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Heritage and L2 processing of person and number features: Evidence from Spanish subject-verb agreement

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ABSTRACT

EN This article reports on a study, with online measures, which investigated the processing of subject–verb (SV) agreement sentences by one group of heritage Spanish speakers (HSs), two groups of L2 learners of Spanish (L1 English) and one group of traditional Spanish native speakers. Experimental SV sentences manipulated person and number features with subjects and verbs in the present tense. Between-group statistical analyses indicated differential processing between the heritage and the L2 groups. The heritage group's performance was more native-like than the L2 participants. Within-subject tests showed some similar patterns between heritage and L2 high-level processing, including delayed sensitivity to ungrammaticality after the verb region. We argue that the HSs were able to process basic grammar structures, just as traditional native speakers do. This suggests early bilingualism conferred an advantage to HSS when compared to L2 learners, in the control of basic agreement in Spanish.

Key words: ONLINE PROCESSING, VERBAL FEATURES, SV SENTENCES, HERITAGE LANGUAGE.

ES El artículo presenta a los lectores un estudio con resultados medidos en línea y dirigido a investigar el procesamiento de oraciones de tipo sujeto-verbo (SV) por parte de un grupo de hablantes de español como lengua de herencia (LH), dos grupos de aprendientes de español como L2 (con inglés como L1) y un grupo tradicional de hablantes nativos de español. Las oraciones experimentales de tipo SV combinaban aspectos de persona y número con diversos sujetos y verbos en presente. Los análisis estadísticos entre los distintos grupos mostraron un procesamiento diferenciado entre los grupos de español LG y español L2. El grupo de herencia mostró un comportamiento más cercano al nativo que al de español como L2. Las pruebas entre sujetos dieron como resultado una cierta similitud de patrones entre los grupos de herencia y de L2 con un nivel alto de procesamiento. Ambos grupos mostraron una sensibilidad diferida frente a la agramaticalidad tras el grupo verbal. Se concluye que el grupo de LH ha sido capaz de procesar estructuras gramaticales básicas tal y como lo hacen los hablantes nativos, lo cual sugiere que su bilingüismo a edades tempranas les confiere una ventaja con respecto a los aprendientes de L2 a la hora de controlar la concordancia básica en español.

Palabras clave: PROCESAMIENTO EN LÍNEA, ASPECTOS VERBALES, ORACIONES DE TIPO SV, LENGUA DE HERENCIA.

IT L'articolo riporta i risultati di uno studio realizzato con misurazioni online, volto a valutare la capacità di elaborare frasi concordate soggetto-verbo (SV) da parte di un gruppo di parlanti spagnolo come lingua ereditaria (HSs), due gruppi di studenti di spagnolo come lingua seconda (con inglese L1) e un gruppo di ispanofoni nativi tradizionali. Le frasi SV prese in esame combinavano la concordanza della persona e del numero con soggetti e verbi al tempo presente. Le analisi statistiche tra i gruppi hanno evidenziato un diverso modo di elaborare le frasi tra il gruppo ereditario e i gruppi di lingua seconda. Il gruppo ereditario si è comportato più spesso come i parlanti nativi rispetto agli apprendenti di spagnolo come lingua seconda. I test *within subjects* hanno evidenziato comportamenti simili nell'elaborazione di alto livello tra parlanti ereditari e apprendenti di lingua seconda. Entrambi i gruppi avevano una minore capacità di riconoscere la scorrettezza grammaticale dopo il gruppo verbale. Si conclude che gli HSs siano stati in grado di elaborare strutture grammaticali di base, proprio come i parlanti nativi tradizionali. Questo sembra indicare che il bilinguismo precoce li abbia avvantaggiati nel controllare la concordanza di base in spagnolo rispetto agli apprendenti di lingua seconda.

Parole chiave: ONLINE PROCESSING, COMPETENZE ORALI, FRASI SV, LINGUA EREDITARIA.

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1. Background and motivation for a formal study

1.1 Introduction

Contrasting the grammatical knowledge of heritage speakers (HSs) of any language with the one held by native speakers and L2 learners has raised interest among linguists in recent years (Cuza & Frank, 2015; Keating, VanPatten, & Jegerski, 2011; Montrul, 2010, 2013; Montrul & Bowles, 2009; Montrul & Perpiñán, 2011; Pascual y Cabo & Gómez Soler, 2015; Potowski, Jegerski, & Morgan-Short, 2009; Rothman, 2007, among others). These studies have hinted that HSs may have different linguistic preferences that set them apart from traditional native speakers and L2 groups.

HSs have had different linguistic experiences. They are functional individuals in the native language of one or both parents (Valdés, 2000). Therefore, they are accustomed to a bilingual environment from childhood, and at one point become dominant in the majority language of the home country (Benmamoun, Montrul, & Polinsky, 2013; Montrul, 2009). However, they still communicate quite at ease in the household language with friends and extended relatives at all times.

Montrul (2009) has commented on the vast proficiency range a single group of HSs may display (low, intermediate, advanced, native-like proficiency). Some of these differences may be due to differential literacy levels in the heritage language (Rothman, 2007). Even if raised at home in a language other than English, and with formal instruction in the dominant language, HSs show a great deal of variability in their development. Heritage L1 grammatical systems may have undergone either incomplete acquisition, loss of forms (attrition) or linguistic contact acquisition (Potowski et al., 2009), or any combination of the three, all of which lets us conclude that grammatical knowledge in HSs is more heterogeneous than the one held by other groups.

Learning the home language at such an early age seems to hold advantages for HSs with regards to late bilinguals. Rich and continuous input in the home language may grant HSs skills to resolve grammatical ambiguity (Cuza & Frank, 2015; Keating et al., 2011; Montrul, 2010; Montrul et al., 2014) for some structures acquired very early in childhood. This advantage may hold only for certain grammatical structures of the L1.

The role of bilingualism onset age in the development of grammatical linguistic representations in groups of HSs has been discussed by many (Cuza & Frank, 2015; Montrul et al., 2008; Perpiñán, 2008, among others). These authors have converged on the idea of a heritage speaker advantage with regards to late bilinguals. In particular, either for syntactically ambiguous structures or basic Spanish agreement, HSs may have linguistic representations already in place by the time they reach the same age of their L2 counterparts.

It is possible that HSs went through some of the same stages of L1 acquisition (Montrul, 2011) when compared to traditional native Spanish speakers. However, as HSs begin their formal schooling in the majority language—around the age of 5—or school entrance, their linguistic development takes a different course from the path followed by traditional monolingual speakers of any language. HSs remain bilinguals, but with formal instruction in the social dominant language, and with various degrees of oral and written proficiency in their L1 (Benmamoun et al., 2013); HSs cannot be seen as traditional native speakers.

This study will report on the on-line processing of SV sentences by a group of HSs, two groups of second language learners, and a group of traditional native Spanish speakers. The L2 Spanish learners had English as an L1. The article will review recent literature on the grammatical knowledge of HSs and how they have performed in contrast to other L1 and L2 groups in off-line and on-line tasks. We will describe the experiment in question and discuss its results. We will outline some pedagogical implications concerning grammatical instruction of heritage groups and present suggestions for further research.

1.2 Differential heritage knowledge

Research on heritage linguistic knowledge is relatively recent, but some studies offer interesting findings in terms of the linguistic domain(s) explored and the kinds of experimental tasks presented. In the area of phonology, HSs usually display superior skills in their home language, though not necessarily at native-like levels (Au, Knightly, Jun, & Oh, 2002). HSs may exhibit different levels in heritage speech that connect to the quality of prior interactions and experiences in the home language. Language experience certainly plays a role in attempting to define heritage linguistic knowledge.

