

How frequent are these verbs? An exploration of lexical frequency in bilingual children's acquisition of subject-verb agreement morphology

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Abstract

In monolingual (L1) acquisition, children produce target-like subject-verb agreement early in development in both Spanish (Grinstead 1998) and English (Guasti 2002). However, in heritage simultaneous bilinguals (2L1) and child second language acquirers (L2), agreement morphology shows variability (Goldin 2020; Herschensohn & Stevenson 2005) due to age of acquisition (AoA) effects. Lexical frequency is another factor that has been shown to play a role in modulating L1 (i.e. Ambridge et al. 2015) and heritage acquisition (i.e. Giancaspro 2017, 2020), but little is known about its effect in child L2. This study explores the extent to which verb lexical frequency plays a role in the acquisition of verb morphology for bilingual children with differing AoA, comparing 42 2L1 heritage children with 46 L2 Spanish learners with AoA of 5;0. They participated in a Spanish fill-in-the-blanks production task. The results of an analysis focused on singular *correr* and *comer* (chosen because they differ in only one phoneme) indicated that responses to *comer*, the more frequent verb, were more target-like for both groups, and that frequency showed a stronger effect for heritage 2L1 children than for L2 children, while also modulating non-target-like responses. We discuss these findings with implications for bilingual development and education.

Keywords: morphology, subject-verb agreement, lexical frequency, age of acquisition, bilingual development, child second language acquisition.

1. Introduction

In monolingual (L1) acquisition, children produce target-like subject-verb agreement at a very young age in both Spanish (Grinstead 1998) and English (Guasti 2002). Simultaneous bilingual children's (2L1) production develops in each language just as their monolingual counterparts (Austin 2009). However, in heritage simultaneous bilinguals (HL) and child second language acquirers (L2), agreement morphology has been shown to be prone to residual optionality (Goldin 2020; Herschensohn & Stevenson 2005; Rodriguez et al. 2017) due to age of acquisition (AoA) effects as well as a variety of other co-existing variables including L1/L2 proficiency, language dominance, frequency of L1 and L2 use, and kind of input (native vs. non-native) (De Houwer 2011; Unsworth 2016; Unsworth & Blom 2010) and socio-motivational and individual cognitive factors.

One such co-existing variable that has been shown to play a key role is lexical frequency, but despite its relevance in language acquisition, little is known about its effect in child bilingualism. Lexical frequency refers to how often a word or morphological form appears in the input (Ellis & Collins 2009). Studies have found that high frequency forms are acquired earlier by L1 children (Ambridge et al. 2015; Gathercole et al. 1999, 2002) and show less variability within heritage speakers, who experience fluctuating levels of heritage language activation (Giancaspro 2017; Hur et al. 2020). For adult L2 learners, lexical frequency effects have led to mixed results (Linford & Shin 2013; Hur 2021; López Otero 2020).

Comparisons of L1, 2L1, child L2 and heritage acquisitions demonstrate that these processes are decidedly different in developmental path and ultimate attainment.

Thus, this study explores the extent to which verb lexical frequency plays a role in the acquisition of verb morphology for bilingual children with differing AoA. We compare simultaneous heritage children (2L1) with those acquiring Spanish as an L2 from the age of 5 in a dual language school, a naturalistic immersion environment that is also accompanied by instructed learning (Herschensohn & Stevenson 2005).

In what follows, we review subject-verb agreement in English and Spanish, the literature on age of acquisition, as well as previous research on the effect of lexical frequency in bilingual acquisition. Subsequent sections include a description of the study, presentation of the results, and a discussion of the findings with implications for education and future research.

2. Subject-verb agreement

While English has an impoverished subject-verb agreement system, Spanish has a more morphologically robust paradigm. The only agreement marker in the English verb paradigm is third person singular /s/ (Corbett 2006; Hudson 1999). Spanish verbs, on the other hand, are inflected for person, number, tense, aspect and mood, and are organized into three classes based on their thematic vowel (-a, -e, -i) (Aguirre 2003).

Table 1. Person and number inflections for verbs in English and Spanish

	English		Spanish	
<i>Person</i>	<i>Number</i>		<i>Number</i>	
	<i>Singular</i>	<i>Plural</i>	<i>Singular</i>	<i>Plural</i>
<i>First</i>	-∅	-∅	-o	-mos
<i>Second</i>	-∅	-∅	-s / ∅	-is
<i>Third</i>	-s	-∅	-∅	-n

Under Chomsky's (1995) Minimalist Program, person and number features are grammatical but do not carry meaning within the linguistic system where instead the number, case and person of the subject noun phrase are what contribute to the interpretive component. Further, Bybee's (1985, 1995) lexical morphology model posits that morphological markers for identifying person and number distinctions are peripheral to the verb's meaning. According to the model, person and number features do not carry strong semantic relevance because they do not impact the inherent meaning of the verb.

Under these proposals, listeners must rely on other features in a phrase, like context or the overt subject, for information about number and person on the verb. This may do for an analysis of English, with its minimal morphological paradigm and overt subjects, but an analysis of Spanish morphology may require further consideration because its verbal inflections carry all the semantics of subject person and number due to its status as a null subject language.

In summary, English and Spanish feature contrasting subject-verb agreement systems. In English, third person singular verbs receive the only agreement marker in the paradigm while all verbs in Spanish are marked for person and number except for third person singular verbs. This study investigates the acquisition of these two opposing systems by bilingual children.

2.1. Monolingual acquisition of subject-verb agreement

In both English and Spanish, before consistent use of agreement morphology emerges, young children pass through a stage in which main clause declaratives are produced with both inflected verb forms that are grammatical in the adult language as well as infinitival verb forms that are not. Due to the optional co-existence of both inflected and uninflected forms, Wexler (1994) termed this period the Optional Infinitive Stage. Sentences that appear during this period with ungrammatical verb forms are referred to as ungrammatical Root Infinitives (RIs) in L1 acquisition literature because uninflected forms appear in places where finite verbs would be expected in the adult grammar (Montrul 2004).

In languages such as Dutch, German or French, the non-finite forms are actual infinitives, as evidenced by the presence of the infinitival morpheme on the verb, as in (1a). However, in languages that lack infinitival morphology, like English, the RI phenomenon appears as bare forms (with no tense or agreement morphology) as shown in (1b).

