Article

The role of experience in the acquisition and production of diminutives and gender in Spanish: Evidence from L2 learners and heritage speakers

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Abstract

This study examined whether type of early language experience provides advantages to heritage speakers over second language (L2) learners with morphology, and investigated knowledge of gender agreement and its interaction with diminutive formation. Diminutives are a hallmark of Child Directed Speech in early language development and a highly productive morphological mechanism that facilitates the acquisition of declensional noun endings in many languages (Savickienė and Dressler, 2007). In Spanish, diminutives regularize gender marking in nouns with a non-canonical ending. Twenty-four Spanish native speakers, 29 heritage speakers and 37 L2 learners with intermediate to advanced proficiency completed two picture-naming tasks and an elicited production task. Results showed that the heritage speakers were more accurate than the

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L2 learners with gender agreement in general, and with non-canonical ending nouns in particular. This study confirms that early language experience and the type of input received confer some advantages to heritage speakers over L2 learners with early-acquired aspects of language, especially in oral production.

Introduction

The present study is concerned with the potential role of linguistic experience in the mastery of gender marking in Spanish by second language (L2) learners and Spanish heritage speakers. By experience we mean the timing, type, modality, frequency and amount of exposure to relevant input and use of the language, which differ in these two groups of language learners. L2 learners typically acquire the language around puberty in an instructed setting through visual and aural input, while Spanish heritage speakers are exposed to the language since early childhood at home, through aural input and interactions with caregivers. We will show that the type of learning experience, which cannot be disentangled from age of acquisition, explains important differences between the two groups when it comes to the oral production of gender in Spanish. Furthermore, we propose that timing and frequency of input can account for the types of gender errors observed primarily at the lexical level in the two groups of speakers.

An interesting fact about gender marking in noun phrases is that native speakers typically produce it with very high accuracy. That is, adult native speakers of languages morphologically inflected for gender hardly ever make gender errors in production, including errors with irregular forms or nouns with non-transparent, non-canonical endings. Conversely, children learning languages with gender often make gender errors at the earliest stages of development, especially with non-canonical ending nouns. The Spanish-speaking child studied by Hernández Pina (1984), for example, produced gender errors with determiners (*un llave* 'a key', *un leche* 'a milk', *una camión* 'a van', *una pez* 'a fish') before age 2;8, but these eventually disappeared. In an experimental study with made-up words, Pérez-Pereira (1991) found that by age 4 Spanish-speaking children had already mastered the gender agreement system of their first language (L1). According to theoretical accounts that consider gender to be a formal feature in nouns (Carroll, 1989; Carstens, 2000; Chomsky, 1995; Hawkins and Franceschina, 2004), acquisition of this formal feature takes place in early childhood. As such, native speakers are assumed to have a mental representation of gender as a grammatical category and to deploy this knowledge efficiently and successfully during oral production by making correct gender agreement between nouns, determiners and adjectives. If and when native speakers make gender errors during production, these are taken to be a reflection of performance during online production, rather than as a deficit at the level of linguistic representation (Poulisse, 1999).

The situation in adult second language acquisition is quite different. Unlike native speakers, L2 learners are notorious for having great difficulty mastering gender marking with native-like ability in oral production, even at very advanced levels of proficiency,

including so-called 'near-natives' (Franceschina, 2001; Grüter et al., 2011, 2012; Hopp, this issue). Both Carroll (1989) and Hawkins and Franceschina (2004) claim that problems for L2 learners of languages with gender whose L1 does not have gender (e.g. English speakers learning Romance languages or German as an L2) are related to maturational constraints and transfer effects. That is, many L2 learners cannot acquire the gender feature after puberty because their native language does not instantiate gender. For Carroll (1989: 573–574), the main problem lies in lexical assignment: after age 5, the universal feature of gender distinction 'atrophies' and disappears for those speakers whose L1 has no grammatical gender system. Alternatively, for Hawkins and Franceschina (2004), the syntactic mechanism for gender agreement (the abstract gender feature) fossilizes in L2 learners due to a critical period effect if uninterpretable gender features are absent in the L1. By contrast, White et al. (2004) contend that it is possible to overcome the blueprint imposed by the L1 and, thus, L2 learners of non-gender marking languages can acquire the grammatical gender feature instantiated in the L2.

In line with this last claim, results from several recent studies have shown that L2 learners are quite accurate with gender marking in offline written production and comprehension tasks (Alarcón, 2011; Grüter et al., 2012; Montrul et al., 2008; White et al., 2004), including tasks that test knowledge of gender indirectly through the phenomenon of noun drop (Iverson, 2010; Liceras et al., 2000) and the semantics of adjective placement (Rothman et al., 2010). Other studies also show that L2 learners are sensitive to gender agreement violations in aural and visual recognition tasks that require explicit focus on grammaticality, explicit focus on grammatical forms or explicit monitoring of grammatical concepts (Keating, 2009; Montrul et al., in press; Sagarra and Herschensohn, 2011). Findings of this sort appear to give credibility to the view that gender agreement is acquirable in L2 acquisition, that the formal gender feature is not subject to maturational constraints in L2 acquisition, and that transfer can eventually be overcome. However, many of these studies documenting apparent native-like performance in L2 learners have focused on gender marking with regular, canonically ending nouns. The most regular pattern of noun endings in Spanish is instantiated in that approximately 96.3% of feminine nouns end in the word marker -*a* and approximately 99.8% of masculine nouns end in the word marker -*o* (Teschner and Russell, 1984). When new words enter the language, they abide by this pattern and are marked by masculine -*o* or feminine -*a*. Hence, accurate performance by L2 learners on regular nouns is hardly surprising. On the other hand, studies on Spanish that have also included non-canonical ending nouns, such as nouns ending in -*e*, a consonant, or an exceptional word marker (masculine -*a* and feminine -*o*), have found that L2 learners are actually highly inaccurate on gender assignment (i.e. classifying nouns as masculine or feminine in the mental lexicon) and gender agreement (syntactic concord) with these nouns (Montrul et al., 2008, Valenzuela et al., 2008); It is thus hard to accept, on the basis of successful deployment of gender marking with canonical nouns reported in some studies using written and metalinguistic tasks, that L2 learners have the same mental representation of gender features as native speakers. L2 learners' high inaccuracy on non-canonical ending nouns, especially in production, and the source of these errors need to be accounted for. We suspect that the main problem with these irregular words for L2 learners is largely at the level of the lexicon, not in the syntax, as we show in this study.

If, following Hawkins and Franceschina (2004) and others, we accept that a late age of acquisition may underlie difficulties for L2 learners, it remains to be explained why gender errors are common in heritage speakers as well. Heritage speakers are early bilinguals exposed to a minority language since birth. Although exposed to the language during the age of optimal language learning potential (the pre-school years), heritage speakers of Spanish in the USA often consider Spanish their weaker language and English their dominant language. Unlike monolingual Spanish-speaking children who are fully immersed in the language, heritage speakers receive less input in Spanish because they grow up in a bilingual environment and are typically schooled in English. When they reach early adulthood, their language displays many of the non-native patterns found in L2 learners, including errors with gender (Alarcón, 2011; Anderson, 1999; Lipski, 1993; Montrul and Potowski, 2007; Montrul et al., 2008; Mueller-Gathercole, 2002). Studies have also found that like L2 learners, heritage speakers are more inaccurate with non-canonical ending nouns than with canonical ending nouns (Montrul et al., 2008). As far as experimental tasks are concerned, studies that have used different research methodologies to investigate command of gender in heritage speakers (Alarcón, 2011; Montrul et al., 2008; Montrul et al., in press) have found that heritage speakers show more native-like patterns in oral production tasks than in tasks that have a written/visual and/or a metalinguistic component. The same studies have found that the L2 learners being compared to the heritage speakers showed the opposite pattern: more native-like performance in written tasks and in aural tasks that involve metalinguistic awareness than in oral production tasks.

If age of acquisition is the main variable that differentiates L2 learners and heritage speakers, the type of task effects found in the two groups of bilinguals suggests that maturational explanations alone cannot be entirely correct. Learners who received input earlier should be more accurate in a particular grammatical domain on all tasks regardless of modality, in comparison to learners who received input later in life. Why would early acquisition in heritage speakers favor accuracy in oral production, yet late acquisition in L2 learners favor accuracy in more metalinguistic tasks? This suggests that the type of input and experience with the language, in addition to perhaps age, may play a significant role in explaining how the two types of language learners differ from each other in their acquisition, processing, and production of gender morphology in Spanish.

In this study we test the potential role of language experience more directly by focusing on the interaction of diminutive formation and gender agreement in oral production. Diminutives are a hallmark of Child Directed Speech in early language development and are a highly productive morphological mechanism, argued to facilitate the acquisition of declensional noun endings (Savickienė and Dressler, 2007), and especially with irregular or non-canonical ending nouns in many languages. Gender learning is easier if the input contains fewer non-transparently gender-marked nouns (Frigo and McDonald, 1998; Kempe and Brooks, 2001). As we will show, diminutive formation renders non-canonical nouns transparently marked for gender, and this may aid acquisition of gender assignment and agreement with non-canonical nouns. Although both L2 learners and heritage speakers have been shown to have problems with gender in non-canonical ending nouns, the hypothesis we test in this study is that Spanish heritage speakers should be more

accurate at producing diminutives and at gender agreement with non-canonical nouns than L2 learners. Because heritage speakers were exposed to Spanish since birth, they were potentially also exposed to many instances of diminutives through Child Directed Speech, whereas L2 learners of Spanish were not exposed to such forms in early childhood. Although L2 learners of Spanish may have learned diminutives in the classroom as adults, the frequency of diminutive use in adult speech is much lower than in the speech directed to children (Marrero et al., 2007). Hearing non-canonical nouns in diminutive forms in early childhood may have helped the heritage speakers classify those nouns as feminine and masculine reliably in their mental lexicon as they were growing up, thereby reducing the likelihood of making agreement and assignment errors with those nouns later in adulthood.