HSs at lower proficiency, and with less oral practice growing up, have not mastered all phonological aspects (sounds, syllables, intonation) at the native-level (Au et al., 2002). However, in Au et al.'s study, this finding did not hold consistently among all HSs. For example, there were no significant differences in how the group of Spanish HSs produced voiceless stops when compared to traditional Spanish native speakers. In all, HSs were found to be not homogenous as a group in their phonological skills.

Turning to morphology and the comprehension of person and number features in Spanish, HSs seem to display particular preferences which set them aside from other groups as well. In interpreting null subjects, for example, HSs do not necessarily behave like Spanish native speakers at all times. Native Spanish speakers tend to resolve complex anaphoras by linking the *pro* element to an antecedent in the specifier (Spec) of the inflection phrase (IP). Overt pronouns tend to be associated with lower antecedents in the clause. Keating et al. (2011) investigated null/pronominal subject resolution and antecedent linking in Spanish in HSs and L2 learners. They contrasted their responses with Spanish L1 native speakers using an offline questionnaire and comprehension questions, as in (1 a-b) and (2):

1) a.

Daniel	ya no	ve	a Miguel	desde	**que**	se casó.
Daniel	no longer	see – 3rd Pers Sing	Miguel	since	Pro Null	got married - 3rd Pers Sing Preterite

Daniel no longer sees Miguel ever since (he) got married.

b.

Daniel	ya no	ve	a Miguel	desde	que	**él**	se casó.
Daniel	no longer	see – 3rd Pers Sing	Miguel	since	Null 3rd Pers Sing	he	got married - 3rd Pers Sing Preterite

Daniel no longer sees Miguel ever since he got married.

2)

¿Quién	se	casó?
Who	REFL 3rd Pers Sing	got married – 3rd Pers Sing Preterite

Who got married?

A. Daniel B. Miguel

The authors concluded the participating groups had adopted differential assignment strategies. The group of HSs displayed subject bias for overt pronouns only, while the L2 learners did not show any specific subject bias treating both overt and null pronouns as in free variation. As expected, the native speakers linked all anaphora (pro) to noun in [Spec, IP] position (i.e., *Daniel* in the previous examples). Keating et al. (2011) concluded the HSs had not behaved exactly like native speakers displaying a subject preference for overt pronouns only (not pro).

As bilingual native speakers, however, HSs may well display a range of null assignment strategies based on prior linguistic experiences. Their preference for overt pronouns in the Keating et al. (2011) study could be a result of bilingualism or the influence of English as formal language of instruction through school years. Even in L1 Spanish, preferences for overt pronouns may also change from one dialect to another. Ordoñez and Olarrea (2001) and Toribio (1993) offer a discussion on the overt second person singular pronoun in some Caribbean dialects.

It is possible that HSs may resort to linguistic contact acquisition experiences in selecting one of these preferences. We agree with Beaudrie (2005) that HSs represent many home language registers. In Spanish, some of these account for standard varieties of the language, while other registers may account for non-standard varieties. In sum, depending on specific linguistic experiences of the past, HSs do not necessarily have to choose the same options as traditional native speakers when judging structures.

1.3 Asymmetric relationship in heritage oral and written skills

HSs usually perform well when presented with oral tasks (Bowles, 2011; Montrul & Polinsky, 2011). They may display superior oral skills, similar to those of native speakers. Performing better orally may be traced to the particular modality of heritage language learning; oral form in a naturalistic context. In administering oral and written tasks to HSs, Montrul (2011) investigated morphological variability (gender agreement) in Spanish HSs and L2 learners with oral picture description, oral narratives, and un-timed written recognition tasks. An example of Montrul's (2011) recognition task is seen in (3), where the correct answer is option B:

3)	No	quiero	llevar	**las**	_____	de ese color.
	Not	want – 1st Pers Sing Pres	take	the – Direct Object FEM Pl		of that color

I don't want to take the ones of that color.

A. Bufanda *Scarf* B. Maletas *Suitcases* C. Pantalones *Pants*

In contrasting the performance of the HSs and the L2 Spanish learners, Montrul (2011) concluded that HSs were more accurate in oral tasks. For the L2 learners it was quite the opposite. They made more frequent errors in oral than in written production. Montrul (2011) pointed at heritage context of acquisition (naturalistic/at home) and variant of acquisition (aural input) as having a role in how the HSs of her study performed. Written task effects in the HSs could have been related to how heritage literacy skills in Spanish became second to literacy skills in English at one point, as HSs transitioned into English formal instruction around school entry age.

When looking at the acquisition of mood and aspect in written tasks, HSs evidence a complex acquisition pattern. Montrul (2009) compared HSs and Spanish native speakers on oral/written production and sentence judgment tasks. This study included the preterite-imperfect dichotomy, as in (4 a-b). In one condition the imperfect was logical (4a) and the preterite contradictory (4b). In the other condition, the opposite occurred. The second study in Montrul (2009) tested the indicative-subjunctive distinction. In one condition, the indicative was logical (5a) and the subjunctive contradictory (5b).

4)	a.	Los González	**vendían**	la casa,	pero nadie	la	compró.		*Imperfect (logical)*
		the González	sell – 3rd Pers Pl Imperfect	the house	but nobody	it	buy - 3rd Pers Sing Preterite		

The González family was selling the house but nobody bought it.

b.	*Los González	**vendieron**	la casa,	pero nadie	la	compró.		*Preterite (contradictory)*
	the González	sell – 3rd Pers Pl Preterite	the house	but nobody	it	buy - 3rd Pers Sing Preterite		

**The González family sold the house but nobody bought it.*

5)	a.	Cada año	Ana	se	alegra	cuando	le	aumentan	el sueldo.	*Indicative (logical)*
		every year	Ana	REFL – 3rd Pers Sing	rejoice	when	Indirect Object - 3rd Pers Sing	raise – 3rd Pers Pl Indicative	the salary	

Every year Ana rejoices when they raise her salary.

a.	*Cada año	Ana	se	alegra	cuando	le	**aumente n**	el sueldo.	*Subjunctive (contradictory)*
	every year	Ana	REFL – 3rd Pers Sing	rejoice	when	Indirect Object - 3rd Pers Sing	raise – 3rd Pers Pl Subjunctive	the salary	

**Every year Ana rejoices when they raised her salary.*

When reporting on group differences, Montrul (2009) concluded the HSs had better command of *tense-aspect* with regards to *mood* control. Results were also consistent with the Interface Hypothesis (Tsimpli & Sorace, 2006) given the complexity of mood versus aspect. In Spanish, in particular, mood is difficult to master. As HSs have not undergone formal grammatical training in Spanish, they may have retained some verbal categories, but not all of them. Most likely, they may have retained less complex ones (Benmamoun et al., 2013).

In spite of differential rates in heritage oral and written skills, HSs traditionally perform in more target-like ways than L2 groups, even when presented with written acceptability judgment tasks. Montrul (2010) tested a group of HSs and another group of L2 learners on clitic pronouns and word order on the "grammaticality" of clitic simple sentences, such as (6) and (7):

6)	Juan	**lo**	mira	todos los días.	*Pre-verbal (grammatical)*
	Juan	it – Clit 3rd Pers Sing	watch – 3rd Pers Sing Present	every day	
	Juan watches it every day.				