- (1)a. *Child French* (Liceras et al. 2006)
Michel dormir
Michel to.sleep
- b. *Child English* (Liceras et al. 2006)
Eve sit(Ø) floor

While the phenomenon lasts for several years in Germanic languages, as well as French (Wexler 1994; Hyams 2001), it is short-lived in null-subject Romance languages like Italian, Catalan, and Spanish (Austin 2010; Bel 2001; Grinstead 1998). For example, in children aged 1 to 3, the rate of RI production in Romance languages ranges from 3% to 16% (Bel 2001; Grinstead 1998; Liceras et al. 1999) compared to 78% in English (Guasti 2002; Hyams 2001).

In monolingual Spanish, studies examining the emergence of agreement show that children as young as 1;7 produce finite verbs with person contrast and that plural forms appear soon after. Thus, the first verbs of Spanish-speaking children are almost always inflected (Bel 2001; Grinstead 1998). In Bel (2001), who analyzed the verbal productions of three Spanish acquiring children ages 1;7 to 2;1, the occurrence of ungrammatical RIs is very low, around 6% of the total sentences of the group.

In sum, RIs are found in various languages but the Optional Infinitive Stage is short in null-subject languages with robust morphological paradigms like Spanish (Austin 2010; Guasti 2002). Spanish monolingual children produce inflected verbs earlier than English monolingual children and acquisition of nominal morphology precedes that of verbal morphology (Forsythe 2015; Marrero & Aguirre 2003).

2.2. Bilingual acquisition of subject-verb agreement

Simultaneous bilingual children in contexts of societal bilingualism (2L1) acquiring English in combination with another more morphologically rich language show that the acquisition of verbal morphology in the other language precedes that in English (Castro & Gavruseva 2003; Paradis & Genesee 1996), consistent with monolingual acquisition patterns in English (Hyams 2001) and Spanish (Grinstead 1998). 2L1 acquisition is shaped by language specific processes and features parallel syntactic systems (De Houwer 2011; Meisel 2011). A possible explanation for this contrast in the acquisition of finiteness marking may be the difficulty encountered in pronouncing

verbal roots (e.g., *entr-* ‘enter’) (Harris 1991) and the ubiquity of word-final morphological processes in Spanish, as opposed to English, in which verb stems do not require any inflectional morphology in many contexts (Pratt & Grinstead 2007).

Much research has shown that adult L2 learners display optionality and instability in their L2 morphology when marking finiteness, tense or mood (i.e., Montrul 2004; Prévost & White 2000). Jiang (2000) proposes that the functional features of lexical items (including verbs) are acquired in stages and that morphological features are the most challenging, leading to the variability seen during L2 lexical development. On the other hand, Lardiere (2009) attributes the optionality and instability of L2 morphology to the difficulty in determining the specific conditions where the features of the L2 may or may not be morpho-phonologically expressed. Both of these studies posit that L2 challenges lie in appropriately remapping these features onto morphology, which is the last stage of acquisition.

For L2 children, while the acquisition of English subject-verb agreement morphology has been extensively investigated (i.e., Blom et al. 2012; Johnson & Newport 1989; Paradis 2010), the acquisition of Spanish verbal agreement morphology is still understudied. Herschensohn & Stevenson (2005) studied the acquisition of Spanish in 7-year-old child L2 learners in an immersion setting by testing them several times at 2-month intervals during their second year of immersion schooling. The authors found that, while their syntax was target-like, their morphology was not despite showing signs of development with each round of testing. The authors conclude that this contrast between syntax and morphology indicates that child L2 acquisition is closer to adult L2 than child L1 acquisition.

Variability in subject-verb agreement morphology has also been found in heritage speakers (Montrul 2011). Heritage speakers may be either sequential bilinguals, having acquired the heritage language prior to the majority societal language (Valdés 2000), or simultaneous bilinguals, which differ from simultaneous bilinguals in contexts of societal bilingualism, referred to as 2L1 above. Verbal morphology in heritage speakers may show signs of variability in the domain of subject-verb agreement, tense, aspect, and mood (Montrul 2011; Perez-Cortes 2016; Potowski et al. 2009). Montrul (2011) argues that theoretical proposals conceived for L2 learners cannot account for heritage grammars despite similarities in their outcomes. Montrul claims that, together with influence from the dominant language, reduced input and limited opportunities to use the heritage language, particularly after starting school in the dominant language, lead to the simplification and overregularization of heritage morphology. On the other hand, Putnam & Sánchez (2013) argue that variability in heritage languages is the result of its lack of activation for production and comprehension purposes. Variability in subject-verb agreement morphology has been found in the preschool years (Bedore & Leonard 2001) and through elementary years (Jacobson 2012; Rodriguez et al. 2017), which suggests that language dominance shift starts early in linguistic development, when schooling in the majority language begins.

3. Age of acquisition

Second language (L2) and heritage bilingual children show different development patterns and divergent outcomes to monolinguals and to balanced bilinguals in contexts of societal bilingualism. Heritage language children are rarely equally

proficient in both languages due to the fact that they speak a non-majority language in the home and usually only receive their formal education in the majority language (Grosjean 1998; Montrul 2004; Polinsky & Kagan 2007; Valdés 2000). L2 children also differ from monolingual children and 2L1 children due to L1 influence, as in adult L2 acquisition (Unsworth 2007). While monolingual acquisition is widely accepted as successful, these two non-dominant bilingual groups show differences in their developmental path and ultimate attainment, as well as within-speaker and across-speaker variability, particularly in verb morphology (Rothman 2007). Importantly, these two groups differ in their AoA: heritage speakers are exposed to the target language from birth while L2 children begin their exposure after the foundations of their first language are in place (Meisel 2011; Unsworth 2016; Unsworth & Blom 2010).

Differences in their developmental patterns may stem from these differences in AoA. It has been proposed that the pivotal moment in development of morphosyntax when qualitative differences can be detected among bilingual children is the age of 4 (Goldin 2020; Guasti 2002; Meisel 2011; Unsworth 2016), which suggests that L2 children who start acquiring their L2 after this age should present differences with 2L1 children, who receive regular exposure from their two languages before that age. While the availability of UG in L2 acquisition is debated (i.e. White 2003), Schwartz (2003, 2004) showed that child L2 is influenced by UG (as in L1 acquisition), yet it differs from L1 acquisition: specifically, child L2 acquisition is closer to child L1 acquisition in the domain of inflectional morphology. However, in the domain of syntax, it is more like adult L2 acquisition as there is L1 influence. In the same line of inquiry Paradis et al. (2017) and Paradis & Jia (2017) argue that amount of input and cognitive factors, as well as the syntax of the L1, appear to confer advantage in syntax acquisition for L2 children. However in the case of adult L2, speakers may experience difficulty acquiring the abstract syntactic features that trigger movement (VanPatten et al. 2012).