Before presenting the details of our experiment, we describe how diminutive formation interacts with gender in Spanish.

Gender and diminutives in Spanish

Gender assignment is a lexical property of nouns. The grammatical category gender categorizes nouns into two or more genders or classes. In Spanish, gender assignment is predominantly morphologically and phonologically based (Corbett, 1991), even though a select few animate nouns referring to people and some animals are classified as feminine or masculine based on the semantic notion of sex or biological gender: *el hombre* (masc.) 'the man', *la mujer* (fem.) 'the woman', *el perro* 'the dog (masc.)', *la perra* 'the dog (fem.)'.

The exponents of gender marking with animate and inanimate nouns follow formal rules. Typically, feminine nouns end in the vowel 'a' (which can be construed as an inflectional morpheme as in *señor* (masc.) – *señora* (fem.), or the last vowel or word marker of a root (*cara* 'face') (Harris, 1991). Masculine nouns typically end in the vowel 'o' as in *hijo* 'son', *caballo* 'horse', *libro* 'book'. Despite these apparent regularities, the system has many exceptions, and although *-o* and *-a* are the prototypical masculine and feminine word markers, these morphemes have three other allomorphs or morphological variants. That is, both masculine and feminine nouns can end in the vowel 'a' or 'o', in the vowel 'e', or in a consonant, as shown in Table 1. According to Harris (1991), canonical *-o* masculine-ending and *-a* feminine-ending nouns form the 'inner core', or most prototypical cases, while

Table 1. Canonicity of Spanish inanimate nouns based on noun ending.

| | Canonical | Non-canonical | | |
	-a/-o	*-e*	Consonant	*-a/-o*
Masculine	*libro* 'book'	*puente* 'bridge'	*motor* 'engine'	*planeta* 'planet'
	techo 'roof'	*diente* 'tooth'	*papel* 'paper'	*cometa* 'comet'
Feminine	*libra* 'pound'	*noche* 'night'	*piel* 'skin'	*mano* 'hand'
	casa 'house'	*nube* 'cloud'	*nariz* 'nose'	*foto* 'photo'

non-canonical *-e* and consonant ending nouns form the 'outer core'. Masculine nouns ending in *-a* and feminine nouns ending in *-o*, as well as other infrequent exceptional forms, are the 'residue'. In our study, we will refer to masculine nouns ending in *-o* and feminine nouns ending in *-a* as canonical or transparent. All other endings (*-e*, consonant, opposite vowel) are referred to as non-canonical or non-transparent.

The specific morphological status of word markers is difficult to categorize. Words like *muchacho/muchacha* 'guy/girl', *perro/perra* 'male dog/female dog', *abuelo/abuela* 'grandfather/grandmother' have led linguists to treat the terminal elements *-a* and *-o* as actual inflectional morphemes with the meaning [±feminine] (Falk, 1978: 32). Such a 'rule' seems to have psychological validity because native speakers perceive masculine and feminine words ending in the vowels 'o' and 'a' as regular, as opposed to words that end in the other non-transparent word markers. This suggests that some sort of regular rule is in place in the grammar of native speakers. Nonetheless, this generalization is descriptively incorrect because it does not capture the high level of irregularity and the lack of direct correspondence between form and meaning with many other words in the Spanish lexicon. Harris (1991: 30) explains that word markers typically have no associated meaning and fulfill strictly morphophonological rules by marking a derivationally and inflectionally complete word. They cannot be followed by any other suffix, derivational or inflectional, except plural. In sum, word markers in Spanish are not full-fledged inflectional morphemes like the past tense or plural, but they do share some partial predictability that must somehow be registered in the grammar.

Diminutive formation is a very productive morphological mechanism that interacts with gender as it turns non-canonical nouns (outer core and exceptional) into canonical ending nouns (inner core) in Spanish and many other languages. Diminutives are derivational affixes that denote the meaning of smallness, as well as a variety of other meanings including endearment and tenderness (Dressler and Barbaresi, 1994). In Spanish, the most common and frequent diminutive affix is *-it* or its variants *-cit*, *-ecit*, and with gender agreement it is *-ito*, *-cito*, *-ecito* (masculine) or *-ita*, *-cita*, *-ecita* (feminine) (Melzi and King, 2003). The diminutive affix regularizes gender marking in nouns with non-canonical endings by making explicit the canonical word marker on the noun, as shown in Table 2. In addition, the diminutive regularizes stress assignment in nouns, such that *nariz* bears stress in the last syllable, while its diminutive form *naricita* shifts the stress to the penultimate syllable, the canonical stressed syllable in Spanish.[1] Compare simplex and diminutive forms in the non-canonical column for nouns ending in *-e* and in a consonant. In simplex nouns the word marker appears right after the root, as in *cas+a*. However, in diminutive formation, the word marker is not added until the end of the word, after the diminutive suffix attached to the root, as in *cas+it+a*. In simplex non-canonical nouns, the word marker is *-e* or zero, but after the diminutive applies the marker is realized as *-o* if masculine or *-a* if feminine. (For a more detailed morphophonological account of Spanish diminutives, see Colina, 2003.)

As we have seen, the classification of nouns into masculine or feminine gender is lexical. Yet gender is manifested syntactically through agreement in the noun phrase

Table 2. Gender agreement with canonical and non-canonical masculine and feminine nouns in simplex and diminutive forms.

	Canonical		Non-canonical	
	Simplex	Diminutive	Simplex	Diminutive
Masculine	el aut**o** rojo the car red 'the red car'	el autit**o** rojo the car-D red 'the little red car'	el coch**e** negro the car black 'the black car'	el cochecit**o** negro the car-D black 'the little black car'
			el lápi**z** amarillo the pencil yellow 'the yellow pencil'	el lapicit**o** amarillo the pencil-D yellow 'the little yellow pencil'
Feminine	la cas**a** blanca the house white	la casit**a** blanca the house-D white 'the little white house'	la nub**e** blanca the cloud white 'the white cloud'	la nubecit**a** blanca the cloud-D white 'the little white cloud'
			la nari**z** fría the nose cold 'the cold nose'	la naricit**a** fría the nose-D cold 'the little cold nose'

Note: D stands for diminutive affix.

and in the verb phrase: there is gender concord between the noun, the determiner, and adjectives. Examples (1a) and (1c) show canonical and *-a* feminine *-o* masculine ending nouns, while examples (1b) and (1d) show non-canonical feminine and masculine nouns ending in a consonant.

(1)   a.   La   taza   roj-a   feminine
                 the-fem   cup (fem)   red-fem
                 'the red cup'
       b.   La   flor   abiert-a   feminine
                 that-fem   flor (fem)   open-fem
                 'the open flower'
       c.   El   techo   roj-o   masculine
                 the-masc   roof (masc)   red-masc
                 'the red roof'
       d.   El   árbol   caíd-o   masculine
                 the-masc   tree (masc)   fallen-masc
                 'the fallen tree'

Within the syntactic literature, there is agreement that nouns come lexically determined with a gender feature [±feminine] (Carroll, 1989; Carstens, 2000). The gender feature is an interpretable feature in nouns and an uninterpretable (formal) feature in determiners and adjectives, which must be checked through agreement (Chomsky, 1995). Nouns check their gender features in specifier–head (for noun–adjective concord) and head–head (for determiner–noun concord) relations. Thus, gender agreement is an operation handled by the syntax.

The learning problem

As stated earlier, gender errors are very common in non-native grammars and it is crucial to investigate how these errors come about and how they can be overcome, if at all. In producing gender marking, there are at least two possible sources of errors for speakers. The first one is lexical and relates to gender assignment to nouns. If the target phrase is as in (2a), *el coche rojo*, and a learner says *la coche roja* ('the-fem. car red-fem.') as in (2b), where the determiner and the adjective match with each other but not with the noun, it is likely that the learner has misclassified the head noun *coche* as feminine in his or her mental lexicon and then performed agreement between determiner and adjective correctly in the syntax. If the learner says *el coche roja* ('the-masc. car red-fem.') instead, as in (2c), where the determiner and the noun match but the adjective does not, one can assume that the error is syntactic rather than of lexical misclassification; that is, in the gender agreement rule between noun, determiner, and adjective in the syntax. As we discuss in more detail below, in the language acquisition literature, the gender of the determiner is often taken as evidence for lexical assignment of gender in French and Spanish (Carroll, 1989; Lew-Williams and Fernald, 2010). Other potential errors include *la coche rojo* (the-fem. car red-masc.), as in (2d), where the noun and the adjective match, but the determiner and the adjective do not match. These are ambiguous between assignment or agreement errors because the gender of the determiner may indicate incorrect lexical assignment; however, since the determiner and the adjective do not match either, that would also be lack of concord. In previous work we have coded these as agreement errors, but following Grüter et al. (2012), in this study we coded them separately.