7)	*Juan	mira**lo**	todos los días.	*Post-verbal (ungrammatical)*
	Juan	watch – 3rd Pers Sing Present it – Clit 3rd Pers Sing	every day	
	Juan watches it every day.			

Montrul (2010) concluded that even HSs of low proficiency had an advantage compared to L2 learners matched in proficiency. Early exposure and richness of input seemed to have contributed to the superiority of the heritage group in the acceptability judgments. If HSs were exposed to the home language since birth, it is possible that they have retained qualities of that initial language exposure.

As seen in these studies, HSs and L2 learners do differ in their performance across various tasks, which suggests they could benefit from differential curricular instruction. We have undertaken our study to shed light on these differences and to contribute to HS pedagogy (see end of Section 5 for additional discussion). We have adopted an on-line task not only because it would trigger unconscious responses from participants (see next section), but also because it would mirror real pressures of classroom instruction. In the context of the classroom, the teacher would be lecturing or students would be communicating in groups, and language would need to be processed very fast. We have adopted the linguistic phenomenon under investigation (the processing of person and number features) since it entails cross-linguistic variation with English, the other language of the bilingual groups.

1.4. Advantages of testing heritage sensitivity with an on-line measure

Heritage on-line research is relatively recent. Many on-line paradigms indirectly measure reading skills as well as formal language instruction. In theory this is problematic for Spanish HSs who receive formal education in English, and whose Spanish reading and writing skills may underrepresent their linguistic ability. Most heritage studies have employed off-line measures in the past to report on heritage grammar knowledge.

Testing Arabic HSs with off-line oral production tasks, Albirini, Benmamoun, and Brahim (2013) indicated they had better accuracy in basic SV agreement (82.78%) when compared to noun-adjective agreement (63.92%). In interpreting these results, Albirini et al. (2013) pointed at the importance of the verb both lexically and grammatically at the sentential level. It is possible HSs have control of basic SV agreement, which is a premise to communicate fluently in their heritage language.

Using grammatical judgments and a correction task, Rothman (2007) investigated knowledge of inflected infinitives with a group of Brazilian Portuguese (BP) HSs. Significant results made possible to observe differences between the advanced and the heritage groups. The author concluded the group of HSs had not displayed knowledge in the distribution of inflected infinitives when compared to native speakers and advanced learners of BP. However, two of his participating HSs did perform native-like, as their literacy level in BP was higher. Rothman's study concluded that not all HSs shared identical control of verbal forms.

The aforementioned studies are just a couple of the several experiments that have made use of off-line measures (see also Montrul & Bowles, 2009; Montrul, Foote, & Perpiñán, 2008). It can be argued that off-line tasks are useful in general to describe linguistic patterns in participating groups. However, they do not permit to detect unconscious grammatical sensitivity. With an off-line measure, there is always the possibility of participants relaying on content or metalinguistic knowledge, something that self-paced reading or eye tracking experiments do not allow.

An on-line task, on the other hand, distracts participants from the main structure of interest. In particular, self-paced reading makes it possible to detect irregularities in the input when participants take longer to read certain sentential segments (VanPatten & Jegerski, 2013). On-line research offers another way

to view and describe heritage grammar, as it offers a view into intuitive knowledge and unconscious reactions departing from un-timed tasks, like grammaticality judgments.

In the last decade or so, heritage research has begun to employ on-line experiments to detect how HSs react to one or more structures without relying on background knowledge. Foote (2010) investigated SV agreement production in early and late English-Spanish bilinguals and late Spanish-English bilinguals using an on-line completion task. There were no significant differences between both groups of bilinguals and the control native speakers. However, the HSs seemed to be more affected by task effects than the late bilinguals when errors were concerned. Foote (2010) attributed these results to a naturalistic context of acquisition in the HSs group versus an instructed context for the late learners. Still, the HSs performed similarly to the late learners.

Using a self-paced reading task, Montrul (2006) examined the processing of English and Spanish unaccusative and unergative verbs in HSs. She contrasted the results of the heritage group with English and Spanish native controls. The HSs took longer to read the input in both languages, and their reaction times were also larger than the ones of the monolingual groups. HSs processed both verb classes faster in Spanish than in English, though patterns of performance were similar in both languages by the same group. Montrul (2006) concluded the group of HSs seemed to have control of "core" Spanish syntax.

With the hope of expanding on-line heritage research, we have adopted a self-paced reading moving window paradigm to document processing of basic SV agreement in Spanish. A "real time" pressure task taps into implicit mental representations (Jiang, 2007), something that is arguably beyond the limits of off-line measures. On-line measures are able to more directly shed light on heritage intuition when processing grammar in real time (Bolger & Zapata, 2011).

2. Subject-verb agreement in Spanish and English

Both English and Spanish exhibit basic Subject Verb Object (SVO) order, but the strength of their verbal features, even for basic SV agreement morphology and tense forms is different. Spanish is a morphologically rich language with many verbal inflections. English, with the exception of the Simple Present Tense, is not as morphologically rich.

The preterite singular form of the regular verb *estudiar* (to study) in both languages is illustrated in Table 1. The verb in Spanish agrees with the subject in person and number at all times. These specific verbal features of Spanish as to person and number agreement contrast with the English verb forms in which there is weak person and number agreement, as noted in the identical verb morphology of the English translations for the first, second, and third person singular forms.

Table 1
A contrast between Spanish and English morphology and person/number features

Spanish	English glosses	English translations
(Yo) estudié	I studied - 1 pers. sing/Past	*I studied*
(Tú) estudiaste	You studied- 2 pers. sing/Past	*You studied*
(Él) estudió	He studied -3 pers. sing/Past	*He studied*

In Table 1, the verb form *estudiaste* (study-2 Pers. Sing/Past) can only agree with the informal second person singular (*tú*/you). This stands in sharp contrast with the English verbal form for the same grammatical person. In English, there is weak agreement between the verb and its subject. Spanish, however, exhibits a richer paradigm in verb morphology, with one unique and distinctive form for the first person, second and third person singular, as showed in Table 1.

Spanish is also characterized by its *Null-Subject* nature (Zagona, 2002), the inclusion of person and number features in the verb that allows to drop the subject of the sentence and retain grammaticality. This is seen in Table 1, for the first, second, and third singular forms. English, on the other hand, is a *Non-Null Subject Language* and dropping the subject in English is unlicensed. This is an important syntactic difference between the two languages that HSs may acquire from home Spanish, the strong Spanish verbal morphology and its *pro* drop nature.

The verb in Spanish has person and number features and undergoes overt movement due to its strong features. It moves from a low position in the sentence, from the VP, to a high projection in the structure, such as TP or AgrSP, to agree with the subject of the sentence in person and number (Montrul,

2004; Rizzi, 1986; Zagona, 2002). In English, the verb may move overtly in certain constructions, like yes/no questions, but basic and regular declarative sentences do not exhibit overt verb movement due to the weak features of the English verb (Radford, 2004).

As HSs learned Spanish in infancy and became dominant in English at one point after school entrance, they may control verbal syntactic operations of Spanish, but up to what extent? Montrul (2009) has reanalyzed the original *Regression Hypothesis* proposed by Jakobson (1941) to propose that native bilinguals like HSs may have stronger control of tense and aspect versus more complex categories, like mood which is generally acquired later in many languages. In Montrul (2009), accuracy in grammatical aspect—which is of earlier acquisition—was greater than accuracy in mood.