The present study aims to investigate what factors modulate the acquisition of subject-verb agreement morphology in combination with AoA. Particularly, we focus on the role of lexical frequency by examining both L2 learners and heritage speakers attending dual language schools.

4. Lexical frequency

Lexical Frequency refers to the number of times a particular form or word appears in the input and it is a variable that has been investigated in child L1 acquisition, adult L2 acquisition and HL acquisition. Ellis & Collins (2009) categorize lexical frequency into two different types: type frequency (“the number of distinct lexical items that can be replaced in a given slot in a construction”, p. 330) and token frequency (“how often a particular form appears in the input”, p. 330, hereafter lexical frequency), which is the category we address in this study.

Lexical frequency has been shown to play a key role in L1 vocabulary and morphosyntactic acquisition (Ambridge et al. 2015; Gathercole et al. 1999, 2002). Monolingual children first acquire words that are more frequent in their input, such as *daddy*, *mommy*, and *hi*, but not, for example, *coffee* or *computer* (Fenson et al. 1994). In addition, a word is more likely to be learned first if it is relevant to the child, their needs and their immediate environment (Ninio 2006) and attested in a wide range of contexts (Naigles & Hoff-Ginsberg 1998; Küntay & Slobin 2002). It has also been found that there are independent effects of input frequency across verbs (Naigles &

Hoff-Ginsberg 1998; Smiley & Huttenlocher 1995; Theakston et al. 2004), adjectives (Blackwell 2005), and nouns and function words (Goodman et al. 2008). Frequency effects of certain forms are also associated with lower rates of error, and higher rates of correct production and comprehension compared to low-frequency forms (Ambridge et al. 2015; Schwartz & Terrel 1983).

For example, Schwartz & Terrel (1983) taught one to three year old children either four novel nouns or four novel verbs. The authors found that the higher-frequency words were correctly recalled significantly more than the low frequency words. The same effects were found for both nouns and inflected forms. Dąbrowska & Szczerbiński (2006) found a correlation between the input frequency of genitive, dative, and accusative Polish noun case-marking inflections, and children's correct performance with novel noun inflection.

The effects of frequency are also attested to in the domains of simple grammatical constructions. Several studies have found that not only the overall frequency of the verbs but also the frequency of those verbs in the same constructions influence the order in which children acquire the verb+argument construction (Ninio 1999; Theakston et al. 2004). Furthermore, children are sensitive not only to verb+argument and verb+construction combinations, but to the frequency of more abstract cues for word order. For example, children's sensitivity to cues for word order, case marking and animacy in simple noun-verb-noun constructions show that children are better with sentences with multiple cues (e.g. word order in combination with case marking) that indicate the same sentence interpretation as those with only one single cue (e.g. only word order) that operates in isolation (Bates & MacWhinney 1982; Dittmar et al. 2008; Goksun et al. 2008; Slobin & Bever 1982).

4.1. Lexical frequency effects in L2 and heritage language acquisition

Lexical frequency effects have also been investigated in adult L2 acquisition and heritage language acquisition. Linford & Shin (2013) conducted a study of twelve L2 learners of Spanish who were divided into two groups based on proficiency: Level 1 and Level 2. The investigators analyzed a total of 980 tokens from a semi-directed sociolinguistic interview where expression or omission of subject pronouns were possible. Results found that the effects of frequency of the verb had a significant impact on pronoun expression only on the lower proficiency group, meaning that beginner level L2ers expressed more pronouns with the most frequent verbs. However, as their level of proficiency increased, lexical frequency did not have a direct impact on pronoun expression. Nonetheless, it is noted that lexical frequency mediated other linguistic variables that impacted pronoun use. Erker & Guy (2012) on the other hand found that for heritage speakers, lexical frequency did not impact by itself subject expression but acted as a mediator of other predictor variables that impacted subject pronouns. What is important to note is that the effect of lexical frequency modulated the expression of subject pronouns differently among the L2 learners and heritage speakers. Frequency had an effect for L2ers only at the beginning stages of acquisition and dissipated at the later stages while for heritage speakers there was not a direct impact in subject expression.

Much more work has addressed the effects of frequency for heritage speakers. Giancaspro (2017, 2020) provided results on the relation between subjunctive mood and lexical frequency. Using a production and a receptive knowledge task, Giancaspro found that heritage speakers showed more sensitivity to the difference between subjunctive and indicative mood in sentences containing high-frequency verbs, and

demonstrated more variability when the context contained low-frequency verbs. Hur's (2021) study on the acquisition of DOM among Spanish HSs and the effects of frequency found that verb lexical frequency had an effect on Spanish direct object marking (DOM). Through a production and comprehension task, the effects of frequency were found to have an effect of proficiency, meaning that it was only the intermediate heritage speakers and not the advanced bilinguals who relied on the frequency of the verb in the moment of retrieval of syntactic and semantic features needed for DOM production. Additionally, the effects of frequency were found only on the production task and not on the receptive knowledge task.

Hur et al. (2020) found similar effects of lexical frequency in the study of gender agreement and assignment among early bilinguals of Spanish. Lexical frequency modulated target-like gender assignment in Spanish along with canonicity, gender and proficiency. López Otero (2020) found lexical frequency effects in the production of imperative verb morphology in heritage speakers of Spanish; however, no effects were found in L2 speakers or in the receptive grammatical knowledge of either the heritage or the L2 speakers. These most recent studies (Giancaspro 2017, 2020; Hur et al. 2020; Hur 2021; López Otero 2020) were set within the framework of the Activation Approach (Putnam & Sánchez, 2013) and used lexical frequency and proficiency as a proxy to measure activation of the heritage language. According to the Activation Approach, bilingual speakers activate their heritage language with less frequency which increases the chances of dominant language transfer and reassembly of features in the heritage language.

In summary, comparisons of L1, 2L1, L2 and heritage acquisitions demonstrate that these processes follow different developmental paths. Thus, this study explores the extent to which verb lexical frequency plays a role in the acquisition of verb morphology for bilingual children with differing AoA.