(2) a.   el coche rojo   target
     b. * la coche roja   assignment error
     c. * el coche roja   agreement error
     d. * la coche rojo   ambiguous error

In languages like Spanish that rely on morphophonology (word ending) rather than semantics to classify nouns into masculine or feminine, there is another potential source of error arising from the canonicity or transparency of word ending. Non-canonical or non-transparent nouns present a particular challenge to language learners: one can only reliably determine the classification of these particular nouns, not by their endings because they are ambiguous, but by the morphophonological form of the other items in the phrase that agree with the noun (i.e. determiners and adjectives).[2] Several studies of different languages that present these characteristics have shown that gender assignment and agreement with non-canonical or non-transparent nouns take longer to learn and to process. Bates et al. (1995) and Taraban and Kempe (1999) found slower processing of gender agreement with non-transparent nouns in Italian and Russian native speakers, while Taraban and Roark (1996) found similar difficulties in French native and non-native speakers. The errors in L1 Spanish cited earlier from Hernández Pina (1984) illustrate that most of the gender errors made by the child studied longitudinally occur with non-canonical ending nouns. In a study of L1 attrition in a Guatemalan adoptee, Montrul (2011a) also

reported that the vast majority of errors produced by the adoptee occurred with non-canonical ending nouns.

The canonicity or transparency of the noun ending also poses significant difficulty for L2 learners and early bilinguals with weaker command of their L1 than of their L2, or Spanish heritage speakers as mentioned earlier. Montrul et al. (2008) found that both L2 learners of Spanish and Spanish heritage speakers were more inaccurate with non-canonical than with canonical ending nouns in a written comprehension task, a written recognition task and in an oral production task. Alarcón's (2011) replication of the Montrul et al. (2008) study found the same patterns in written comprehension and oral production. In another recent study, Montrul et al. (in press) administered three spoken word recognition experiments (a gender monitoring task, a grammaticality judgment task and a repetition task) to all the Spanish heritage speakers and of L2 learners of Spanish tested in the present study. The two groups were more inaccurate and slower with non-canonical than with canonical ending nouns. The Spanish native speakers in these three studies, however, were not affected by the canonicity of the nouns to the same extent, and performed at ceiling in all tasks.

At the same time, several crosslinguistic studies of child language have shown that diminutive morphology facilitates the acquisition of gender agreement in nouns with irregular or non-canonical endings (Kempe and Brooks, 2001; Savickienė and Dressler, 2007; Ševa et al., 2007). In an experimental study manipulating simplex and diminutive forms of nouns, Kempe et al. (2007) showed that Russian toddlers committed fewer gender agreement errors with diminutive nouns than with their simplex counterparts. Ševa et al. (2007) replicated this finding with 24 Russian children (mean age 3;7, range 2;10–4;6) and 22 Serbo-Croatian children (mean 3;8, range 3;0–4;1). The children were shown pictures of familiar and unfamiliar animals and colors and were asked questions aimed at eliciting noun phrases with gender, with diminutive or simplex nouns. In both languages, the children were more accurate with familiar non-canonical than with non-familiar non-canonical nouns, more accurate with masculine than with feminine gender, and more accurate with diminutive than with simplex nouns. Thus, both studies report a diminutive advantage in production for young children.

Valenzuela et al. (2008) investigated knowledge of gender and diminutives in adult L2 learners of Spanish as a way to tease apart lexical versus syntactic problems with gender. They found that the learners were more accurate at producing gender in diminutive nouns than in doing gender agreement with determiner and adjectives. More errors occurred with non-canonical ending than with canonical ending nouns. Kempe and Brooks (2001) examined whether features of Child Directed Speech could also aid adults, and taught Russian nouns with transparent and non-transparent gender and gender agreement with adjectives to two groups of L2 learners with no previous knowledge of Russian. For a diminutive to facilitate the learning of Russian gender, the learner needs to generalize from the gender of a diminutive noun to its base form as well as to novel nouns. One group was trained with diminutives and the other one was trained with simplex forms. In the testing trials, the L2 learners who received the diminutive training were more accurate at producing gender agreement with nouns and adjectives in Russian in general than the group which was trained on simplex forms only. The two groups were still highly inaccurate on non-canonical ending nouns, however: there was no direct

transfer of gender from diminutive training items to respective non-canonical simplex forms of nouns presented during testing. Kempe and Brooks take this result to suggest that diminutives facilitate gender learning by aiding the L2 learners in recognizing morphophonological gender cues in general, rather than by fostering an associative link between abstract gender and a lexical representation of a noun. It is important to note, however, that the L2 adults showed no diminutive advantage for gender agreement on canonical and non-canonical ending nouns during oral production. Assuming the tenets of item-based learning, Ševa et al. (2007) explained that there is a diminutive advantage for children because children rely on low-level schemata to extract and compute morphophonological regularity.[3] We suspect that one reason why L2 learners in the Kempe and Brookes (2001) study did not show a diminutive advantage may be because they perhaps do not rely on low-level schemata to compute sublexical regularities; compare Johnson and Newport's (1989) 'less is more hypothesis'.

We are not aware of similar experiments in child Spanish, but, as in Slavic languages, diminutives are a feature of Spanish Child Directed Speech and regularize morphological endings. Spanish diminutive morphemes recover the prototypical gender marker from the noun when this is not expressed overtly on the root and shift the stress of the word to the penultimate syllable, the default stress pattern in Spanish (see Table 2). Marrero et al. (2007) reported that children exposed to Peninsular Spanish use 13 times more diminutives than do adults, and the two children they studied longitudinally already used diminutives productively between ages 1;7 and 1;10 along with correct gender agreement with diminutive nouns. In another study, Melzi and King (2003) analyzed dyads consisting of Peruvian mothers and their children. Acquisition of these morphemes was evident well before age 3 in these children.[4] Mothers of the 3-year-olds used more diminutives (8.8% of all words) than mothers of the 5-year-olds (5.5%). Kempe et al. (2007) state that the estimated frequency of diminutized nouns in Spanish Child Directed Speech is 42%, which is quite high (compared to German, which they say is 3%). These findings confirm that diminutives are very frequent in Spanish Child Directed Speech and most frequent at the earliest stages of development.

Research questions and hypotheses

Previous studies comparing L2 learners and heritage speakers' knowledge of gender agreement in Spanish have investigated the potential role of age of acquisition. The fact that heritage speakers are superior to L2 learners in oral production is consistent with an age of acquisition explanation, but the fact that heritage speakers are not equally superior in other tasks suggests that type of language learning experience, which is confounded with age of acquisition in the two groups, is also at play. The novelty of our study lies in its attempt to isolate a feature of language experience – type of input – that would allow us to begin to disentangle age effects from other potential experiential effects.

We capitalize on diminutives as a salient feature of Child Directed Speech and their interaction with gender agreement in order to investigate potential differences between L2 learners of Spanish and Spanish heritage speakers related to their language learning experience. Presumably, heritage speakers were exposed to diminutives in Spanish in their early childhood through Child Directed Speech, whereas L2 learners may have

been exposed to fewer diminutives in their interactions with other adults and in the class-room. Unlike the study conducted by Kempe and Brooks (2001), which involved teaching forms with diminutives to participants with no knowledge of the language in order to investigate the facilitating role of diminutives in the acquisition of gender marking and agreement overall, our study investigates current knowledge of gender marking in participants with intermediate to advanced proficiency in Spanish who already know about gender but do not necessarily produce it at native-like levels. We ask whether heritage speakers, who were exposed to Spanish since birth and in early childhood, are more familiar with diminutives than L2 learners, and whether they show higher accuracy (i.e. more native-like ability) than L2 learners with the production of gender agreement in Spanish generally, and with non-canonical ending nouns in particular.

The problem with non-canonical ending nouns is that they are not transparent for gender. Heritage speakers receive early input with diminutives, which makes the gender of the non-canonical ending nouns transparent and increases the frequency of regular forms in the input. If early input with diminutives gives heritage speakers an advantage over L2 learners who did not receive the same type of early input, heritage speakers should be more familiar with diminutives than the L2 learners. They should also be better than L2 learners with gender agreement with non-canonical ending nouns.

It is an open question whether adult heritage speakers, like Slavic-speaking children, will also be more accurate on gender agreement with non-canonical nouns in the diminutive form than on gender agreement with non-canonical simplex nouns, or whether they will be like L2 adults, who did not show a diminutive advantage during production (Kempe and Brooks, 2001). This is because certain developmental trends typical of child language, like primacy of nouns over verbs in lexical acquisition for example, do not necessarily apply to adult acquisition. And even if heritage speakers may have displayed an advantage with diminutives and gender agreement in childhood as an acquisition mechanism operative at an early age, it does not follow that such advantage will necessarily show up in adulthood as well. Heritage speakers look like L2 learners because they undergo incomplete acquisition and/or language attrition in childhood.

