liked English*". He also systematically stated that he felt more English. As the years passed, his explanations became more reflective. In Y1, he felt, "*a bit more English*". His Y2 response was more emphatic, "*more English*". In Y3, his response was justified, "*more English because I read more English and I have quite a lot of English friends and I like England for Cadbury's chocolate*". In Y4, he argued that, "*I feel more English inside than French*", claiming this resulted from a preference for English culture, notably, "*food, books, the weather*". Verbs associated with French were "*to be born*" and "*to come from*" but Gabriel's discourse lacked emotional attachment compared to English, for example, "*I'm born in France but I feel more English*"; "*I come from France but I prefer being in England*" (Y4). From Y4 negative verbs and adjectives appeared relating to French and France, "*French history-geography, I just hate it*" (Y4), and "*I hate the French education system*" (Y5). In Y4, French was

described as “horrible” because of, “*grammar, conjugations, cause it's way more complicated than English*”. Conversely, he associated positive adjectives with English. Gabriel wished he could attend an English-medium only school in France, because, pupils were “*really happy there*” (Y4). Likewise, English assignments at the School were, “*more fun*” (Y4).

By Y5, Gabriel declared that despite always living in France, he felt more comfortable in English, “*I speak more English so I find it easier because I find my words I guess and I'm just more used to it so it's easier*”. Similarly, responding to a question about his identity, he explained that he undoubtedly felt more English, although that had not always been the case, “*when I was younger, I would say when you live in a French town, with no English friends around you, you feel more French because there are more French people around, whereas now, with the School, it's easier to feel English, to have double nationality*”, highlighting the importance of socialisation with English-speaking peers within a bilingual programme, reinforcing his English identity.

3.3.4. Synthesis

While French exposure was greater from birth, Gabriel also had extensive English exposure. He chose English frequently for language-related activities, especially for reading. By Y5, his French narrative was lexically more diverse but both were grammatically accurate. His French and English receptive vocabulary scores were comparable. As the study progressed, Gabriel's preference for the English language and culture increased while negative feelings towards French and certain aspects related to France intensified. By Y5, he clearly identified more as English.

4. Discussion

We have explored the interplay of language exposure, language skills and bilingual and bicultural identity construction in three French-English bilingual adolescents. We posited that higher exposure to a language would result in greater linguistic skills in that language and stronger feelings of identification with the corresponding language and culture. We discuss our findings below.

4.1. The interplay of individual difference factors

This longitudinal study has demonstrated the interplay of the child-internal, proximal and distal individual difference (ID) factors in bilingual development discussed in Paradis (2023). The children grew up with parents who were L1 speakers of one language in Camille's and Elin's case, and of two different languages in Gabriel's case. The children came from middle to high SES families, with highly educated parents who provided their children with language-rich environments and clearly valued quality education. Gabriel was naturally and harmoniously exposed to two languages and cultures at home from birth (De Houwer, 2015). Elin and Camille's parents chose to change countries, leading to their children's rich quantitative and qualitative exposure to a new language and culture, primarily in school, resulting also in harmonious bilingual development, defined by De Houwer, (2015, p. 169) as, “*the experience of well-being in a language contact situation involving young children and their families*”. All three families selected a bilingual programme for their children, underscoring positive attitudes to bilingualism and biculturalism.

L2 AOA is thus entirely subject to family mobility: children neither choose their languages nor when they encounter them (De Houwer, 2019). We recall that Gabriel had always lived in France, was a simultaneous bilingual (2L1) following the one person-one language approach with his parents. Camille and Elin acquired

their L2 on leaving their birth country and moving to a host country. Camille moved, aged 5, for a time-bound period, before returning to her birth country. Elin's family moved permanently to France, according to her parents, *"to make a lifestyle change and give our children the opportunity to become bilingual"*, when Elin was 9. Consequently, the influence of the birth country, along with that of the host country or, in Gabriel's case, the country with which he identifies more, is part of the family's life trajectory. Children then build their own experiences related to each language and culture, progressively exercising their own agency and making their own choices.

Home language exposure to child directed speech from birth, was primarily French for Camille, English for Elin, and balanced French and English for Gabriel. Exposure patterns have consequences for children's internalisation of language, with regard to the neurolinguistic patterns and sociolinguistic repercussions. Neuroscience studies have demonstrated that AOA incorporates neurobiological factors linked to brain plasticity and the ease with which language learning is proceduralised, relying on highly efficient synaptic processes up to age 6 which decline thereafter.