5. The present study

5.1. Research questions

Given that lexical frequency modulates morphosyntactic acquisition in L1 children and in adult heritage speakers, but not necessarily in adult L2 learners, we posit the following research questions. First, we ask how lexical frequency modulates the acquisition of Spanish subject-verb agreement in bilingual children attending dual language schools, a naturalistic immersion environment that is also accompanied by instructed learning (Herschensohn & Stevenson 2005). Due to the fact that the dual language environment mimics that in which children acquire their L1, we hypothesize that verbs more frequent in the input will be acquired earlier than lower-frequency verbs, in line with previous findings of L1 development (i.e., Ambridge et al. 2015). From a heritage language acquisition and maintenance perspective, heritage speakers may find difficulties activating the phonological forms of their heritage language, particularly for low-frequency lexical items, in spite of maintaining their functional features (Putnam & Sánchez 2013:489-490). Specifically, we hypothesize that heritage speakers have syntactic knowledge of subject-verb agreement in Spanish yet they may struggle retrieving monolingual-like subject-verb agreement morphology for production purposes. On the other hand, L2 learners acquire syntactic features prior to functional morphology; therefore, we expect L2 learners to experience difficulties retrieving L2 functional morphology, namely subject-verb agreement morphology, as

a result of being in the process of reassembling agreement into their L2 Spanish morphology (Jiang 2000; Lardiere 2009).

Second, we explore not only how lexical frequency affects accurate production of subject-verb agreement morphology, but also bilingual children's non-target morphological productions when they are unable to retrieve an exact match between syntactic features and morpho-phonological forms. An analysis of non-target-like productions provides a fascinating window into the language acquisition process in general. Here, we hypothesize that frequency will play a role in the types of morphology produced, whether infinitive endings or a range of other person/number/tense mismatches, following Herschensohn & Stevenson (2005) and Goldin (2020).

Finally, we investigate whether the effect of lexical frequency is the same in children with differing ages of acquisition of Spanish, specifically simultaneous heritage bilinguals and child L2 learners whose exposure to Spanish begins after the age of 4 (the moment in development of morphosyntax at which qualitative differences in acquisition may occur; i.e. Goldin 2020; Unsworth 2016). We hypothesize that frequency effects will be found in the heritage group, as in previous studies of adult heritage speakers (i.e., Giancaspro 2017, 2020), but not necessarily in the L2 children considering that frequency research so far has shown mixed results with effects only for beginners (Linford & Shin 2013), only for advanced speakers (Hur 2021) or no effects at all (López Otero 2020) depending on the linguistic feature tested.

5.2. *Participants*

88 bilingual children aged 3;0-7;0 were recruited from a Spanish immersion preschool and a dual language charter school on the East Coast of the United States to participate in this study. The heritage bilinguals (HL, $n=42$) included 11 children in Pre-K3 (mean age=3;8, $SD=3.91$); 10 children in Pre-K4 (mean age=4;9, $SD=4$); 11 children in Kindergarten (mean age=5;8, $SD=3.1$); and 10 children in 1st grade (mean age=6;9, $SD=4.7$). The L2 learners with AoA of 5 (L2, $n=46$) included 19 children in Kindergarten [mean age=5;9, $SD=4.3$] and 27 children in 1st grade [mean age=7;0, $SD=4$]. The participants' parents completed a language background questionnaire (LBQ) aiming to gather information on the children's language exposure and use since birth. All HLs in this study were simultaneous bilinguals who had been exposed to both Spanish and English at or before age 2. The L2 learners began exposure to Spanish at age 5 in Kindergarten. For this study, we follow the criterion that the pivotal moment in development of morphosyntax when qualitative differences can be detected among bilingual children is the age of 4 (Goldin 2020; Guasti 2002; Meisel 2011; Unsworth 2016). Therefore, the HLs' exposure to Spanish began well before age 4, and the L2 children's exposure began after age 4.

The immersion schools follow a 90:10 model in which they spend 90% of their day in Spanish and 10% in English. This bilingual environment is led by Spanish-dominant teachers from Latin American countries, Spain and the U.S. and reinforced by bilingual signage and wall decorations. The children are consistently reminded and encouraged to use Spanish and interact with their peers in Spanish, although they may switch to English during playtime. While in the preschool 50% of the students are heritage speakers and 50% come from English-speaking families, in the dual language school, most students are Spanish L2 learners from English-speaking families and only some are Spanish HLs.

Table 2. Properties of each group of bilingual children

	HL children	L2 children
<i>Age of acquisition of Spanish</i>	<i>At or before age 2</i>	<i>At age 5</i>
<i>Ages at time of testing</i>	<i>3;0-7;0</i>	<i>5;0-7;0</i>

5.3. Materials and procedure

Children's acquisition of nominal morphology was assessed by administering a modified version of the Bilingual English Spanish Assessment (BESA, Peña et al. 2014). Ability to produce nominal morphology in both English and Spanish was investigated because previous studies have shown that acquisition of nominal morphology precedes that of verbal morphology in monolingual children (Forsythe 2015; Marrero & Aguirre 2003). They then completed a fill-in-the-blanks elicited production task delivered via a PowerPoint presentation in Spanish and English in order to examine their knowledge of both languages. The tasks were administered orally first in Spanish and then in English in a 20-minute session at the children's schools and the participants' responses were audio and video recorded for later coding. For the purposes of this study, we will only report on the Spanish task.

5.4. Fill-in-the-blanks elicited production task

The fill-in-the-blanks elicited production task included 8 experimental items and 4 distractors. The participants were presented with two images, showing one singular and one plural action respectively. They heard the accompanying sentence for the first image and were asked to complete the sentence for the second image by using a specific verb. In four experimental items, participants were asked to complete a sentence with a singular subject while in the other four items, the subjects of the sentences were plural, as shown below in 2a and 2b. All the verbs were in the present tense and featured *-ar*, *-er*, and *-ir* conjugations. All items were counterbalanced, as well as the expected responses. The distractors elicited the production of the passive voice.

- (2)a. Elicitation of a third person singular verb form in Spanish
 Experimenter in Spanish: *Aquí los niños corren todos los días y aquí Alex también. ¿Qué hace Alex todos los días? Alex ...*
 'Here the children run every day and Alex does too. What does Alex do every day? Alex ...'
- b. Elicitation of third person plural verb form in Spanish
 Experimenter in Spanish: *Aquí la niña baila todos los días y aquí sus amigas también. ¿Qué hacen sus amigas todos los días? Ellas ...*
 'Here the girl dances every day and her friends do too. What do her friends do every day? They ...'