Even if the heritage speakers make overall fewer gender errors than the L2 learners (a quantitative difference), a related question is whether the errors made by the two groups of learners are of the same type (a qualitative difference). Gender agreement errors would indicate inability to establish and compute the abstract formal gender feature (a syntactic problem), whereas lexical assignment errors would indicate mistaken classification of nouns in the mental lexicon based on input and experience. Montrul et al. (2008) considered lexical assignment errors and agreement errors in oral production data of low to high intermediate-proficiency L2 learners, finding no differences between the types of errors in the two groups. Most recently, Alarcón (2011) conducted a similar analysis with advanced L2 learners and heritage speakers and found that assignment errors were by far more frequent than agreement errors in the two groups. Grüter et al. (2012) found the same pattern in the oral task administered to the advanced L2 learners in their study. Because the participants tested in the present study are also more advanced than the ones tested in the Montrul et al. (2008) study, we expect to find more lexical assignment errors than syntactic agreement errors in the two groups, especially with non-canonical ending nouns. If both groups have difficulty with lexical assignment and agreement is not the

problem, it is more likely that input and experiential factors account for lexical problems than grammatical deficits.

Method

Participants

A group of 24 Spanish native speakers, a group of 29 Spanish heritage speakers born in the USA and a group of 37 L2 learners of Spanish whose native language was English participated in the three experiments. All of these participants also completed the three word recognition experiments reported in Montrul et al. (in press). The native speakers (mean age 32.2) were all born and raised in a Spanish-speaking country (Argentina, Colombia, Honduras, Peru, Puerto Rico, Spain or Venezuela) and were residing in the USA at the time of testing. They were all graduate students or postdoctoral researchers at an American university with a length of residence in the USA ranging from 2 months to 10 years (average 3 years and 6 months). The heritage speakers and the L2 learners were recruited from advanced Spanish classes at the same university. All the heritage speakers (mean age 23.6) were born in the USA to Spanish-speaking families (25 of them were from Mexican background) and began exposure to English before age 5. The L2 learners (mean age 21.5) were born in the USA to English-speaking parents. They started learning Spanish as a second language in high school or college (after age 11, range 11–17). More information on the heritage speakers and the L2 learners is displayed in Table 3.

Table 3. Information about the heritage speaker and L2 learner participants.

	Spanish heritage speakers (n = 29)	L2 learners of Spanish (n = 37)
Mean age	23.6	21.5
Age of acquisition of Spanish	Birth	13.2
Native language	Spanish 90%; Spanish/English 10%	English 100%
Language(s) spoken at home in early childhood	Spanish 51.7%; Spanish/English 48.3%	English 100%
Language of schooling at the elementary level	English 76%; some Spanish 24%	English 100%
Language of schooling in middle and high school	English 100%	English 100%
Level of Spanish classes taking at the university	Intermediate and advanced	Advanced
Traveled to Spanish-speaking country	Yes 97% (since childhood); No 3%	Yes 100% (in college)
Length of stay in Spanish-speaking country	2 weeks to 9 months	2 weeks to 6 months

Materials

All participants completed an oral proficiency measure, and an elicited production task. The oral proficiency measure was a picture-naming task (PNT) (48 nouns for inanimate objects), which the two experimental groups performed in English and Spanish separately to establish their degree of language dominance (O'Grady et al., 2009). Participants saw black and white images on a computer screen and were prompted to say the name of the object as quickly as possible. In the Spanish naming task, participants were prompted by the instruction *diga*, and in the English version by the instruction *say*. Both accuracy and reaction times were measured. (The nouns used in these two tasks are the same nouns used in the oral elicitation task shown in Appendix 1). Two independent one-way ANOVAs compared the three groups on speed and accuracy in the Spanish PNT. The heritage speakers and L2 learners were also compared on their speed and accuracy of naming in English. The Spanish PNT was taken first (after the background questionnaire and a written proficiency test).[5] Right after the Spanish PNT, participants completed three other online tasks (reported in Montrul et al., in press), followed by the main experimental task to be described below. The English PNT was taken at the end. The results are summarized in Table 4.

The Spanish native speakers were significantly faster ($F(2,85) = 12.139$, $p< .001$) (322 and 439 ms) and 7% more accurate ($F(2,85) = 11.128$, $p < 0.001$) than the heritage speakers and the L2 learners in the Spanish PNT, according to Tukey ($p < .001$). The heritage speakers and the L2 learners were not significantly different from each other on either the Spanish PNT or the English PNT, in either speed or accuracy ($p > .05$ for each independent samples *t*-test for accuracy and speed in English and in Spanish). The L2 learners and heritage speakers were actually 463 ms and 255 ms faster ($F(1,62) = 63.4$, $p < .001$) and 11% and 10% more accurate ($F(1,62) = 116.4$, $p < .001$) naming words in English than naming the same words in Spanish, which suggests that they were dominant in English.

Oral elicitation task

The main task used to investigate our hypotheses was an elicited oral production task. The stimuli for the elicited production task consisted of 48 Spanish nouns. All nouns were picturable concrete objects that were semantically plausible in both simplex and

Table 4. Mean accuracy and reaction times in the Spanish and English picture-naming tasks (standard deviations appear in parentheses).

Group	*n*	Spanish picture-naming task		English picture-naming task	
		Speed (ms)	Accuracy (%)	Speed (ms)	Accuracy (%)
Native speakers	23	788 (185)	95 (2.9)	–	–
Heritage speakers	29	1110 (277)	88 (7.2)	855 (190)	98 (2.4)
L2 learners	37	1227 (450)	88 (7.7)	764 (204)	99 (1.5)

diminutive forms. Additionally, care was taken to select nouns according to norms for word frequency in Spanish (Alameda and Cuetos, 1995). Words ranged in frequency from 9 to 1,775.[6] In order to avoid potential coding complications due to the resyllabification of *una* and a following noun – for example, distinguishing between *un abrazo*, 'a' (masc) 'hug' (masc.) and **una brazo*, 'a' (fem.) 'arm' (masc.) – no noun began with the /a/ phoneme.

The 48 nouns included 24 phonologically transparent, canonical nouns: 12 masculine nouns ending in -*o* and 12 feminine nouns ending in -*a*. The remaining 24 nouns were non-canonical: six masculine nouns ending in -*e*, six feminine nouns ending in -*e*, six masculine nouns ending in a consonant and six feminine nouns ending in a consonant. The list of Spanish nouns can be found in Appendix 1. In this task, participants were asked to produce utterances containing an indefinite determiner, a noun and an adjective of color, and the images employed to elicit these responses were modified with respect to their size and their color, detailed below.

A total of eight adjectives of color were used in the present study: four were explicit, ending in either *o* or *a* depending on a preceding masculine or feminine noun referent respectively (*blanco/a* 'white', *negro/a* 'black', *rojo/a* 'red', *amarillo/a* 'yellow'), and four were non-explicit, ending in *e* (*verde* 'green'), a consonant (*azul* 'blue', *gris* 'gray'), or a non-gender explicit *a* (*violeta* 'purple'). Target nouns were randomly assigned one of the four explicit adjectives of color, whereas distracter nouns were assigned one of the four non-explicit adjectives of color. For example, the explicit adjective *roja* 'red' (fem.) was randomly assigned to the target noun *tortuga* 'turtle' (fem.), whereas the non-explicit adjective *azul* 'blue' was randomly assigned to the distracter noun *toro* 'bull' (masc.). For the adjective–noun combinations (target items and distractors) used, see Appendix 1.

An image of each noun referent was found using Microsoft Office 2003 ClipArt and Google Image Search. The color of each image was modified to match the color it had been randomly assigned using Adobe Photoshop Elements. Correctly colored images were then placed as JPG files into a Microsoft PowerPoint slide. Each slide had a white background and in the center a PDF image of a brown table (also obtained through Google Image Search). Each noun was placed either above, below, to the right, or to the left of the table in separate slides. The location of each noun with respect to the table was randomly assigned. A diminutive noun image (the original noun image scaled down to roughly a sixth of its original size) was then placed on the opposite side of the table such that every slide had two images for each noun referent, one simplex (normal size) and one diminutive (small size), either above and below the table or to the right and to the left of the table. Lastly, the name of the simplex noun was written in 52-point Arial font and placed either below or to the left of the table, depending on which space was free. Screen shots of the 48 completed slides were converted into JPG images and placed into SR Research Experiment Builder v.1.4.624, an EyeTracker software program that allows for a computer presentation of audio and visual stimuli and that can record participant speech. Sample computer displays are shown in Figure 1.

A native Mexican Spanish-speaking female was recorded in a sound-proof studio uttering four questions: *¿Qué hay debajo de/encima de/a la derecha de/a la izquierda de*

PROMPT: *¿Qué hay encima de la mesa?*

Pez

EXPECTED RESPONSE: un pececit**o** amarill**o**

PROMPT: *¿Qué hay a la derecha de la mesa?*

Cruz

EXPECTED RESPONSE: una crucecit**a** negr**a**

Figure 1. Sample computer displays.

la mesa? 'What is under/on top of/to the right of/to the left of the table?'. The recordings were amplified to 60 decibels and placed as audio.wav files in SR Research Experiment Builder.

Procedure

Participants met individually with a research assistant and completed the simplex-diminutive gender task in a quiet room at the university. They were given a set of headphones with a recording microphone attached and sat in front of a computer. They were asked to view a series of pictures and listen to a series of questions regarding the location of one of two images on the screen. Their task was to name the appropriate images requested, and they were explicitly told to use the diminutive form when necessary (i.e. when they were asked about the small size image). One second after an image was displayed, the corresponding audio file played. Participants answered the location question in three-word phrases, such as *una casa roja* 'a red house' or *una casita roja* 'a red house-D' (where D indicates diminutive). Participants pressed a key on the keyboard to advance to the next image after answering the question.