Spanish exposure from birth may have granted specific advantages to HSs in the acquisition of tense. If Spanish basic tenses are acquired early in life in the home language, it would be interesting to research how much intuition of that early grammatical knowledge has been retained in HSs, even when English has become the dominant language. Benmamoun et al. (2013) have also proposed that tense may have remained a robust category in the mental grammar of HSs since early on, as it is not as critical to word order as mood.

This brings us to the case of L2 learners of Spanish with L1 English. In view of the differences in verbal features between Spanish and English, they must change the weak verbal features of English and acquire the strong verbal features of Spanish. They must restructure linguistic values of a *weak* verbal morphology in their L1 (English) to acquire the *strong* morphology of the L2 (Spanish). For the most part, L2 Spanish learners with L1 English have had a few years of instructed Spanish to undergo changes in their mental representation, from a weak verbal morphology in English to a stronger one in Spanish.

Do HSs share the same experiences in learning Spanish? It is unlikely, as HSs have taken extensive instruction in English, and used Spanish mostly with friends and family in an unstructured environment. Though this unstructured acquisition does not seem to have disturbed their oral proficiency in the home language, it is still unclear whether Spanish HSs are able to control "core" Spanish verbal features.

As bilinguals, HSs may also pay attention to strong cues during on-line processing and not necessarily to verbal morphology at all times, since time pressure associated with real-time processing may increase processing costs. Bilinguals may resort to the overt Spanish subject, for example, instead of verbal morphology as a strong cue. This would be the result of English transfer. Given the presence of two language systems in the typical bilingual mind, we believe they may use a different and perhaps a more efficient strategy while undertaking an on-line experiment when compared to L2 learners.

How would a group of HSs differ from L2 learners in their comprehension of basic tense in Spanish in real time? This question builds upon emerging heritage literature studies (Keating et al., 2011; Montrul, 2013; Montrul & Bowles, 2009; Montrul & Perpiñán, 2011; Potowski, et al., 2009) which have implemented both off-line tasks and on-line measures to contrast how HSs differ from L2 learners in their grammatical knowledge in Spanish.

Differences between English and Spanish syntactic operations are vast enough. Processing the strong Spanish morphology in real time may represent a processing cost for both HSs and L2 learners. Comparing on-line reading times across groups can inform whether morphology has affected processing at any given sentential segment under real time constraints; it can also be explored whether any group has resorted to other cues for processing. Pedagogically, it is important to investigate how much intuitive knowledge of earlier tense has been retained by HSs to better address their classroom needs.

3. The experiment

3.1 Experimental setting

This experiment was part of a larger study which also documented verbal agreement in sentences containing the Spanish particle *se* with some of its uses. However, only the analysis with SV sentences will be reported here, as processing of *se* has been documented in a prior study (Rodríguez, 2015). For our analyses with SV sentences, we departed from VanPatten, Keating, and Leeser's (2012) study on underlying representations of person and number inflections in Spanish, and their view that participants lacking strong representations of person and number will be unable to make use of these in a "pressure task."

VanPatten et al. (2012) did not include HSs as participants; only L2 non-advanced learners were included. However, we saw advantages in using a self-paced reading measure similar to theirs. In a self-paced reading task, participants focus on meaning through post-input comprehension questions. The inclusion of a

heritage group reacting to basic SV agreement in the present tense can be revealing given past grammatical asymmetries displayed by this group and emerging literature on heritage on-line processing.

In self-paced reading, differences in reading times at given regions can point at how participants are affected by features of the upcoming stimulus (VanPatten & Jegerski, 2013). Basic knowledge of SV sentences in HSs was compared with L2 learners and traditional Spanish native speakers. There were four regions of interest in SV sentences: Verb, Verb + 1, Verb + 2 and Verb + 3, as depicted in (8). Post-verbal regions were included to test for possible spill-over effects.

8)	Ahora	Pedro	**toma**	el	refresco	en	el salón.
			Verb	**Verb + 1**	**Verb + 2**	**Verb + 3**	
	Now	Pedro	drink – 3rd Pers Sing Present	the	soft drink	in	the living room.

Initially, the study included one (1) between-subject independent variable: *group* (low intermediate, heritage, native). Though HSs are also native speakers, the heritage group was placed and named separately to distinguish it from the traditional native group. There was (1) independent variable tested within subjects: *subject-verb agreement* (agreement, no agreement sentences). The dependent variable of the study was *reaction time,* measured in milliseconds. Experimental sentences were presented to the participants using Super-Lab building software from Cedrus. Participants read all sentences word by word. A comprehension question in English followed.[1]

Sixty-four SV sentences were randomized and mixed with ninety-six sentences which contained an accusative pronoun, adapted from VanPatten and Houston (1998). There were also forty-eight sentences containing Spanish *se* as detailed in Rodríguez (2013, 2015). Four test versions (four lists of sixty-four sentences each) were used and randomly presented to participants as part of the self-paced reading. Sentence length varied from 8 to 12 words given the three different structures (SE, SV constructions, and sentences with the accusative pronoun). Each experimental list contained sixteen SV sentences with eight sentences representing the + agreement condition and the remaining eight sentences the – agreement condition. There were also twenty-four sentences with *se* and twenty-four sentences containing an accusative pronoun in each list.

3.2 Participants

Three participating groups were initially considered in all analyses. The L2 group (n = 32) was recruited from upper undergraduate courses offered in the Department of Modern Languages and Linguistics at a large university in North Florida. The L2 group's ranging scores in the portion of the *Diplomas de Español como Lengua Extranjera* (DELE) exam administered were 11 to 24 out of a total of fifty points (M = 21.1). Given the low scores in speaking and in the DELE test as seen in Table 2, the L2 group was classified as low intermediate participants. All low-intermediate participants were native speakers of English and did not speak a language other than English at home.

The HSs were also enrolled at the same institution, and hailed from various disciplines. They reported Spanish as the first language learned at home with at least one of their parents. The ceiling for U.S. date of arrival to be deemed a heritage speaker was set at seven years of age. All participants who grew up speaking Spanish at home with at least one parent were grouped with the HSs.[2] The heritage group also completed a language history questionnaire and a portion of the DELE. The heritage group mean in the DELE exam was 38.7. Seven out of the twenty-one heritage participants were U.S. born, seven were born in Colombia, two in Puerto Rico, and there was a representative from Cuba, Dominican Republic, Honduras, Spain, and Venezuela as well.

There was also a group of traditional native Spanish speakers (n = 24) who had grown up in a Spanish-speaking country and had completed their formal education there. They were recruited from upper

[1] One of our anonymous reviewers cited follow up comprehension questions in English as a limitation. However, we believe the inclusion of a low intermediate group with limited proficiency in Spanish in the participating sample justified the use of English and not Spanish in comprehension questions. Comprehension in Spanish could have imposed an additional cognitive load on the low intermediate participants. In this sense, we followed Keating et al. (2011) and VanPatten et al. (2012) who also employed a similar design with advanced and low intermediate participants.

[2] The HSs were together as a group to differentiate them from traditional native speakers who were late bilinguals and had acquired English as a second language in adulthood.

level undergraduate and graduate courses offered in the same department at the same institution. Some of the native participants were also graduate teaching assistants (TAs) in the Spanish Division. For participants to be placed in the native group, they had to score 45 points or more in the DELE exam, out of a total of 50 points (M = 46.6). The traditional native group represented countries in which Spanish is the official language: namely, Argentina, Colombia, Cuba, Ecuador, Honduras, Panamá, Perú, Spain, and Venezuela.