5.5. Measures of lexical frequency

The lexical frequency count of the lexical items under examination (*comer* 'to eat' and *correr* 'to run') was measured with two different tools: the Davies' corpus (2018) and two corpora from the CHILDES database (MacWhinney 2000). While the former source provides lexical frequency counts, we calculated the lexical frequency counts from the latter by counting the instances in which the lexical items under examination appeared in two Spanish-English bilingual corpora. The first bilingual corpus, reported

in Silva-Corvalán (1992), included individual recordings of the interaction in Spanish between bilingual children ($n=8$, mean age=5;4) and a female research assistant consisting of naturalistic, spontaneous conversation and role-play with puppets. The children lived in California. The second bilingual corpus, reported in Jackson-Maldonado (2012), was very similar and consisted of recordings of bilingual children ($n=11$, mean age=3;0) in southern California interacting in Spanish with a research assistant and/or parent. A source alternative to the Davies' corpus (2018) was determined necessary in order to gather a more realistic picture of input and interaction in Spanish-English bilingual children in the United States. We acknowledge that the lack of corpora on L2 child speech in dual immersion schooling may be a limitation of this lexical frequency operationalization. However, the corpora are relevant to both groups because the L2 children were learning Spanish in an immersion context which includes both instructed and naturalistic input. Table 3 below shows the lexical frequency counts across lexical items and sources.

Table 3. Lexical frequency counts across lexical items and corpora

	Davies' corpus	CHILDES corpora
<i>Comer</i> 'to eat'	301,060	191
<i>Correr</i> 'to run'	194,603	58

The decision was made to focus the analysis of this study on the verbs *correr* and *comer* because this pair of lexical items represented a unique opportunity to compare two verbs that differ greatly in terms of frequency in a child's input but differ in only one phoneme in their phonological representation (/m/ in the verb *comer* and /r/ in the verb *correr*). They are also both regular verbs within the same macroclass, specifically Class II within the second macroclass (-er verbs) (Aguirre & Dressler 2006). Thus, a comparison of these two verbs allows us to disentangle the effect of lexical frequency from other factors, such as morphological regularity, thematic vowel group, and number of phonemes constituting the lexical item. However, it is noteworthy to point out that these verbs present some differences: 'comer' is a transitive verb while 'correr' is an unergative verb. On the other hand, both verbs can appear with and without objects as 'comer' can take a null object (e.g., Pepe comió calabaza 'Pepe ate pumpkin'; Pepe comió 'Pepe ate'; Bosque Muñoz & Gutiérrez-Rexach 2009) and 'correr' can function as a transitive verb (e.g., Pepe corre todos los días 'Pepe runs every day'; Pepe está corriendo una maratón 'Pepe is running a marathon'). In sum, despite these two verbs presenting different argument structures, they both can appear with and without direct objects.

6. Results

In this section we present children's results on the fill-in-the-blanks production task (FIB). Firstly, to assess possible group differences on the BESA and children's acquisition of nominal morphology, the data were analyzed in R version 1.1.5019 (R Development Core Team, 2012) using a linear regression to examine BESA scores as a function of group (HL, L2) and age.

The HL group performed more accurately ($\beta = -0.62$; $SE = 0.058$; $z = -11.75$; $p = 0.5$), but there was no significant difference between groups (see Figure 1). There was a main effect of age ($\beta = 0.03$; $SE = 0.001$; $z = 22.1$; $p < 0.001$) as accuracy in

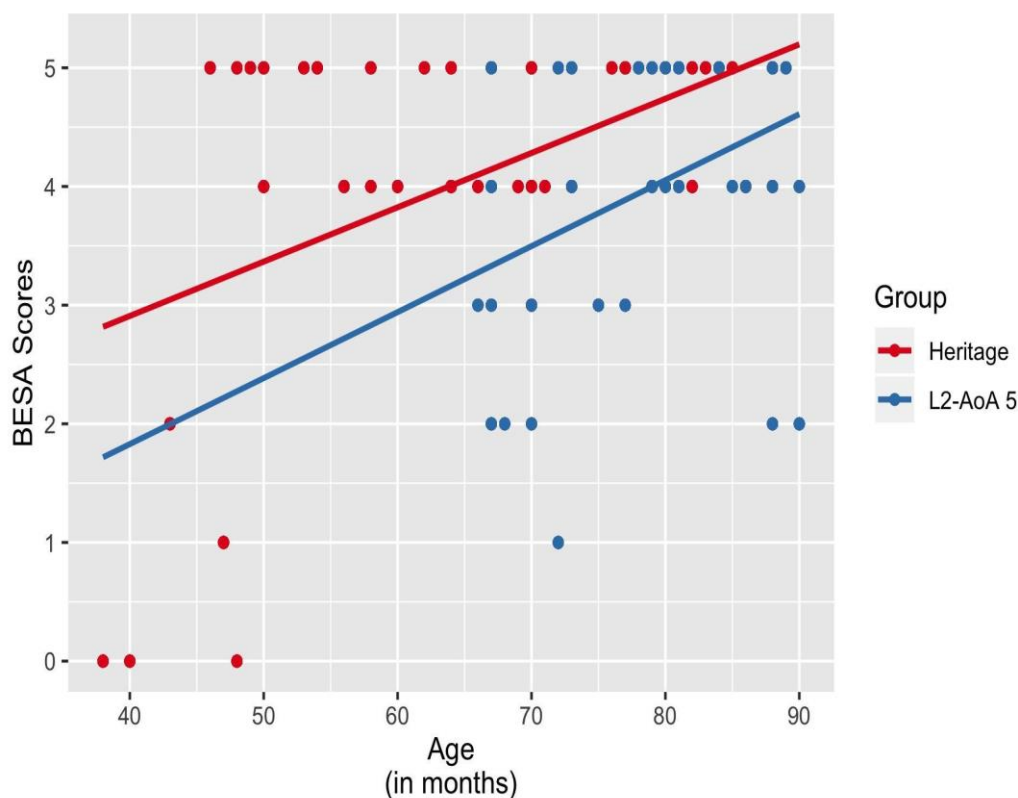
both groups increased with age. For both groups, the plural /s/ marker of nominal morphology was acquired within the age range tested.

Table 4 below shows us the mean scores on a scale from 1 to 5 and standard deviations in each group by grade. In both groups, accuracy was lower in the earlier stages of acquisition and was either at ceiling or nearly at ceiling by 1st grade. Even the L2ers with AoA of 5 had mean scores near ceiling by 1st grade which suggests that the plural /s/ marker of nominal morphology is acquired relatively quickly.