Furthermore, following the children longitudinally requires us to consider the natural continuum between oral and written language. Elin learnt to read in English, her L1, while Gabriel learnt to read simultaneously in his two L1s. In contrast, Camille learnt to read in her L2 on moving to Australia. She was not yet reading in French, having left France before reading was taught formally in first grade. We can assume then that Camille was close to becoming a reader in French, since cognitive skills, like phonological awareness and rapid automatised naming (Furnes & Samuelsson, 2011), which are both relatively independent of more linguistic aspects such as vocabulary level (Chiappe & Siegel, 2006) predict reading.

However, with time, children attain a critical threshold of exposure (Gathercole, 2007) and are freed from formal constraints (e.g., mastery of tenses), having acquired a diversity of structures in oral and written language. Their greater brain agility enables them to manipulate their two languages with increasing mastery and without apprehension. For example, Elin's results show that morphosyntactic adjustments are made progressively, based initially on the L1. Once reading is mastered, the lexical base becomes more robust, enabling words to be combined correctly. Children's confidence then increases, freeing them to make choices and express their preferences, thus, again, building on their own agency.

The children developed their oral and written skills in both languages within a school which clearly promoted biliteracy, bilingualism and biculturalism. Coupled with the families' positive attitudes, we posit that the children's process of positive identification towards languages and cultures triggered a form of agency which boosted their cognitive learning of linguistic structures in that language. As Bandura (2006) observed, agency is the control exercised by individuals over their own functioning, their behaviour and the environment. The teenagers followed over five years were active rather than reactive in their linguistic interactions and choices with family members and peers.

4.2. Exposure and language skills

Studying the children longitudinally through adolescence contributes to our understanding of the temporality of bilingualism on different levels. Measures of current and cumulative language exposure showed that each child had greater exposure to one language from birth. Language exposure was principally in the home and school, key environments for bilingual language development (Cohen, 2016; De Houwer, 2006; Ghimenton et al., 2023; Hoff, 2006). The language used with peers is also a significant language exposure source (Ghimenton et al., 2023; Hoff, 2006). This language generally aligned with the language participants had greater exposure to in their daily lives, except for Camille in Y5 who had balanced English

and French interactions with school friends, despite greater French current exposure overall. Interestingly, Camille's English current exposure was at its highest in Y5. Gabriel switched from having greater French current exposure and French dominant friendship groups in Y4, to greater English current exposure and English dominant friendship groups in Y5.

To gain a finer understanding of children's language exposure, it is important to distinguish between different input sources. Exposure through language-based activities did not necessarily align with the language used most with family or friends, or with overall current and cumulative exposure. Camille and Gabriel had greater exposure to French overall, yet they often chose English for language-based activities. Research shows that children's language skills relate to their quantitative language exposure, especially when they are young (Cohen, 2016; Pearson, 2007). For aL2 bilinguals, L1 skills often exceed L2 skills, although there is wide variability (De Houwer, 2021). Our results on adolescents partially support this and depend on the language skill. Expressive vocabulary and grammatical accuracy have been shown to relate to exposure (Altman et al., 2016; Tsimpli et al., 2016). This was the case for Elin's lexical diversity scores throughout the study, with English scores exceeding French scores. In contrast, while Elin's French error rate in Y1 was much higher than her English error rate, the difference between languages had reduced considerably by Y5. Camille's higher exposure to French aligned with higher lexical diversity and a lower error rate in Y1. By Y3, her English error rate dropped but was still a little higher than French, whereas lexical diversity was balanced. By Y5, lexical diversity scores were almost identical and her French error rate was only marginally higher than English. Gabriel's lexical diversity was consistently higher in French, with the highest difference in Y5, supporting findings on the relationship between exposure and language skills. His error rate throughout the study was low in both languages, supporting Meisel's (2008) findings on bilingual development in 2L1 children.

For the standard receptive vocabulary scores, Elin performed better in English until Y4, aligning with much higher English current and cumulative exposure and supporting the literature reporting that higher exposure results in wider receptive vocabulary (e.g., Thordardottir, 2011). Yet in Y5, having lived in France for six years, her French score exceeded her English score by several points. Camille's English current and cumulative exposure was considerably lower than her French exposure yet her scores were very high and not dissimilar throughout the study. Gabriel, who had more balanced cumulative exposure, and whose French current exposure was higher than English until Y5, systematically scored higher in English.¹⁰

Thus, our results show that despite having considerably lower cumulative exposure to one language, results for each language may gradually align over time as a critical mass of exposure to each language is reached (Gathercole, 2007). Depending on the skill, the children often either scored higher by Y5 in the language with lower cumulative exposure, or their scores across languages were virtually identical, with the exception of Elin and Gabriel whose lexical diversity scores were higher in the language with greater cumulative exposure, as predicted in the literature. Our results therefore only partially support our first hypothesis.