Table 2 presents proficiency scores and resulting group divisions after participants had provided answers to the self-report questionnaire and completed the portion of the DELE Exam.

Table 2
Participant Mean Scores in Spanish Language Skills and DELE Exam

Group	N	Reading	Speaking	Writing	Comprehension	DELE
Low L2	32	6.8	5.2	6.2	7	21.1
Heritage	21	7.9	8.1	7	9.4	38.7
Native	24	9.5	9.7	9	10	46.6

These scores were submitted to a one-way ANOVA by group (Low L2 Intermediate, Heritage, and Spanish Native), the between-subject variable of interest. The main effect of group was significant F (2, 231) = 30.18, p < .001, η^2 p = .493. Post-hoc tests with Bonferroni adjustment indicated the traditional native speakers had scored higher than the HSs and L2 learners in reading, writing, speaking, DELE measure, p < .001. The group of HSs scored higher than the group of L2 learners in speaking p < .001, comprehension p = .001 and DELE measure, p < .001. There were no other significant findings.

3.3 Sentence manipulation

Sixty-four SV sentences were presented to the participants in four randomly assigned lists. These sentences manipulated person and number verbal features (VanPatten et al., 2012). Subjects and verbs appeared next to each other. All verbs belonged to the verbal first conjugation. Person and number manipulation allowed control for verb length and participants read each segment, one word at a time, as part of the self-paced task. Half of the quadruplets had third and first person singular subjects matched with third and first person singular verbs, as illustrated in examples (9) and (10).

9)	Ahora	Pedro	**toma**	el	refresco	en	el salón.
	Now	Pedro – 3rd Pers Sing	drink – 3rd Pers Sing Present	the	soft drink	in	the living room.

10)	Ahora	yo	**tomo**	el	refresco	en	el salón.
	Now	I – 1st Pers Sing	drink – 1st Pers Sing Present	the	soft drink	in	the living room.

The other half of the quadruplets had second person singular and third person plural subjects crossed with verb forms in the second person singular and third person plural, as depicted in examples (11) and (12). Half of the sentences illustrated a grammatical condition (9) and (10), while the other half depicted ungrammatical sentences, as in (11) and (12).

11)	*En este momento	tú	**lavan**	el	auto	con	los hermanos.
	Now	you – 2nd Pers Sing	wash – 3rd Pers Pl Present	the	car	with	the brothers.

12)	*En este momento	ellos	**pagas**	el	alquiler	de	este mes.
	Now	they – 3rd Pers Pl	pay – 2nd Pers Sing Present	the	rent	of	this month.

3.4 Procedure

The presentation of all stimuli and the tracking of participants' performance were conducted via a computer using *Super-Lab* building software from Cedrus. Participants were tested individually in a laboratory in the Department of Modern Languages and Linguistics of the institution. After signing a consent form, participants completed the proficiency measures. Prior to starting the self-paced reading task, participants were provided with a vocabulary list, containing nouns and verb forms that appeared in the task. This facilitated vocabulary familiarization. They were also provided with instructions on how to proceed from sentence to sentence and were asked to complete five practice items.

Participants were instructed to read each sentence carefully and to answer comprehension questions as quickly and accurately as possible. Comprehension questions appeared after participants had read the whole sentence in the moving window (Jegerski, 2013). The self-paced reading task and the placement measures took 50 minutes to an hour to complete. Participant time spent on each word of every sentence was recorded. Standard statistical tests (analysis of [co]variance and regression) were used in the analyses in order to determine in what ways native language, grammaticality, and group affected learners' sensitivity to Spanish agreement. All data was analyzed using SPSS (Statistical Package for the Social Sciences).

3.5 Research questions

The main purpose of this study was to investigate if early bilingualism had conferred HSs an advantage in reading SV sentences word by word. We also investigated whether reaction times differed among groups and whether participants were being sensitive to agreement violations at critical regions (at the verb and the 3 subsequent post verbal regions).

1. Does early onset age of bilingualism in HSs confer them any advantage in reading person and number features word by word when compared to late L2 Spanish learners?
2. Given early age of exposure to Spanish, how does length of heritage reading reaction times compare to L2 and traditional native Spanish at critical regions when reading SV sentences as part of an on-line task?

With regards to the first research question, it was hypothesized that the heritage and the late L2 Spanish group would display dissimilar reading patterns of SV sentences. HSs tend to have an advantage in tasks that investigate implicit knowledge (Montrul, 2011). They also benefit from grammatical content learned early in life (Carreira & Potowski, 2011; Cuza & Frank, 2015). Early bilingualism should confer them an advantage over late learners of Spanish.

As to the second research question, we hypothesized the group of HSs would display different reading times, quite apart from the other two groups. When comparing them with traditional native speakers, HSs may lack complete monolingual-like strategies with regards to grammatical rules (Keating et al., 2011; Rothman, 2007) since they have not had extensive formal training or extended instruction in the L1 grammar. This last factor also differentiates them from L2 learners who are more experienced with formal instruction. We sided with Montrul (2011) in that HSs would simply be different from other groups when analyzing grammatical content, and that this would be evident in differential reaction time length as a group.

4. Results

4.1 Comprehension data

Participants scored at 85% accuracy or greater on the comprehension questions presented after the word-by-word input for all sentences. Table 3 presents the descriptive statistics for *structure type* and *group* for the comprehension questions in English that followed the self-paced SV sentences. The tests of between-subjects effects revealed no significant differences in comprehension between participating groups. Table 4 presents the ANOVA results for comprehension. As Table 4 indicates, there were no main effects for level or for structure in comprehension. The interaction between level and structure was not significant either.

Table 3
Comprehension descriptive statistics

Group	Structure Type - SV Sentences		
	n	*M*	*SD*
Low Intermediate	32	90.2	10.2
Heritage	21	95.8	8.5
Native	24	94.2	8.6

Table 4
ANOVA comprehension table

Source	df	MS	F	p	ŋ² p
Group (L)	2	213.43	2.66	.072	.023
Structure (S)	1	172.27	2.14	.119	.018
L x S	4	2.07	.025	.999	.001
Error	231	80.22			

To explore on-line processing of the SV sentences within the groups, mean reading times per group and region of interest were applied to matched t-tests with *group* and *verbal agreement* as independent variables of interest. The dependent variable was *reaction times*, recorded for every word of the SV sentences. All reaction times higher than 1000 ms were cut off, as they were considered high values indicating a processing difficulty. Within group results appear detailed next.

4.2 Traditional native speakers

Results of paired samples of the t-test revealed no significant results for the traditional native speakers at the Verb region, t (23) = -1.10, p = .281, two-tailed. At the Verb + 1 region for the natives, results of paired samples of the t-test did not show any significance either, t (23) = 1.31, p = .200.

By contrast, results of the paired samples at Verb + 2 did show significance, t (23) = -3.64, p = .001, two-tailed. It took the traditional Spanish natives longer to read ungrammatical SV sentences at Verb +2 region, which indicated sensitivity to ungrammaticality after the main verb of the construction. As to Verb + 3 it also took native speakers longer to read ungrammatical SV sentences, though no significant differences were observed in the paired samples of the t-test, t (23) = -1.62, p = .117. Mean reading times (in milliseconds) and standard deviations for the native group follow next in Table 5.

Table 5
Reaction time mean scores and standard deviations for native speakers (SV sentences)

Condition	Verb		Verb + 1		Verb + 2		Verb + 3	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Grammatical	461	104	456	84	461	89	434	63
Ungrammatical	488	97	433	71	536	126	456	62

A summary of the findings for the native speakers when processing SV sentences word by word is represented in Figure 1.