In total, participants viewed 96 images, each one repeated once so that every simplex noun image and diminutive noun image was requested. The presentation order of the images was randomized and then held constant across participants so as to facilitate more efficient coding of participant responses, which were monitored by a researcher through a paper-and-pencil checklist. Before beginning the experiment, a trial session was performed with four nouns in simplex and diminutive forms. Participants also viewed a slide identifying the eight possible colors of subsequent noun images so as to avoid possible confusion of colors (e.g. using *purple* for *violet*). Accuracy with respect to gender concordance between determiners and nouns and between adjectives and nouns was measured. Checklists and audio files were analyzed by at least two different raters. Correct responses were assigned one point and incorrect responses received a score of 0. Percentage accuracy scores were then calculated for each participant individually. Responses containing non-explicit adjectives like *verde* 'green', *gris* 'gray', *violeta* 'purple' and *azul* 'blue', the distractor items, were excluded from the analysis as they do not allow us to investigate agreement with adjectives, or the difference between lexical versus agreement errors.

Results

Overall accuracy

We computed overall accuracy on gender marking in determiners and in adjectives. The native speakers performed at ceiling with gender marking on the 48 target stimuli phrases; that is, 100% accuracy. As a result, statistical comparisons were only performed between the two experimental groups – the heritage speakers and L2 learners – and by the four within-participants variables manipulated: noun type (simplex vs diminutive), domain of agreement (determiner vs adjective), canonicity or noun ending (canonical ending vs non-canonical) and noun gender (masculine vs feminine) in a factorial ANOVA with repeated measures and written proficiency as a covariate.

Consistent with our main hypothesis and the results of previous studies relying on oral tasks, the heritage speakers were overall more accurate on gender marking ($M = 95.32$, $SE = 1.57$) than the L2 learners ($M = 83.3$, $SE = 1.38$), as revealed by a main effect for group ($F(1,63) = 22.09$, $p = .0001$). There was also a main effect for gender ($F(1,63) = 4.37$, $p < .05$), as both groups were more accurate on masculine nouns ($M = 96.32$, $SE = .69$) than on feminine nouns ($M = 84.37$, $SE = 1.86$). Proficiency measured by the written task was not significant ($F(1,63) = .40$, $p = .52$) nor did it interact with other variables. The predicted interaction between canonicity or noun ending and group was highly significant ($F(1,63) = 23.95$, $p < .0001$), but the interaction between noun type (simplex-diminutive) and group was not significant ($F(1,63) = .20$, $p = .827$). The following interactions were also significant: gender by domain of agreement by group ($F(1,63) = 8.63$, $p = .005$), gender by noun type by group ($F(1,63) = 5.39$, $p = .023$) and gender by canonicity by noun type by group ($F(1,63) = 8.61$, $p = .005$).

To follow up on the interactions, repeated measures ANOVAs were conducted separately for each group. The two groups were more accurate on canonical than on non-canonical ending nouns, but the L2 learners were significantly more affected by

canonicity (a difference of 25.5%) than were the heritage speakers (a difference of 6.9%), as shown in Table 5. The effect for canonicity in the separate ANOVAs was significant for the L2 learners ($F(1,35) = 4.85$, $p = .039$) but not for the heritage speakers ($F(1,28) = .015$, $p = .90$).

The significant interaction of gender (masculine vs feminine) by domain of agreement (determiner vs adjective) by group indicated that the L2 learners were more accurate on the gender of determiners than on gender agreement with adjectives, especially with feminine nouns. The repeated measures ANOVA performed on the L2 learners indicated that the difference was marginally significant ($F(1,37) = 3.11$, $p = .068$). The repeated measures ANOVA performed on the heritage speakers revealed that they were equally accurate with gender agreement on both determiners and adjectives ($F(1,27) = .03$, $p = .958$), as shown in Table 6.

The four-way interaction of gender by canonicity by noun type by group is summarized in Table 7 (canonical nouns) and Table 8 (non-canonical nouns). In Table 7 we see that accuracy on canonical ending nouns was quite high and uniform between groups. Whether a noun was in simplex or diminutive form did not affect accuracy on

Table 5. Mean percentage accuracy on gender agreement by noun ending and group (standard errors appear in parentheses).

Groups	n	Noun ending	
		Canonical	Non-canonical
Spanish heritage speakers	29	98.8 (.65)	91.9 (2.88)
L2 learners of Spanish	37	98.0 (.58)	72.5 (2.54)

Table 6. Mean percentage scores by gender and domain of agreement by group (standard errors appear in parentheses).

Groups	n	Masculine nouns		Feminine nouns	
		Determiner	Adjective	Determiner	Adjective
Spanish heritage speakers	29	99.9 (1.16)	99.9 (1.04)	90.8 (2.73)	90.9 (3.13)
L2 learners of Spanish	37	93.7 (0.91)	91.7 (1.02)	79.9 (2.40)	75.8 (2.75)

Table 7. Mean percentage scores on canonical ending nouns by gender and noun type by group (standard errors appear in parentheses).

	n	Canonical masculine nouns		Canonical feminine nouns	
		Simplex	Diminutive	Simplex	Diminutive
Spanish heritage speakers	29	100 (–)	99.9 (.56)	97.5 (1.30)	97.9 (1.60)
L2 learners of Spanish	37	99.6 (1.91)	98.9 (.49)	96.9 (1.15)	96.4 (1.44)

Table 8. Mean percentage scores on non-canonical ending nouns by gender and domain of agreement by group (standard errors appear in parentheses).

	n	Non-canonical masculine nouns		Non-canonical feminine nouns	
		Simplex	Diminutive	Simplex	Diminutive
Spanish heritage speakers	29	99.0 (1.91)	100 (–)	82.3 (5.25)	85.5 (5.20)
L2 learners of Spanish	37	88.5 (1.68)	83.6 (2.25)	56.5 (4.58)	61.6 (4.86)

gender agreement with these nouns. By contrast, the accuracy scores on non-canonical ending nouns shown in Table 8 were lower, especially with feminine nouns. The difference between accuracy on gender with simplex as opposed to diminutive nouns was not significant for the heritage speakers ($F(1,27) = 1.30$, $p = .264$). For the L2 learners, the accuracy patterns differed depending on noun type, but on non-canonical nouns only. The L2 learners were descriptively more accurate on non-canonical feminine diminutive nouns than on their simplex counterparts, although the statistics did not reach significance ($F(1,37) = 3.02$, $p = .091$) and showed the opposite pattern with masculine nouns (i.e. more accurate on simplex than on diminutive forms) ($F(1,37) = 4.11$, $p = .050$).

To summarize, our results show that both heritage speakers and L2 learners are more accurate on gender with masculine nouns than with feminine nouns. This result was expected and consistent with previous findings that learners with non-native knowledge of the language tend to overextend the default (unmarked) gender, masculine in this case, and, thus, be less accurate on feminine nouns, which are marked for gender in the lexicon.

In addition, the results of the present study show that, while heritage speakers and L2 learners performed almost at ceiling on canonical ending nouns, their performance was significantly less accurate on non-canonical nouns. Crucially, however, the heritage speakers showed a clear quantitative advantage with respect to the L2 learners, as they were more accurate with gender overall in this task, and with gender on non-canonical ending nouns than the L2 learners. This suggests that, as they were growing up, and among other factors, diminutives in the input may have facilitated gender agreement acquisition for the heritage speakers by providing more instances of morphophonological regularities and by reducing the frequency of non-canonical nouns in the input. At the same time, since non-canonical ending nouns are a minority in the input as compared to regular nouns, amount of input may contribute as well.[7]

Finally, it is important to note that this pattern of results held constant across noun type: our participants were equally less accurate on feminine nouns and on non-canonical ending nouns on both the simplex and the diminutive conditions. Diminutives did not confer on our heritage speaker participants, advantages on gender agreement in production in the magnitude reported in previous studies with younger children (Kempe et al., 2003; Ševa et al., 2007). If such advantage ever existed in childhood for heritage speakers as well, it did not carry on into adulthood.

Error analysis

The group analysis just presented revealed that both the Spanish heritage speakers and the L2 learners of Spanish of intermediate to advanced proficiency made gender errors in oral production, unlike the native speakers. Quantitatively speaking, the heritage speakers are better. Our next question is whether the types of errors that the two groups make are similar or different. In addition to looking at types of gender marking errors, we will first look closely at errors with diminutives. As per our hypothesis, heritage speakers should be more accurate at producing both diminutive affixes and gender marking than L2 learners, who had less experience with diminutives to begin with.