Table 4. BESA mean scores by group and grade

Group	Grade	BESA Scores Mean	BESA Scores SD
<i>HL</i>	<i>PreK-3</i>	2.91	2.20
<i>HL</i>	<i>PreK-4</i>	4.5	0.50
<i>HL</i>	<i>Kinder</i>	4.3	0.64
<i>HL</i>	<i>1st</i>	4.6	.049
<i>L2 - AoA 5</i>	<i>Kinder</i>	3.32	1.17
<i>L2 - AoA 5</i>	<i>1st</i>	4.41	0.82

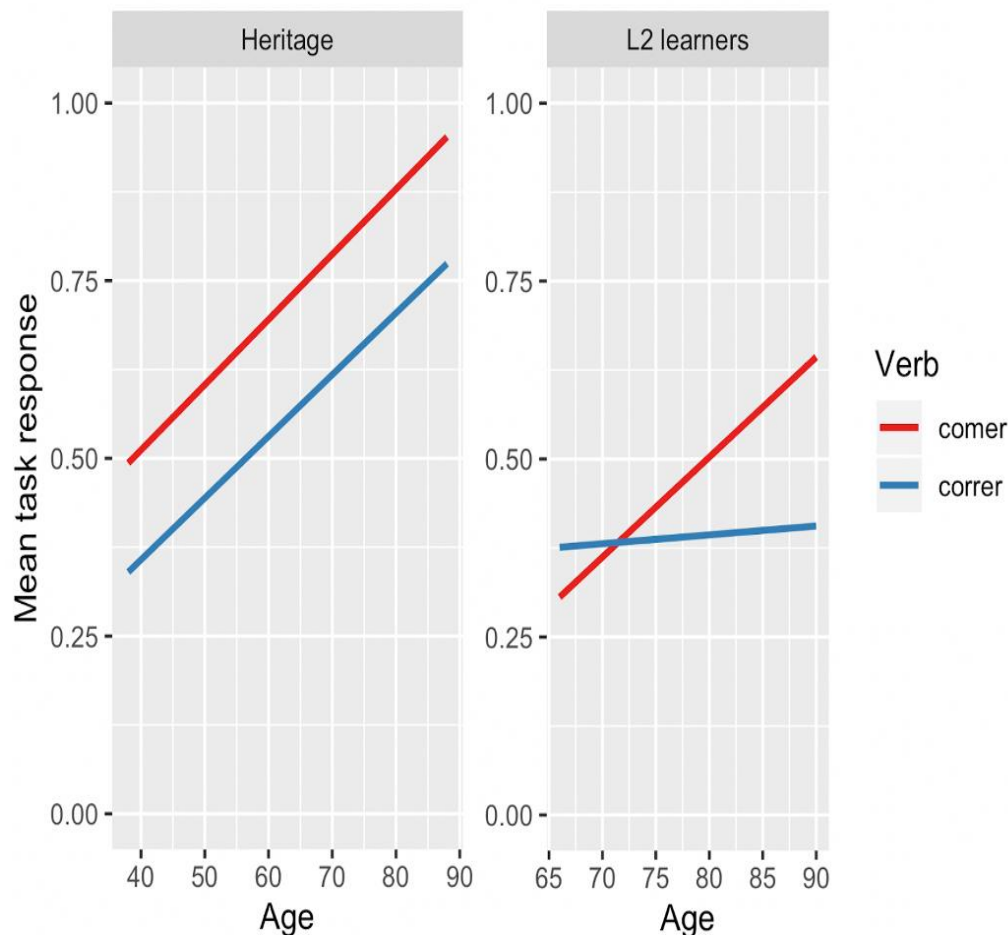
Figure 1. BESA scores as a function of group and age



The experimental production data were analyzed using a GLMM to examine accuracy (0,1) as a function of group (HL, L2) and item (*correr* [less frequent], *comer* [most frequent]). Given the categorical nature of the participants' responses (accurate/non-target-like), the data were modeled using GLMMs with a binomial linking function. Age was centered with the mean age (5;7) set at 0 throughout. Since only the items with the verbs *comer* and *correr* were analyzed, this totaled 176 tokens (88 for each verb).

The analysis yielded a main effect of group such that the L2 group performed less accurately than the HL group ($\beta = -1.26$; $SE = 0.50$; $z = -2.49$; $p < 0.001$) and a main effect of item such that children in both groups had higher accuracy on the more frequent *comer* than on the less frequent *correr* ($\beta = 0.73$; $SE = 0.38$; $z = 1.9$; $p = 0.05$). There was also a main effect of age ($\chi^2(1) = 13.01$, $p < 0.001$), indicating that accuracy in both groups increased with age ($\beta = 0.04$; $SE = 0.01$; $z = 8.15$; $p < 0.01$) (See Figure 2).

Figure 2. Production accuracy of ‘correr’ and ‘comer’ as a function of age and group

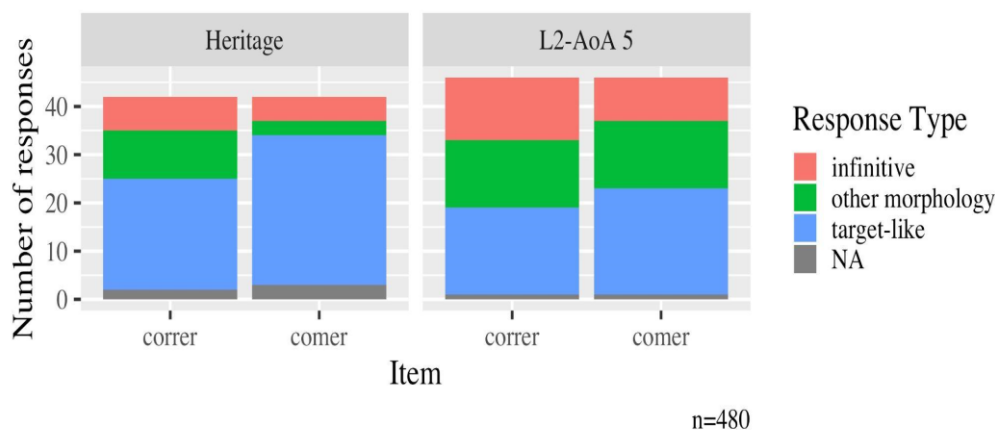


A further GLMM was conducted to determine what kind of non-target like morphology children produced when they did not produce accurate morphology. Non-target responses were coded into two categories: infinitives (e.g., *el niño correr*) and other morphology such as person/number/tense mismatches (e.g., *el niño comiste*). It is noteworthy to mention that no child produced innovative morphology: all the verbs that they produced are part of the verb paradigm in Spanish, with the exception of the form eat-a. See Table 5 for a detailed distribution of children’s productions of *other morphology*. The model examined mean response accuracy as a function of group (HL, L2-AoA 5), age, verb frequency, and category type (infinitive, 3rd person singular, other). Main effects and higher order interactions were tested using nested model comparisons. Age was centered with the mean age (5;7) set at 0.