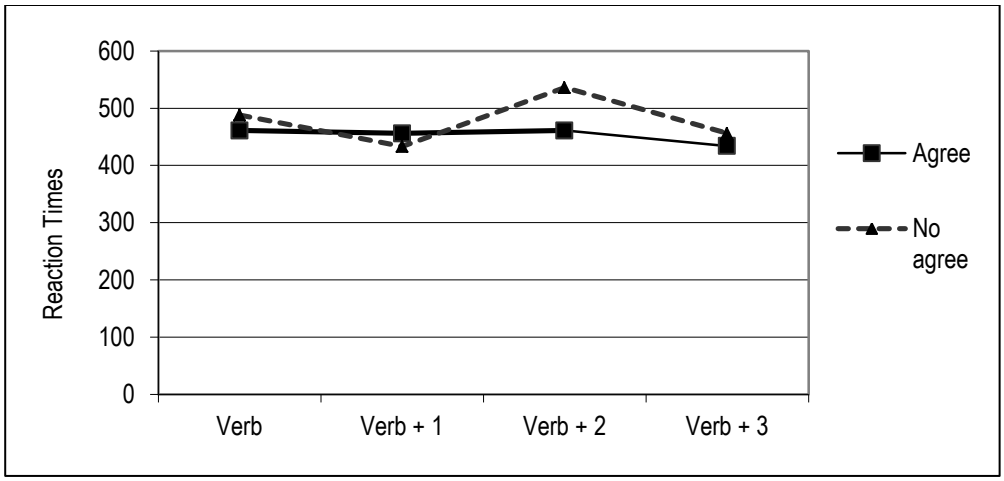

Figure 1. Native SV sentence mean reading time (in milliseconds)

4.3 L2 Low Intermediate learners

Results of paired samples of the t-test revealed no significant results for the low intermediate group at the Verb region, t (31) = .801, p = .429, two-tailed. However, at the Verb +1 region, the t-test revealed that it took the L2 low learners longer to read SV sentences in the agreement condition, t (31) = 2.83, p = .008, two-tailed. This difference was significant.

At the Verb + 2 region, results of paired samples of the t-test revealed no significant results for the low intermediate learners, t (31) = .158, p = .876, two-tailed. At Verb + 3, there were no significant results either, t (31) = .196, p = .846. Low intermediate participants did not show any sensitivity to violations of person and number features in SV sentences. Mean reading times and standard deviations are summarized in Table 6 and in Figure 2.

Table 6
Reaction time mean scores and standard deviations for low-intermediate L2 learners (SV sentences)

Condition	**Verb**		**Verb + 1**		**Verb + 2**		**Verb + 3**	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Grammatical	561	137	522	118	643	163	476	95
Ungrammatical	541	106	469	72	639	131	473	84

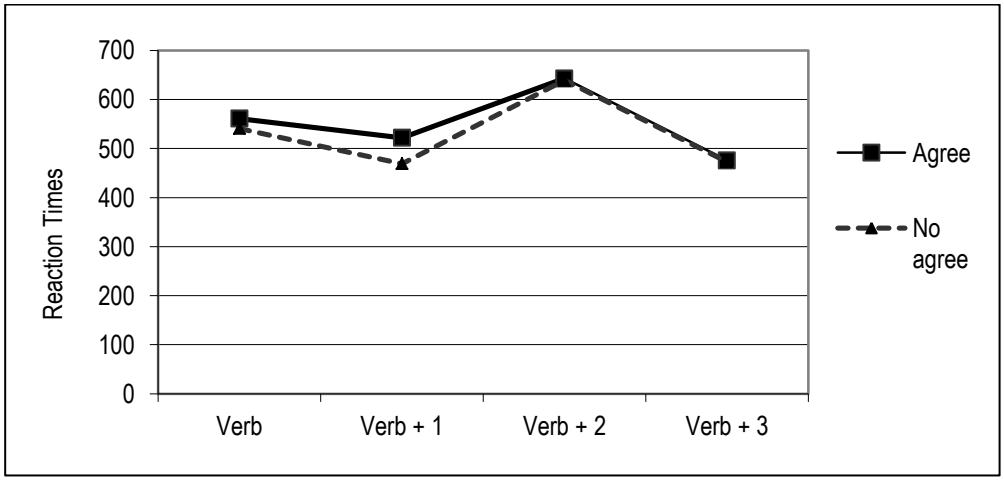

Figure 2. Low-intermediate SV sentence mean reading time (in milliseconds)

4.4 Heritage Speakers

The t-test showed no significant results for the HSs at the Verb region, t (20) = -.784, p = .442, two-tailed. At Verb + 1 the heritage group took slightly longer to process SV sentences in the ungrammatical condition with no significant findings, t (20) = -1.35, p = .192. At Verb + 2 no significant results emerged either, t (20) = -.462, p = .649 for the HSs.

However, at Verb + 3, the HSs took longer to read ungrammatical SV sentences and these results were significant, t (20) = -3.54, p = .002. There was delayed sensitivity to ungrammaticality by the HSs three regions after the main verb of the construction. A summary of the reaction times means of the heritage group is presented next in Table 7. Their processing—region by region—is illustrated in Figure 3.

Table 7
Reaction Times Mean Scores and Standard Deviations for Heritage Speakers (SV Sentences)

Condition	Verb		Verb + 1		Verb + 2		Verb + 3	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Grammatical	463	111	326	55	509	112	429	79
Ungrammatical	484	95	457	82	520	100	496	54

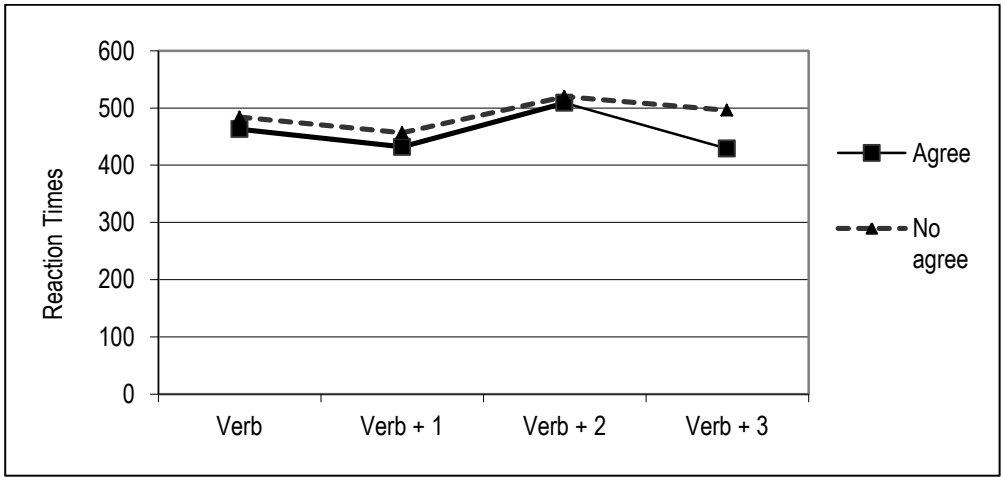

Figure 3. Heritage SV sentence mean reading time (in milliseconds)

Analyses up to here indicate that traditional native speakers were sensitive to ungrammatical SV sentences at Verb + 2, t (23) = -3.64, p = .001. By contrast, the low intermediate group with L1 English took longer to read grammatical sentences at Verb + 1, t (31) = 2.83, p = .008. Overall, the L2 group displayed no sensitivity to grammatical violations of person and number features in the SV sentences. This contrasts with results of the heritage group who patterned with the traditional native speakers in taking longer to read ungrammatical sentences. The HSs took longer for ungrammatical sentences at Verb + 3, p = .002. The heritage group was sensitive to ungrammaticality post-verbally.