Errors with diminutives

Figure 2 shows the types of errors with diminutives, which were of two main types. In many cases, participants were prompted to use the diminutive but produced the simplex form instead. The four errors produced by the native speakers (100%) were of this type. The other type of error was the use of the wrong form of the diminutive morpheme. That is, participants would use an augmentative or the wrong diminutive allomorph, as in *crucita for crucecita, *panito for pancito, *pecito for pececito, *tigrite for tigrecito, *llavita for llavecita, and so on. Some of these also had the wrong gender, such as *redito for redecita or *pecita for *pececito, but we do not take gender errors into account in the analysis. If the presence of diminutive affixes in the input facilitates acquisition of gender in general because they aid learners in recognizing morphophonological gender cues (Kempe and Brooks, 2001), then knowledge of and ability to produce diminutives may be related to overall accuracy on gender agreement and to non-canonical nouns in particular. We note that the native speakers did not make a single error with gender marking, but made four errors out of the 552 total with diminutives (less than 1%). The heritage speakers made 7.04% errors with diminutives (47/667) and 5.08%
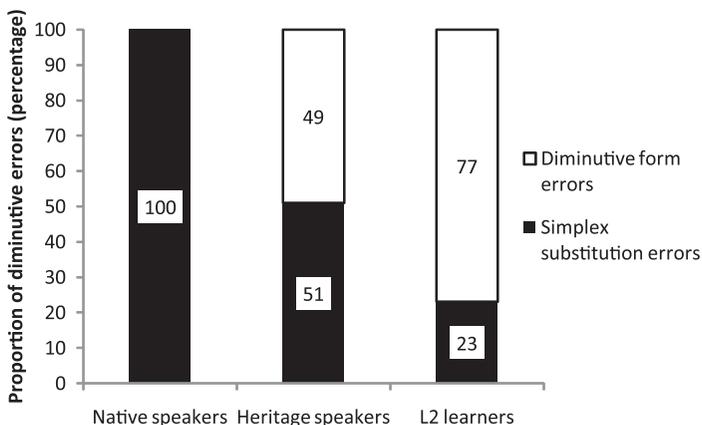

Figure 2. Proportion of errors with diminutives.

errors with gender marking (67/1318); the L2 learners made significantly more errors with diminutive affixes (158/851 = 18.5%) and with gender marking (296/1694 = 17.4%) than the heritage speakers (Mann–Whitney U for diminutives and for gender agreement both $p < .0001$). As Figure 2 shows, errors with diminutive forms were more common in the L2 learners (77%) than in the heritage speakers (49%) (Mann–Whitney $U = p < .0001$), suggesting that the L2 learners are much less familiar than the heritage speakers with Spanish diminutives overall. Figure 3 shows the non-gender-related errors with diminutive nouns by noun canonicity and gender.

A factorial ANOVA revealed a main effect for group ($F(1,63) = 20.29$, $p < .001$), for noun gender ($F(1,63) = 12.848$, $p < .001$) and for canonicity of noun ending ($F(1,63) = 74.532$, $p < .001$), as well as significant canonicity by group and gender by canonicity interactions, both at $p < .001$. The L2 learners were significantly more likely to produce a simplex form or a diminutive affix error with non-canonical nouns than with canonical nouns ($F(1,37) = 6.21$, $p = .017$), and were more inaccurate with feminine non-canonical nouns than masculine non-canonical nouns ($F(1,37) = 6.31$, $p = .017$). For the heritage speakers, the canonicity by gender interaction was also significant ($F(1,28) = 10.54$, $p = .003$). When heritage speakers failed to provide the diminutive or made diminutive errors, these mostly occurred with non-canonical ending feminine nouns. Masculine non-canonical nouns were not affected. Thus, although the two groups show an apparently different distribution of diminutive errors depending on gender and canonicity, they both had difficulty with forming the diminutive and adding the correct word marker of non-canonical feminine nouns, the nouns that are most problematic for gender agreement (including for young children, as in Ševa et al., 2007).

Gender errors

Recall that in producing gender marking, errors could occur at the level of lexical assignment, typically inferred from the determiner (*la_F *coche*$_F$ *vieja*$_F$ 'the old car'),
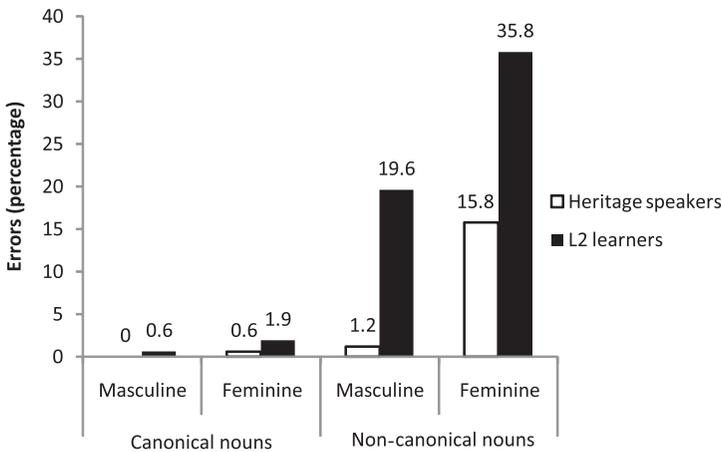

Figure 3. Mean percentage errors with diminutives by gender and canonicity of nouns.

or at the level of gender agreement in the syntax, as evidenced from the gender of the adjective (* el_M $coche_M$ $vieja_F$ 'the old car'). Errors of mismatch of determiner–noun and adjective are ambiguous (* la_F $coche_M$ $viejo_M$ 'the old car'). We analysed all errors produced by the two experimental groups by looking at agreement within each noun phrase (simplex and diminutive) and calculated the proportion of these types of errors by group.

The results in Figure 4 show that the vast majority of errors in the heritage speakers (84%) and in the L2 learners (78%) are assignment errors, followed by agreement errors – about 15% in each group. Two independent Mann–Whitney U tests were performed on the number of errors per group to test whether the proportion of each error type was significantly different between groups. Although the heritage speakers made fewer errors than the L2 learners overall, they made comparatively more assignment errors than the L2 learners (84% vs 76%) (Mann–Whitney U, $p < .0001$). In both groups, these errors also affected more non-canonical than canonical nouns, and within non-canonical nouns, feminine nouns were subject to more errors than masculine nouns. The proportion of errors that fell within the agreement category was comparable in the two groups (Mann–Whitney U, $p = .82$). Ambiguous errors were almost non-existent in the heritage speakers (1%) and very few in the L2 learners (7%). If ambiguous errors are computed as part of agreement errors as we did in a previous study, then it is clear that L2 learners make more agreement errors than the heritage speakers (16% vs 22%).

Finally, we looked at the percentage of participants in each group who made gender errors. We found that none of the native speakers produced gender errors, and that all of the L2 learners (100%) produced at least one gender error. Figure 5 shows that, among the heritage speakers, 19 (65%) of them did not make any gender errors either, behaving in this task like the native speakers. This last analysis reveals there is a wide range of variation among heritage speakers: some have native-like ability in oral production, while others have more unstable knowledge of the language, like that of an L2 learner.
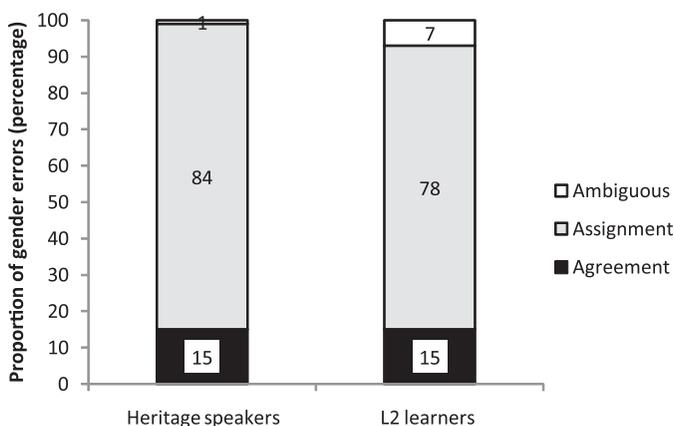

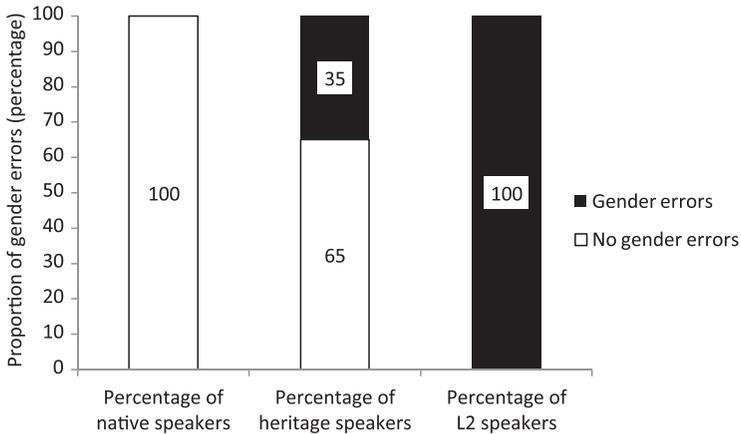**Figure 4.** Proportion of gender errors by group.

Figure 5. Percentage of participants in each group who produced gender errors.

Discussion

The purpose of this study was to ascertain whether Spanish heritage speakers show more native-like performance with gender agreement in oral production than proficiency-matched L2 learners of Spanish, and whether such an advantage could be accounted for in terms of timing of input and type of linguistic experience, which are confounded with age of acquisition. In order to investigate this question we focused on type of input by manipulating a feature of Child Directed Speech – diminutive affixes – that would favor the performance of the heritage speakers. Accordingly, we designed an oral elicitation task that tested the interaction of gender and diminutive formation with canonical and non-canonical ending nouns, given that diminutives have been shown to facilitate acquisition of gender agreement with non-canonical ending nouns in several languages (Savickienė and Dressler, 2007; Ševa et al., 2007). Another goal of this study was to examine the type of gender errors in the two types of learners.