Table 5. Children's non-target-like productions by verb and group

Heritage speakers		L2 speakers	
Lexical item	Verb forms produced	Lexical item	Verb forms produced
<i>comer</i>	<i>comer</i> (n=5) <i>como</i> (n=2) <i>coma</i> (n=1)	<i>comer</i>	<i>comer</i> (n=10) <i>comen</i> (n=6) <i>comí</i> (n=4) <i>comiendo</i> (n=2) <i>como</i> (n=1)
<i>correr</i>	<i>correr</i> (n=7) <i>corra</i> (n=6) <i>corren</i> (n=2) <i>corran</i> (n=1)	<i>correr</i>	<i>correr</i> (n=12) <i>corren</i> (n=6) <i>corriendo</i> (n=5) <i>corran</i> (n=1) <i>corrí</i> (n=1) <i>es corro</i> (n=1) <i>eat-a</i> (n=1)

The analysis yielded no main effects, but a group by frequency interaction ($\chi^2(2) = 16.62$, $p < 0.001$) such that the effect of verb frequency varied across groups with a weaker effect for the L2 learners ($\beta = -1.03$; $SE = 0.49$; $z = -2.08$; $p = 0.03$). As seen in Figure 3 below, the least frequent verb *correr* led to greater productions with infinitive morphology for both groups, suggesting that the frequency of the verb may have an effect on the types of non-target morphological endings bilingual children produce during the acquisition process.

Figure 3. Types of non-target-like responses by group and lexical item

7. Discussion

In this study, heritage and L2 children in dual language schools participated in a FIB task to elicit their production of third person singular and plural subject-verb agreement. We analyzed the effect of verb lexical frequency in their productions of two regular *-er* verbs in Spanish, *comer* 'to eat' and *correr* 'to run', to examine the role this factor plays in bilingual development and how it interacts with age of acquisition. Our main findings revealed that both groups produced the more frequent verb *comer* with higher accuracy, but the effect of verb frequency was stronger for heritage children with exposure to Spanish from birth, in both their target-like

productions as well as their non-target-like productions. We use lexical frequency as a proxy for language activation, following Putnam & Sánchez's (2013) activation approach for heritage language acquisition and maintenance and previously tested among adult heritage speakers (e.g., Giancaspro 2017; Hur et al. 2020; López Otero, 2020, *inter alia*). This operationalization of heritage language activation into lexical frequency assumes that the heritage language is activated for comprehension and production purposes more frequently for lexical items that appear in the input more often than those which are rarely present in it, which has been tested in adult heritage speakers. As for the L2 learners, we follow Jiang's (2000) lexical development approach previously tested among adult L2 learners (Hur 2021) that proposes that the variability experienced during L2 lexical development relies on the developmental stage of each lexical item depending on proficiency and the amount of exposure to the L2. These results shed light on how AoA coexists with other linguistic factors and have pedagogical implications.

As reflected in the children's performance on the BESA production task for nominal morphology, both groups of bilingual children produce the plural morphological marker for nouns (/s/ or /es/ in Spanish). In Spanish, heritage children reach ceiling by 80 months (6;6) and L2 children with AoA of 5 perform above chance right from the very beginning of their acquisition, suggesting that the establishment of nominal morphology in their L1 or their level of metalinguistic awareness provides a foundation on which to acquire nominal morphology more rapidly in the L2 (Schwartz 2003; Unsworth 2007). This evidence from bilingual children adds to previous studies showing that acquisition of nominal morphology occurs more rapidly and precedes that of verbal morphology in monolingual children (Marrero & Aguirre 2003; Forsythe 2015).

Given the children's ability to produce accurate nominal morphology with relative ease, we now turn to the results of the FIB task. To recall, the two verbs under analysis, *comer* 'to eat' and *correr* 'to run', were chosen because they differ in frequency in the input (*comer* is much more frequent than *correr*), but phonologically they differ in only one phoneme (/m/ in *comer* and /r/ in *correr*). While the heritage children gave more target-like responses than the L2ers, both groups displayed higher accuracy on the more frequent verb *comer* than on the less frequent verb *correr*. This suggests that lexical frequency may indeed modulate the acquisition of monolingual-like subject-verb agreement morphology for bilingual children, confirming our first hypothesis and in line with previous studies that have found an effect of lexical frequency for L1 children (Gathercole et al. 1999, 2002) and heritage speaker adults (Giancaspro 2017, 2020; Hur et al. 2020; Hur 2021). As Gathercole et al. (1999, 2002) and Ambridge et al. (2015) suggest for L1 children, the acquisition of verb morphology for bilingual children may also be less dependent on the specific parameters set forth by each language and more reliant on the frequency of the lexicon in the input. Specifically, they note that the acquisition of verb morphology in L1 speakers is a lexically-driven process not free of errors.

Of interest is the finding that lexical frequency also has an effect for the L2 children who are in their early stages of acquisition of Spanish as an L2. This contrasts with other research that has shown there are no frequency effects for adult L2 learners until advanced stages (Hur 2021) or at all (López Otero 2020), but is in line with Linford & Shin (2013), who found frequency effects only for beginner adults. Based on this previous work, we had hypothesized that there may not be an effect of lexical frequency for the L2 children because previous studies on adult L2 had found mixed

results. However, this hypothesis was not borne out, possibly due to the fact that young children learning Spanish as an L2 in a dual language school acquire the language in a naturalistic immersion environment that more closely resembles how heritage children acquire Spanish in the home, as opposed to L2 adults who learn Spanish in an instructed classroom setting (Brown & Larson-Hall 2012). While there is certainly explicit instruction in the input in a dual language program, children in kindergarten and 1st grade are not taught grammar rules (such as verb conjugations) in the way that beginner adult students of Spanish are (Herschensohn & Stevenson 2005).