We concluded the heritage group had differed from the L2 low intermediate learners in their processing (Hypothesis 1 confirmed). However, they had not behaved exactly like the traditional native speakers either in the same regions (Hypothesis 2 confirmed). To make sure the effect was not one of proficiency, we added a new L2 group of comparable proficiency to the HSs. The new group of L2 participants read the same input as part of the same task. Would there be any differences between them and the HSs?

4.5 Additional analyses with a comparable group of L2 participants

The new L2 group of comparable proficiency also responded to the self-report questionnaire and completed the same portion of the DELE exam. Their scores were compared with the Spanish natives and the heritage group. Scores were then submitted to a one-way ANOVA. The main effect of group was significant, F (2, 231) = 32.50, p < .001, η^2 p = .586.

Table 8
Heritage, new L2, and L1 proficiency mean scores

Groups	N	Reading	Speaking	Writing	Comprehension	DELE
Heritage	21	7.9	8.1	7	9.4	38.7
New L2	24	8.1	7.1	7.6	8	33.6
Native	24	9.5	9.7	9	10	46.6

Post-hoc tests indicated the group of traditional Spanish natives had scored higher than both the HSs and the new L2 group in reading, speaking, writing, DELE measure, $p < .001$. The group of HSs scored higher than the new group of learners in comprehension, $p = .004$ and in the DELE exam $p = .002$, but not in reading or writing. We concluded the new L2 participants and the HSs were of comparable proficiency, as opposed to the low L2 intermediate group.

Results of paired samples of the t-test for the new L2 group revealed no significant results at the Verb region, t (23) = 1.28, $p = .212$, two-tailed. At Verb + 1, the results approached significance, t (23) = 1.97, $p = .060$. It took longer for the new L2 group to read grammatical sentences at this region, as seen in mean scores from Table 9. At Verb + 2, there were no significant results, t (23) = -288, $p = .776$. By contrast, at Verb + 3, the new L2 group took longer to read ungrammatical SV sentences, t (23) = -2.13, $p = .043$. The difference was significant. Results for the new L2 group appear in Table 9 and in Figure 4 next.

Table 9
Reaction time mean scores and standard deviations for new group of L2 learners (SV sentences)

Condition	Verb		Verb + 1		Verb + 2		Verb + 3	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Grammatical	556	113	512	90	606	144	466	93
Ungrammatical	529	111	480	71	614	143	507	100

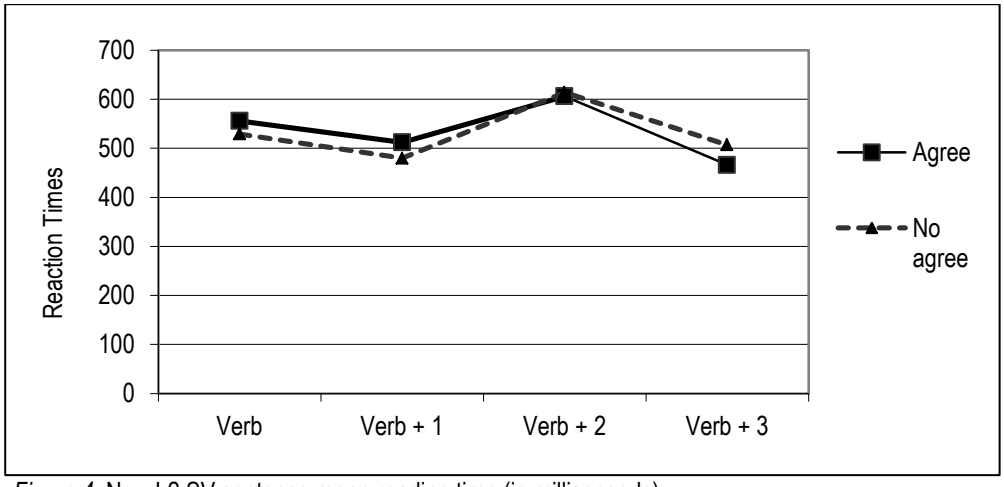

Figure 4. New L2 SV sentence mean reading time (in milliseconds)

The new L2 group and the HSs patterned at Verb + 3 region for ungrammatical sentences. Both groups had delayed sensitivity post-verbally. Quite contrary, the low L2 intermediate group displayed no sensitivity at any of the regions of interest. They took longer to read grammatical sentences at Verb +1. We proceeded to investigate possible effects between the groups, or additional differences between the HSs and the two groups of learners.

4.6 Between-subject analyses

Between-subject analyses (t-test) to contrast mean reading times across the four groups and regions indicated the two L2 groups processed differently from the HSs (as seen in mean scores from Table 10). The

traditional native group and the HSs processed similarly. In the grammatical condition at the Verb region, the low intermediate group took longer to read SV sentences when compared to the traditional native group, and this difference was significant, p = .004. There were also significant differences between the native speakers and the low intermediates at Verb + 1, p = .024 and Verb + 2 regions, p = .001 when reading grammatical sentences.

Table 10
Summary of reaction time mean scores across group (SV sentences)

Group			Verb region		Verb + 1 Region		Verb + 2 Region		Verb + 3 Region	
		n	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
L2 Low Intermediate	(+)	32	561	137	522	118	643	163	476	95
L2 Low Intermediate	(-)	32	541	106	469	72	639	131	473	84
Second L2 Group	(+)	24	556	113	512	90	606	144	466	93
Second L2 Group	(-)	24	529	111	480	71	614	143	507	100
Heritage	(+)	21	463	111	432	55	509	112	429	79
Heritage	(-)	21	484	95	457	82	520	100	496	54
Traditional Native	(+)	24	461	104	456	84	461	89	434	63
Traditional Native	(-)	24	488	97	433	71	536	126	456	62

The low intermediate group also differed from the HSs in how they read SV sentences in the grammatical condition. At the Verb region, it took longer for the low learners to read SV sentences when compared to the HSs, p = .009. These differences were also significant at the Verb + 1 and Verb + 2 regions, p = .002. By contrast, there were no significant differences observed between the two L2 groups when reading grammatical sentences. Differences were not significant either between the HSs and the traditional native group as to mean reading times length at any of the critical regions for the grammatical condition.

In the ungrammatical condition, the low intermediate group differed with regards to the traditional native group at Verb + 2. The results were significant, p = .005. The low intermediates also took longer than the HSs at Verb + 2, p = .001. The only difference in the ungrammatical condition between the HSs and the traditional native speakers was at Verb + 3. This difference was significant, p = .027. The HSs took longer than the native group to process at this region.

There were no significant differences observed between the two L2 groups in terms of reading times of ungrammatical sentences. The new L2 group also differed with regards to the traditional native speakers and the HSs. It took longer for the high intermediates to read agreeing SV sentences at the Verb region when compared to the native speakers, and this difference was significant, p = .004. The high L2 group also took longer than the native group to read grammatical SV sentences at Verb + 1, p = .031 and at Verb + 2, p = .001.