The native speakers who acted as baseline were 100% accurate on gender. We found that the heritage speakers were significantly more accurate than the L2 learners producing gender in general. In fact, 65% of the heritage speakers showed native-like performance on gender agreement in this task (that is, a complete lack of gender errors), whereas not a single L2 learner did. The finding that heritage speakers are more native-like than L2 learners is of course consistent with an age of acquisition effect: the heritage speakers were exposed to Spanish since birth, while the L2 learners began exposure after age 11. Furthermore, the heritage speakers may have received more exposure to Spanish in general, even if they underwent attrition due to reduced input later on. Yet age effects and amount of early input do not explain why proficiency-matched heritage speakers do not outperform L2 learners in other tasks that do not involve oral production, as we report in a related study with the same participants (Montrul et al., in press).

We hypothesized that heritage speakers would be more accurate on gender and more familiar than L2 learners with diminutives, and our findings are consistent with this hypothesis.

   Note that according to the information provided in Table 3, the heritage speakers were exposed to Spanish primarily before age 5, when input with diminutives is more frequent. Input and use of Spanish decreased dramatically for most heritage speakers beyond elementary school. We acknowledge that the evidence linking diminutives with gender directly is not very strong in our study, but it is still possible to suggest that prior exposure and use of diminutives may have facilitated the heritage speakers' acquisition, retention and accuracy with gender marking, especially with non-canonical nouns. The morphophonological ambiguity of non-canonical nouns creates a problem for learners. But the availability of diminutives in the input facilitates gender learning by providing more instances of noun canonicity and aiding the learner in recognizing morphophonological gender cues. What we did not find with our adult participants, however, is a diminutive advantage during oral production. The heritage speakers (and the L2 learners) did not perform more accurately on gender agreement with non-canonical ending nouns when these were elicited in the diminutive as opposed to the simplex form. Therefore, production of diminutives does not necessarily improve gender agreement on the noun phrase as has been shown for Slavic children, probably because this may be a developmental stage in child acquisition, and heritage speakers now being adults no longer process morphological regularities online as young children (Kempe and Brooks, 2001). We are not aware of any experimental studies showing a diminutive advantage for diminutive forms during production in the L1 acquisition of Spanish, but if such an advantage existed earlier in childhood for the heritage speakers it may have been short-lived. To address this issue, we are expanding this line of research with younger monolingual and bilingual children in current work. In short, the fact that heritage speakers are better with the gender of non-canonical nouns than the L2 learners and are more familiar with diminutives than the L2 learners provides evidence that type of experience, not just age of acquisition, underlies some of the important differences between the two groups.

   When gender errors were made by the two groups, these conformed to the trends already established in several previous studies (Alarcón, 2011; Montrul et al., 2008; White et al., 2004). Errors were more frequent (a) with feminine than with masculine noun phrases, consistent with the idea that masculine is the default form in Spanish (Domínguez et al., 1999; Harris, 1991; McCarthy, 2008), and (b) with non-canonical than with canonical ending nouns, as shown in other studies of L1 and L2 acquisition (Alarcón, 2006, 2009; Fernández-García, 1999; Franceschina, 2001; Hernández Pina, 1984). With respect to domain of agreement, many studies have shown that L2 learners tend to be more accurate with gender agreement on determiners than on adjectives (Bruhn de Garavito and White, 2003) and so are heritage speakers (Alarcón, 2011), especially in oral production. In our study, this pattern only obtained with the L2 learners.

   Further evidence for the role of experiential factors in gender production comes from the error analysis we performed. We found that the overwhelming majority of errors were of the sort *un_M *nube* *blanco$_M$* 'a white cloud' (compare *una$_F$* *nube$_F$* *blanca$_F$*), which suggests that the noun *nube* may have been misclassified as masculine in the participant's mental lexicon because there is correct agreement between the determiner and the adjective. This finding, which is entirely consistent with the error patterns reported by Grüter et al. (2012) for advanced L2 learners of Spanish and by Alarcón (2011) for

both advanced L2 learners and Spanish heritage speakers in oral production, suggests that gender errors in advanced speakers have a lexical rather than a syntactic etiology.

We suggest that the quantitative differences between the two groups in oral production are related to their input experience, rather than to inability to represent the abstract gender feature in the syntax before and after the critical period (compare Carroll, 1989; Franceschina, 2001, 2005), although we note that many L2 learners still had problems with agreement. Simply put, the heritage speakers are better than L2 learners in oral production because they have been exposed to more aural input than the L2 learners. As adult learners, the L2 learners were primarily exposed to both visual and aural input in the classroom. Thus, in addition to having been more or less exposed to diminutives, the two groups also received different input in terms of modality, and this difference may have had an effect on their input processing experience and strategies. Indeed, several studies have also demonstrated that L2 learners are quite accurate on gender agreement in offline written tasks and in tasks that emphasize metalinguistic abilities (Alarcón, 2011; Grüter et al., 2012; Montrul et al., 2008; White et al., 2004), as predicted by the Missing Surface Inflection Hypothesis (Prévost and White, 2000). The Missing Surface Inflection Hypothesis states that problems with gender in L2 learners are strictly confined to lexical assignment and processing during oral production and are not a problem at the level of syntactic representation and computation of agreement. But this hypothesis cannot be easily extended to heritage speakers (Montrul, 2011b).

We believe that receiving input aurally versus visually greatly influences how gender agreement is processed and learned. When preliterate young children learn Spanish or any other language with gender, they hear sequences of determiners and nouns in the acoustic input and must identify nouns in the speech stream (through computations of transitional probabilities). In fact, very young monolingual and bilingual children produce their first nouns with a preverbal vowel (*e pie* 'the foot', *a queca* 'a doll', *u fo* 'a flower'; López Ornat, 1997), a protodeterminer according to Lleó (1998), which coincides with the vowels of gender-marked definite and indefinite determiners (*el*, *la*, *un*, *una*). These alleged unanalyzed chunks suggest that there is a very tight association between determiners and nouns in the lexicon, at least for native speakers. With more input and experience, the child later segments the chunk into determiner and noun. Lew-Williams and Fernald (2007a, 2007b, 2010) suggest that noun–gender associations are strong in the L1 lexicon as a consequence of early speech segmentation, although there is no direct evidence. In their studies of the visual world paradigm, they found that both adult native Spanish speakers and 3–4-year-old Spanish-speaking children use gender information in determiners to predict nouns during spoken word recognition.

Critically, second language acquisition around puberty is different. Instructed L2 learners at this age are exposed to visual input through reading and writing, in addition to aural input. They already know through their L1 that determiners and nouns are separate words and decompose the phrase from the beginning. Visual input in the second language reinforces this idea because there are spaces between words. Because visual input gives information about word boundaries, L2 learners do not need to rely as much on distributional properties and transitional probabilities to segment the acoustic stream and do not create these amalgams. We agree with the proposal put forth by Grüter et al. (2012) and supported by Montrul et al. (in press) and Hopp (this issue) that, as a result,

the association between noun–determiners and noun–gender in the lexicon is not very strong in the L2. It appears, then, that input modality affects language representation and processing and may explain why L2 learners are typically less sensitive to gender marking than native speakers. A logical follow-up study would be to test adult L2 learners who acquired the language in a naturalistic setting (and perhaps do not read much) to see whether age or modality of exposure explain their potential performance on these tasks as compared to instructed L2 learners and heritage speakers.

Although heritage speakers are child learners, many of them – but not all – make errors like L2 learners. This suggests that their noun–gender lexical associations may be stronger than in L2 learners but weaker than in mature native speakers. Sixty-five percent of the heritage speakers in the present study did not make a single agreement error, like the native speakers. It is likely that for the remaining 35%, reduced input and use of the minority language throughout the school-age period may have led to reduced frequency of use of nouns and their associated genders as they grew older. Gollan et al. (2008) proposed the 'weaker links hypothesis' to explain potential speed and accuracy differences between monolinguals and bilinguals in lexical access. Extending the weaker links hypothesis to the specific case of gender processing and production in heritage speakers, we can assume that gender–noun links may have been stronger in their childhood, but they may have also progressively weakened as their first language became the secondary language. Weaker links due to reduced frequency of exposure and use lead to slower retrieval of nouns in the lexicon and gender assignment errors like the ones we have observed. Indeed, the 19 heritage speakers who did not produce a single gender error, like the native speakers, had a mean naming latency in the Spanish picture-naming task of 1,030 ms, whereas the 10 heritage speakers who made gender errors had a mean naming latency of 1,262 ms – a 232 ms difference ($t(29) = 8.54$, $p < .0001$) – suggesting that their lexical retrieval is actually slower.