Furthermore, we analyzed not only children's accuracy in production of subject-verb agreement morphology but also what kind of non-target morphology the children produced in Spanish when they could not retrieve an input-like inflectional form, allowing us to investigate whether verb frequency may have affected their non-target-like morphology as well. Rather than simply remain silent, children mostly provided responses for all of the FIB items. Their non-target responses were coded into two categories based on the previous literature (Goldin 2020; Herschensohn & Stevenson 2005): infinitives (e.g., *el niño comer*) and other morphology such as person, number and tense mismatches (e.g., *el niño dormiste*).

We had hypothesized that frequency would affect the types of non-target morphology produced. As in Herschensohn & Stevenson (2005), children produce a range of non-target morphology but no instances of bare stems or missing inflection, which, as noted by Harris (1991), are difficult to create in Spanish. Additionally, they did not produce any innovative morphology. With the exception of the form eat-a, all the verbs they produced are part of the Spanish verb paradigm. This demonstrates that all the children show knowledge of the inflectional system in Spanish, but at this stage of acquisition they sometimes struggle to retrieve the target morpho-phonological form. For both groups, the less frequent verb *correr* led to greater productions with infinitive morphology suggesting that verb frequency may have an effect on the types of non-target morphological endings bilingual children produce during the acquisition process. It may be that the more frequent a verb is in the input, the more likely it is that bilingual children will produce non-default inflection mismatches when they cannot activate a target form already acquired (Austin & Sánchez 2018) rather than produce default infinitive morphology because they have not yet acquired the target form.

A qualitative analysis of the *other morphology* produced by each group shows us that heritage and L2 children, who have had less exposure overall to Spanish due to later AoA, resort to different alternatives when they cannot retrieve the target form. For the heritage children, the most common non-target inflection was a stem change in the thematic vowel by saying *corra* instead of *corre*. The L2 children produce a much wider range of verb endings including the gerund *comiendo* ('eating') and *corriendo* ('running').

Previous studies have proposed that bilingual children may default to the least inflected form when they have difficulty retrieving an input-like inflectional form or when they have not fully acquired the inflectional morphology associated with a set of features (Austin & Sánchez 2018; Goldin 2020; McCarthy 2006). The results of this study suggest that this could be the case for heritage simultaneous bilinguals but child L2 learners may resort to other strategies. Putnam & Sánchez (2013) propose that heritage speakers have target-like syntactic competence, but experience difficulty in retrieving input-like morpho-phonological forms in their heritage language when they are not activated by frequent use. This cannot explain the patterns observed in this study, however, because the children attend dual language schools and use Spanish

every day at school. Perhaps it is that for these bilinguals, both heritage and L2ers, who receive formal education in Spanish from an early age, infinitives are more common due to explicit instruction in the input, something that would not occur in monolingual acquisition.

Finally, our third research question addressed whether the effect of lexical frequency would be the same for children with differing ages of acquisition of Spanish, specifically simultaneous heritage bilinguals and child L2 learners with an AoA of 5 whose exposure to Spanish begins after the age of 4, once the L2 grammar is fully established (Goldin 2020; Meisel 2011; Unsworth 2016; Unsworth & Blom 2010). There was indeed an effect of AoA in the children's acquisition of subject-verb agreement as HL children demonstrated higher accuracy on the FIB task than the L2 children. Having been exposed to Spanish from birth conferred the heritage children with an advantage over those who began acquiring Spanish at age 5. There was also an effect of frequency for both groups, though it appears to be slightly different for each.

The HL group shows a steady acquisition rate of both verbs, with consistently higher accuracy on the more frequent verb *comer*. The L2 children showed a rapid acquisition rate of *comer* and a pattern similar to the HL group with target-like productions increasing from just 25% at ages 5;4 to over 60% at ages 7;5. Acquisition of the much less frequent verb *correr*, however, was much slower with target-like morphology hovering around just 40% at ages 7;5 after 2 years of exposure to Spanish in the dual language school. Keeping in mind that the HL children in this study were aged 3;0 to 7;0 at time of testing and the L2 children were aged 5;0-7;0, it is important to note that we compare the two groups in their overlapping age range (5;0-7;0) at time of testing. This differs from their AoA which was before age 2 for the HLs and at age 5 for the L2 children. Given that these two verbs differ only by one phoneme, we posit that lexical verb frequency in the input may explain the pattern observed. Both groups acquired target-like morphology of *comer* at a similar rate (the HL may have exhibited higher accuracy due to more years of exposure to Spanish), but the L2 children struggled to produce target-like morphology of *correr* in the same timeframe. Studies in L1 acquisition have demonstrated that lexical frequency aids in the acquisition of inflectional morphology (Dąbrowska & Szczerbiński 2006; Gathercole et al. 1999, 2002; Theakston et al. 2004) as have studies in heritage language (Giancaspro 2017, 2020; Hur et al. 2020; López Otero 2020). While previous studies of adult L2 learners found mixed results on the effect of frequency (Hur 2021; Linford & Shin 2013; López Otero 2020), here we have evidence that frequency, in addition to AoA, may indeed play a role in early child L2 development possibly due to language learning environment (Brown & Larson-Hall 2012). The effect of frequency varies across the two groups with differing ages of acquisition, but both groups have higher and earlier acquisition of the more frequent verb *comer*.

These findings provide some insight into child bilingualism and the role of lexical frequency across different ages of acquisition. While our analyses were limited to only two verbs, the unique contrast between *comer* and *correr*, as noted earlier, allowed us to investigate how the frequency of lexical items in the input affects bilingual children's acquisition of verbal morphology. This lexically-driven acquisition process only concerns their production of morpho-phonological forms and not mental representation: we do not argue that their knowledge of abstract features of agreement is affected by the lexicon. Future research is needed to examine a range of verbs with varying degrees of input frequency in order to further understand how

agreement features emerge in morpho-phonological forms in bilingual grammars, particularly in children.

8. Conclusion

This study was an initial exploration into the possibility of lexical frequency effects on bilingual children with differing ages of acquisition. We acknowledge that the analysis of just one pair of verbs and the lack of corpora on child L2 speech in dual language immersion schooling may be a limitation of this study, but the results from both children's target-like and non-target-like productions should be a launching point for further investigation into how agreement features emerge in morpho-phonological forms in bilingual grammars. These initial findings have pedagogical implications as well. Educators should note that bilingual children may exhibit more accurate verb morphology with verbs they hear more frequently in the input, that verb conjugations may not be acquired as an evenly distributed rule but rather in piecemeal fashion as has been suggested by Gathercole et al. (1999, 2002) for L1 acquisition.

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