Comparisons between the new L2 group and the HSs in the grammatical condition indicated the new group of learners took longer to read SV sentences at the Verb region, p = .008. Significant differences were also observed between them at Verb + 1, p = .001, and at Verb + 2, p = .016 when reading + SV sentences. With the exception of Verb + 3 region, the reaction times of the new group of L2 learners were significantly larger when compared to the ones of the heritage group, as seen in Table 10 for the grammatical condition.

In the ungrammatical condition, the L2 group of comparable proficiency differed from the traditional native group at Verb + 1, p = .027. At Verb + 2 the results were also significant, p = .005. It also took longer for the new L2 group to read SV sentences in the ungrammatical condition at Verb + 3 when compared to the traditional native group, p = .039.

The only difference between the new L2 group and the HSs in the ungrammatical condition was at Verb + 2, as it took longer for the learners to read non-agreeing sentences, and this difference was significant, p = 0.16. In comparing results between the four groups in both SV conditions, there are some important remarks to be made. The HSs performed more native-like than the two L2 groups. The learners patterned one another in terms of processing. We proceed to guide a discussion to further comment on heritage processing patterns observed in the experiment.

5. Discussion

As evidenced in between-group analyses, both L2 groups took longer to read SV sentences when compared to the HSs, especially in the grammatical condition. There were significant differences reported between heritage and L2 Spanish at Verb, Verb + 1, Verb + 2 regions in the grammatical condition. L2 reaction times were also larger when compared to the HSs. By contrast, there were no significant differences between the traditional native group and the HSs when reading grammatical sentences at any of the regions of interest. The two L2 groups did not significantly differ from each other either in reading grammatical or ungrammatical sentences.

In the ungrammatical condition and comparing them with the HSs, both groups of learners took longer to read SV sentences at Verb + 2. HSs also processed native-like when reading ungrammatical sentences. The only significant difference reported between the HSs and the native group in the ungrammatical condition was at Verb + 3, a later post-verbal region,

Revisiting the proposed research questions of the study, hypothesis one was confirmed. The HSs processed differently from L2 Spanish learners. This is not an effect of proficiency, because both L2 groups pattern one another in terms of their reading times. Heritage and L2 Spanish reading times were different, precisely because heritage reaction times resembled the ones of the traditional native group. This leads us to the unconfirmed second hypothesis: HSs did display reading patterns similar to the traditional native group of the experiment.

Between group, analyses point at how HSs only differed from the traditional native group at Verb + 3 for the ungrammatical condition. These results seem to support recent investigations which signal modest advantages HSs hold with regards to grammatical knowledge. In particular, recent investigations have pointed at the positive value of earlier Spanish acquisition in sequential HSs with exposure to Spanish from birth by at least one of the parents (Cuza & Frank, 2015; Montrul et al., 2014; Pascual y Cabo & Gómez Soler, 2015).

Cuza and Frank (2015) have commented on heritage advantages deriving from Spanish exposure over a long period of time when rich Spanish input has been received since childhood. The availability of rich grammatical input may grant HSs a benefit in analyzing grammatical structures intuitively. Montrul et al. (2014) have also offered comments on how age of acquisition and early language experiences may allow HSs to perform in more target-like ways than L2 learners, when accessing Spanish gender online. Pascual y Cabo and Gómez Soler (2015) concluded that their group of sequential bilinguals had similar patterns to the control group of native speakers in analyzing preposition stranding, mainly due to later onset of the dominant language (English) and for sequential bilinguals only.

We anticipated the heritage group would display unique characteristics, but not exactly like a traditional native group. Heritage reaction times were close to the ones of the traditional native group in terms of length. It is possible that frequent interactions from birth in the Spanish language that have continued into adulthood have conferred HSs the ability to maintain control of basic SV agreement in Spanish.

However, this is not to say that the L2 participants did not show any knowledge of SV sentences. Within-group comparisons indicated the L2 group of comparable heritage proficiency processed similarly to the HSs at Verb + 3 in the ungrammatical condition. Both groups displayed delayed sensitivity. As some participants in the new group of L2 learners of the experiment were Spanish instructors, they may review basic SV structures frequently for lectures. However, this was not the case of the L2 low intermediate group who read ungrammatical sentences faster. This signals emergence in their SV Spanish system and difficulties with the strong verbal features of Spanish.

Turning back to the heritage group of the study, they seem to possess a linguistic benefit for earlier exposure to the home language in childhood (Cuza & Frank, 2015; Montrul et al., 2014). Consequently, they may not necessarily profit from the same curriculum intended for late L2 learners, but rather from an accelerated and distinctive track tailored to their specific needs. In the real world, however, there seems to be a mismatch between these ideal goals and heritage course offerings at many post-secondary institutions. HSs are sometimes placed in the same classroom with L2 learners not matched in proficiency (Potowski, Parada, & Morgan-Short, 2012). At other times, there are heritage courses focusing solely on basic tenses of Spanish, or on cultural content. Many large colleges in the United States have only one course oriented toward HSs (Beaudrie, 2015).

It is only recently that some schools have designed and implemented a dedicated heritage track (Bowles, 2011; Carreira & Kagan, 2011). Assuming that HSs control the core of their L1 grammar, they can

expand this knowledge to higher order, more complex structures of latter acquisition. In this regard, Potowski et al. (2009) have analyzed the effects of processing instruction (PI) lessons with the Spanish subjunctive on heritage students. This pedagogical intervention, however, did not produce as large an effect on them as it did on the L2 counterparts. Montrul and Bowles (2009) centered on explicit uses of the indirect marker "*a"* with *gustar* verb forms to instruct HSs. Their findings also support the idea of limited gains in heritage participants, as opposed to larger improvement in L2 learners. We believe it would be important to address the effects of heritage interventions over several semesters of study, given HSs lack of formal grammatical instruction in the L1. We expand some of these ideas in the final section.

6. Limitations and further research

Any formal study has areas that can be further improved. Inclusion of comprehension questions in English and not in Spanish given the group of low intermediate L2 participants somehow limited the overall experimental design. We believed, however, that comprehension questions in Spanish could have imposed additional cognitive challenges on the low L2 group after reading the word by word input. Because of this, we opted to follow Keating et al. (2011) and VanPatten et al. (2012), who also included English comprehension questions with advanced and low intermediate participants.

Another limitation of the study is that proficiency could have been controlled more precisely across the traditional natives, the HSs, and the more advanced group of learners in order to remove any doubt of a confounding variable. In addition, we relied on the results of the self-paced reading task for the analyses, and did not include a production measure of any kind. In terms of the inferential statistics reported, t-tests are limited to the processing of present tense and to the SV sentences used in the study. No aspectual variations in verbs (preterite, imperfect) or mood (indicative, subjunctive) were part of the experiment. Not all SV sentences carried the same number of words and regions, which is another of the limitations in the experimental design.

We concur with Cuza and Frank (2015) that heritage research should expand beyond grammatical intuition tasks and employ other methods to investigate heritage grammatical knowledge. For instance, differences between two or more heritage groups with and without grammatical instruction over more than one semester of study should be documented. Given that HSs may represent multiple linguistic populations (intermediate, advanced, near-native, native-like) in a single sample, tighter proficiency controls should be in place to compare patterns between two or more heritage groups.

We hope the present study will add to ongoing research that heritage linguistic performance diverges from the one exhibited by L2 learners. The on-line task we have employed documented unconscious responses from all groups. We believe it resembles the pressures of classroom instruction where quick processing is in place. It appears that HSs could benefit from a separate curriculum in the Spanish classroom. We conclude that early bilingualism has conferred them an advantage to control basic SV agreement in Spanish with respect to L2 learners.

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