The contribution of qualitative exposure through linguistically rich activities also undoubtedly contributed to children's language skills, potentially compensating for quantitatively lower exposure, and perhaps explaining certain results. Camille always read frequently in both languages and her scores for lexical diversity and receptive vocabulary were high. In contrast, Elin read infrequently in French, perhaps explaining her comparatively low score for French lexical diversity, despite her awareness of the link between reading and vocabulary development, as she explained in Y5, "*my French vocabulary isn't good enough to read, but*

¹⁰ Receptive vocabulary scores may have been inflated thanks to children's cognate knowledge. See Quirk and Cohen (2022) for a thorough discussion of this.

if I don't read my vocabulary doesn't get any better. So I am trying to make an effort to read and I'm trying to find French books that I find interesting". More puzzlingly, Gabriel who clearly not only preferred reading in English, but also spent considerably longer doing so, had greater lexical diversity in French by Y5, perhaps because he had been in French-medium schools from age 3.

4.3. Exposure and language and cultural identity construction

Elin, Camille and Gabriel positioned themselves differentially along an identity continuum (Fielding, 2015), evolving over time. Elin built her identity on solid English and Welsh roots, enriched over time with a growing attachment to French culture. Camille built her identity in continuity with her family and school environment (Pilote et al., 2011). Her French identity resulted from her family origins, to which she integrated smoothly her experiences with Australian culture and English which were increasingly meaningful to her. These were consolidated by attending a bilingual programme which promoted her values. Gabriel's English identity progressively dominated, to such an extent that he seemed to be breaking away from the culture of his father and his own birth country, despite exposure in France to both cultures from birth (Pilote et al., 2011). Results for Elin and Camille thus support Schroeder et al.'s (2017) findings that the number of years spent in a country, family or school where a language is spoken predict strong cultural identification. However, this was not supported by findings for Gabriel.

By Y5, the languages chosen for language-based activities were largely aligned with students' identity preferences, reading being a striking illustration. Elin and Gabriel clearly preferred English reading. Camille's reading preferences were less marked, aligning with her more balanced identity. The language chosen for language-rich activities therefore seemed to better reflect students' cultural and linguistic identity than their home and school quantitative language exposure. These results thus only partially support our second hypothesis.

Choosing to invest in a language and being highly motivated can be critical for the development of language skills (De Houwer, 2021). We argue then that children's agency takes on an increasingly significant role as they move through adolescence. Thus, as well as evaluating language skills, it is also important to consider how exposure through language-based activities impacts linguistic and cultural identification.

4.4. Shortcomings and future perspectives

This study has several shortcomings. From a methodological point of view, it would have been useful to ask the children's teachers to assess their different language skills using the Common European Framework of Reference (Council of Europe, 2020), to complement our own assessments. Secondly, the children who were acquiring two prestigious languages, including English which has a special status, came from middle to high SES homes with parents who clearly invested in their children's bilingual education and development. However, as Ghimenton and colleagues (2023) have argued, the importance ascribed by families to the section language at the School would be similar regardless of the language (e.g., Polish; Portuguese). Selecting this school rather than a mainstream monolingual school demonstrates parents' desire to maintain their family or mobility language alongside French. Nevertheless, we encourage further longitudinal studies which focus on adolescents attending mainstream schools with diverse language pairs, including minority languages. Recognising and valuing all children's languages and cultures, using tools such as the European Language Portfolio¹¹ is critical for harmonious bilingual development (De Houwer, 2015).

¹¹ <https://www.coe.int/en/web/portfolio/home1>

From a theoretical point of view, we did not have the developmental information required to compare children's profiles in terms of cognitive abilities and socioemotional wellbeing. Nevertheless, the children experienced their bilingualism consciously and harmoniously and they rose to the challenge of attaining and maintaining high level skills in two languages. However, as Paradis (2023) has observed, understanding the complex relations between the various individual difference factors requires more complex analysis tools. Similarly, Kremin and Byers-Heinlein (2021) have emphasised that the bilingual experience is multidimensional, requiring us to rethink descriptive categories and combine different measures of language and psychosocial skills.