What remains to be explained is why irregularity of noun ending affects L2 learners and heritage speakers to such an extent. We have seen that L2 learners and heritage speakers are more accurate in tasks that use canonical ending nouns – and can even display at-ceiling performance – than when the tasks also use non-canonical ending nouns. Although gender is assigned in the lexicon, it does have an overt morphological expression in Spanish nouns, through the word markers -*a*, -*o*, -*e*, and consonant (Harris, 1991). Feminine -*a* and masculine -*o* are regular, the rest are irregular, and L2 learners and heritage speakers are certainly guided by these morphophonological cues when assigning gender to nouns. Due to the existence of non-canonical gender-marked nouns (outer core and exceptions for Harris, 1991), it is tempting to view the Spanish system of morphophonological gender marking in terms of a large class of regulars (inner core or canonical ending nouns) and a class of exceptions. If we assume the dual mechanism model of inflection (Pinker, 1999; Pinker and Prince, 1994; Pinker and Ullman, 2002), for example, regular morphological processes occur in procedural memory and irregularities are stored in declarative memory. Extending this approach to gender marking, once canonical ending nouns are learned, the gender of the noun is associated with the word marker and is automatized as a regular, decomposable, inflectional morpheme attached to the root or a base (if the root has a diminutive), stored in procedural memory and handled by rule when marking agreement (implicitly acquired in childhood by

heritage speakers and learned later but automatized through practice in L2 learners). Non-canonical ending nouns, by contrast, need to be memorized and stored in declarative memory because there are no transparent morphophonological rules from which to extract regularities. It could also be argued that the type of apparent morphological regularity represented by the canonical Spanish word markers is not the same as the regular inflectional rules for plural or past tense on which the dual mechanism model of inflection was based. If the problem of learning gender involves lexical links and probably not decomposition, then the dual mechanism model is not ideal to capture this phenomenon. However, the lexical feature linked to the noun does have a clear morphophonological exponent and – as Albright and Hayes (2003) demonstrated and as this study has also shown – adult native and non-native speakers are consistently more accurate with regular, canonical ending words handled by predictable rules.

We suggest that reduced input and use of Spanish by L2 learners and heritage speakers may affect storage in declarative memory. Although non-canonical nouns may be more difficult to learn and process even for native speakers (Domínguez et al., 1999; Hernández Pina, 1984), mature native speakers whose primary language is Spanish do not typically exhibit gaps with declarative memory because they use the language more frequently on a daily basis. Their lexical-association links remain strong for both canonical and non-canonical ending nouns (Gollan et al., 2008). This idea predicts that non-canonical ending nouns will be highly affected under L1 attrition in native speakers. In fact, Montrul's (2011a) study of an adult Guatemalan adoptee, who stopped using the language at about age 9, showed that the vast majority of gender errors produced by the participant in the case study were precisely with non-canonical ending nouns.

Another possibility is to assume a single associative model and suggest that lexical links between nouns and gender are weaker in L2 learners than in native speakers. And, although they are stronger in heritage speakers due to the type of input received in early childhood, they can also decay over time. This is true for all nouns, canonical and non-canonical. However, in comprehension and production, morphophonological cues in Spanish help activate/access the lexical gender node by virtue of phonological regularity for canonical nouns. For non-canonical nouns, there are no such cues. Eventually, these differences in cues will have a strengthening effect on the links between nouns and gender nodes in the lexicon, with canonical nouns having stronger links than non-canonical nouns, even though both may be stored and represented in the same way and in the same system. That is why canonical nouns are more easily accessible and less prone to attrition. These two theoretical possibilities remain to be teased apart with appropriate lexical and morphological priming experiments with the two groups of learners.

Conclusions

Our study suggests that although both L2 learners and heritage speakers make gender agreement and assignment errors as compared to native speakers who have full command of the language and use it frequently, heritage speakers display more native-like patterns than L2 learners in oral production. This is due to a large extent to differences in language learning experience, including among other things amount of input in childhood and exposure to diminutives, which were likely available to heritage speakers

during Child Directed Speech but are not common in the input L2 adults receive. Although L2 learners are able to develop sensitivity to gender agreement with canonical-ending nouns, and may even attain similar mental representations of gender as a syntactic property, gender assignment at the lexical level is a feature that is very difficult to master at the level of native speakers, and the difficulty may lie in the cumulative experience with the language, the type of input, timing of input and the type of input processing that goes with it.

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Notes

1. The diminutive does not change the form of feminine nouns ending in *-o* (*la moto*, *la motito* 'the motorcycle') or masculine nouns ending in *-a* (*el fantasma*, *el fantasmita* 'the ghost/the ghosty').
2. Not all adjectives show gender agreement either, depending on their morphophonological form. If we take just the example of colors, the colors *negro/a* 'black', *blanco/a* 'white', *rojo/a* 'red' and *amarillo/a* 'yellow' can be inflected in the feminine or masculine form, but those ending in 'e' such as *verde* 'green', *celeste* 'light blue' or in a consonant *azul* 'blue' cannot be visibly inflected for gender and remain invariant (*el auto celeste/azul* 'the car light blue/blue', *la luz verde/azul* 'the light green/blue').
3. What is conceived as a rule of inflectional morphology for generative approaches (e.g. verb + *ed*) is an abstract schema that emerges gradually across numerous stored types and concatenations in the lexicon. Schemas emerge from specific lexical collocations but remain linked to them. Thus, for the item-based approach there is conflation of abstract form and morphophonological knowledge.
4. In addition to nouns, adjectives and adverbs can also appear in the diminutive in Spanish.
5. Even though the focus of our study was on oral production, we also administered a written proficiency test to the two experimental groups, the same test used in Montrul et al. (2008). The maximum score on this test was 50, and the two groups scored in the range of 30–48 (intermediate and advanced). The mean for the heritage speakers was 41.51 (*SD* = 4.57) and the mean for the L2 learners was 38.21 (*SD* = 4.57), which were significantly different on an independent samples *t*-test ($t(64) = 2.54$, $p < .013$). Yet, when we entered proficiency as a covariate in the statistical analysis of the main task, it was not significant, nor did it interact with any of the other within-participants variables.

6. Word frequency was calculated as the absolute number of occurrences in a written corpus of approximately 2,000,000 words from 606 texts of various literary styles: novels, newspapers, essays and scientific or technical books.

7. An anonymous reviewer pointed out that insensitivity to stress assignment, which is common in L2 speakers who are not advanced, may also contribute to less accuracy with gender and diminutives. That is, although diminutives regularize stress, L2 learners may not be sensitive to this cue. A recent study by Kim (2012) shows that heritage speakers have native like perception of stress in Spanish, whereas proficiency-matched L2 learners do not.

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Appendix 1. Items and target responses expected in the oral elicitation task.

	Simplex		Diminutive
Masculine canonical:			
Target items	un caballo rojo	(a red horse)	un caballito rojo
(Explicit adjective)	un pato negro	(a black duck)	un patito negro
	un barco blanco	(a white boat)	un barquito blanco
	un cerdo rojo	(a red pig)	un cerdito rojo
	un gato negro	(a black cat)	un gatito negro
	un perro blanco	(a white dog)	un perrito blanco
Distracter items	un espejo azul	(a blue mirror)	un espejito azul
(Non-explicit adjective)	un gallo gris	(a grey rooster)	un gallito gris
	un cuchillo verde	(a green knife)	un cuchillito verde
	un pájaro violeta	(a purple bird)	un pajarito violeta
	un libro gris	(a grey book)	un librito gris
	un toro azul	(a blue bull)	un torito azul
Feminine canonical:			
Target items	una tortuga roja	(a red turtle)	una tortuguita roja
(Explicit adjective)	una estrella amarilla	(a yellow star)	una estrellita amarilla
	una flecha negra	(a black arrow)	una flechita negra
	una trompeta blanca	(a white trumpet)	una trompetita blanca
	una casa roja	(a red house)	una casita roja
	una puerta blanca	(a white door)	una puertecita/puertita blanca

Appendix I (Continued)

	Simplex		Diminutive
Distracter items	una rana violeta	(a purple frog)	una ranita violeta
(Non-explicit adjective)	una vaca violeta	(a purple cow)	una vaquita violeta
	una mariposa azul	(a blue butterfly)	una mariposita azul
	una maleta violeta	(a purple suitcase)	una maletita violeta
	una manzana azul	(a blue apple)	una manzanita azul
	una pelota verde	(a green ball)	una pelotita verde
Masculine non-canonical:			
Target items	un sobre negro	(a black envelope)	un sobrecito negro
(Explicit adjective)	un tigre rojo	(a red tiger)	un tigrecito rojo
	un elefante amarillo	(a yellow elephant)	un elefantito amarillo
	un lápiz blanco	(a white pencil)	un lapicito blanco
	un corazón amarillo	(a yellow heart)	un corazoncito amarillo
	un pez amarillo	(a yellow fish)	un pececito amarillo
Distracter items	un cisne verde	(a green swan)	un cisnecito verde
(Non-explicit adjective)	un guante verde	(a green glove)	un guantecito verde
	un cohete gris	(a grey rocket)	un cohetito gris
	un pan gris	(a grey bread)	un panecito/pancito gris
	un jabón gris	(a grey soap)	un jaboncito gris
	un tenedor violeta	(a purple fork)	un tenedorcito violeta
Feminine non-canonical:			
Target items	una serpiente roja	(a red snake)	una serpientita roja
(Explicit adjective)	una fuente amarilla	(a yellow fountain)	una fuentecita amarilla
	una torre negra	(a black tower)	una torrecita negra
	una nariz amarilla	(a yellow nose)	una naricita amarilla
	una cruz negra	(a black cross)	una crucecita negra
	una flor blanca	(a white flower)	una florcita/florecita blanca
Distracter items	una llave violeta	(a purple cross)	una llavecita violeta
(Non-explicit adjective)	una hélice azul	(a blue propeller)	una helicita azul
	una pirámide gris	(grey pyramid)	una piramidecita gris
	una red verde	(a green net)	una redecita verde
	una luz verde	(a green light)	una lucecita verde
	una nuez azul	(a blue walnut)	una nuececita azul

Note: Spanish nouns and their English equivalents were used in the two picture-naming tasks.