By investigating internal factors to language systems and external factors related to fluency and context dependence, Babatsouli's (2024) work on language acquisition, learning and use is opening broader research perspectives on bilingualism. From an ecosystemic perspective of multilingual acquisition and learning, the interaction between these factors is at the forefront of research on the acquisition of more than one language. Our longitudinal study shows the effects of time and the impact of the environment on the choice of language-related activities and socialisation settings. Combined with the parameters of language exposure, together with the stimulating affective filters that are a source of self-confidence, motivation and emotions, it really is a bi- or multilingual state of mind that develops the ability to produce or process at least two languages.

5. Conclusions

Using diverse longitudinal rich data sources, we have highlighted the complex interplay of language exposure, language skills and language and cultural identity construction, through case studies of three French-English bilingual adolescents from different home language backgrounds. We have shown that engaging with a language and culture takes time which includes periods of uncertainty. Acquiring a second language is the crucible of a life ideal that converges with nationalities randomly assigned at birth, and the precious cultural assets associated with the countries where individuals grow up, including language and cultural practices. Furthermore, speaking and reading seem to be natural attitudes that complement one another over the course of development. While parents establish the frameworks and set the priorities, children progressively exercise their own agency, choosing the conditions of practice, while selecting their leisure activities, relationships and symbolic networks.

Funding: This research was funded by the LabEx Aslan (ANR-10-LABX-0081) at the University of Lyon within the « Investissements d'Avenir » (ANR-11-IDEX-0007) French state programme run by the Agence Nationale de la Recherche (ANR); the Laboratoire de l'Éducation (LLE, UMS 3773); and the Maison des Sciences de L'Homme, Lyon.

Institutional Review Board Statement: The INEXDEB project (Cohen 2015) received ethical approval from the Service Protection des Données at the Centre National de la Recherche Scientifique in France (approval number 2-21183).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data are not available due to privacy or ethical restrictions.

Acknowledgments: We are grateful to the children and families that participated in the study and to the head teacher and teaching staff for their interest, support and assistance collecting the data for this project.

Conflicts of Interest: The authors declare no conflicts of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

Appendix A. Textometric analyses of interviews of specific linguistic markers reflecting students' feelings towards their languages and cultures

Elin

Occurrences	Associated to English	Associated to French
Affective verbs		
TO LOVE		1
TO PREFER	3	
TO LIKE	3	10
TO WANT	6	7
TO FEEL	6	6
TO BORN	5	
TO BE (+English/French)	7	2
TO COME/BE FROM	5	2
TO LIVE	2	6
TO BECOME		6
TO GROW UP	2	
TO CONNECT	1	
MOVE		3
Personal and possessive pronouns		
MY (+nationality)	3	2
THEY	4	15
Positive and negative adjectives - Adverbs		
MORE	30	10
DIFFICULT		3
COMPLICATED		1
MOST/MOSTLY	25	
NATURAL	1	
FIRST	3	
CONFIDENT	2	1

Camille

Occurrences	Associated to English	Associated to French
Affective verbs		
TO LOVE		1
TO PREFER	3	
TO LIKE	3	10
TO WANT	6	7
TO FEEL	6	6
TO BORN	5	
TO BE (+English/French)	7	2
TO COME/BE FROM	5	2

TO LIVE	2	6
TO BECOME		6
TO GROW UP	2	
TO CONNECT	1	
MOVE		3
Personal and possessive pronouns		
MY (+nationality)	3	2
THEY	4	15
Positive and negative adjectives - Adverbs		
MORE	30	10
DIFFICULT		3
COMPLICATED		1
MOST/MOSTLY	25	
NATURAL	1	
FIRST	3	
CONFIDENT	2	1

Gabriel

Occurrences	Associated to English	Associated to French
Affective verbs		
TO PREFER	14	1
TO LIKE	3	2 don't
TO FEEL	4	1
TO LIVE		1
TO BORN		1
TO HATE		2
Personal and possessive pronouns		
Positive and negative adjectives - Adverbs		
MORE	32	11
MOST/MOSTLY	11	7
ENJOYABLE	1	
INTERESTING	1	
FUN	1	
NATURALLY		1
BORING		1
HORRIBLE		1
COMPLICATED	1 - 1 not	1

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