Psycholinguistic Perspectives on Heritage Spanish

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Introduction

Psycholinguistics

In the most conventional sense, psycholinguistics is a sub-field of psychology dedicated to the study of language behavior and cognition (i.e., mental processes) as observed primarily in the processing of written and spoken language in comprehension and language processing in speech production, and also in first language acquisition and language disorders. Psycholinguistics is closely related to linguistics and the two fields of study overlap to an increasing degree, but there are still subtle differences. Whereas the more humanistic field of linguistics approaches language as a natural phenomenon in its own right and has traditionally relied mostly on introspection and contemplation as methods of research, psycholinguistics sees language more as an instance of cognition and employs experimental methods for its research. Broadly speaking, psycholinguistic data collection methods have included a wide variety ranging from basic pencil-and-paper questionnaires to advanced imaging via fMRI (functional magnetic resonance imaging), but in the study of bilingualism and second language acquisition, the term psycholinguistics has come to imply the more technologically advanced methods that are common in psycholinguistics research, such as computerized reaction time measures and eye tracking (and also brain-based methods like event-related brain potentials, which are covered by Wood Bowden and Issa, Chapter 14, this volume). Psycholinguistics can thus be conceived of as both a field of study with unique theoretical perspectives and as a set of research tools. The present chapter focuses on the latter, reviewing existing research on online language processing among heritage Spanish bilinguals and placing particular emphasis on the specific methodologies used in psycholinguistic research. This first section of the chapter introduces the fundamental concepts of language processing and the classification of some research methods as online, and also provides basic descriptions of four specific research methods that have been or will likely be employed in the study of Spanish as a heritage language (SHL).
Language processing

The fundamental tasks of recognizing individual words and discerning the complex relationships between multiple words in a series are what enable us to select an intended meaning from among an infinite number of potential meanings that can be communicated using human language. This is language processing: the unconscious and effortless steps that occur in a language user’s mind in order to comprehend words and sentences. Language processing at the word level involves the perception of different letters, sounds, and morphological sub-components that enable the reader or listener to access the appropriate word entry in a mental dictionary known as the lexicon. This is called lexical access. Language processing at the sentence level, known as sentence processing, requires more than just basic lexical access for each subsequent word that occurs as the sentence is read or heard. It also requires the incremental processing of syntactic, semantic, and discourse relationships between those words, in order to arrive at the intended meaning, thus achieving successful sentence comprehension. Of course, a similar sequence of complex processes is required to encode a speaker’s intended meaning during speech production, but the present chapter focuses on language processing for the purpose of comprehension.

Online methods

With regard to experimental research methods that are employed to study language processing, these can be either offline or online, with greater emphasis in psycholinguistics on the latter. Offline methods are those that measure or test the end result of language comprehension, as in the meaning of a word or a sentence that was ultimately understood by the language user. Online methods, on the other hand, examine the moment-by-moment cognitive processes that occur along the way in order to arrive at that meaning, and especially the timing and order of different steps. To illustrate with an example using the visual world eyetracking paradigm (Jegerski & Sekerina, 2017, discussed in greater detail below in the section on ‘Research methods’), in which participants listen to auditory stimuli while tracking records their eye movements across an array of pictures related to the audio, an offline measure might be a mouse click on one of the pictures in response to a question. After listening to a brief narrative, the participant hears a stimulus question like Who saved the goat in the hole? and clicks on a picture of a rabbit, then the experimenter compares the accuracy of the mouse click responses that occurred with different types of auditory stimuli, with different types of pictures, or between different participant groups, for an offline measure of sentence comprehension. To measure online processing, on the other hand, the experimenter synchronizes the timing of the auditory stimulus with the participants’ eye movements while they were listening and analyzes the amount of time spent looking at the different pictures while each word of the auditory stimulus was playing. In this way, one can tell, for instance, if one participant group started to look at the picture of the rabbit sooner than the other group did, even if both groups were equally accurate in the mouse click responses to the question. This would suggest a difference in online processing as it occurred in real time, as opposed to a difference in offline sentence comprehension. The online/offline distinction is generally of greater importance in sentence processing research than with lexical or word processing, but lexical processing research often includes basic response time measures and sometimes even eyetracking or ERPs, so online measures can still be relevant (see e.g., Canseco-González, Brehm, Brick, Brown-Schmidt, Fischer, & Wagner, 2010, discussed in greater detail below in the section on ‘Recommendations for practice’).

The present chapter will cover SHL research using online methods, leaving coverage of offline methods to other chapters in the volume (e.g., Fairclough and Garza, Chapter 12: Lexicon; Montrul, Chapter 10: Morphosyntax).
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Four common online research methods

The most basic online psycholinguistic methods record the amount of time (in milliseconds) that participants take to react or respond to stimuli, usually individual words, and can be carried out on a regular computer using specialized software. For instance, in a lexical decision task, the participant reads or hears a word and indicates whether or not it is indeed a word. In self-paced reading, the participant reads sentences one word at a time, using a button to move on to each subsequent word, which gives the researcher a separate reading time for each individual word in a sentence. Eyetracking, on the other hand, requires highly specialized equipment that is usually also quite expensive, in addition to specialized software. In eyetracking with text, the amount of time a participant spends reading each word in a sentence is measured via their eye movements, tracked by one or more cameras that record infrared light reflected off the eyes. With visual world eyetracking (i.e., looking-while-listening), the participant listens to the stimulus sentence while their pattern of eye movements across an array of pictures related to the stimulus is recorded. With all four of these methods, online data are analyzed to draw inferences regarding the moment-by-moment cognitive processes that comprise language comprehension.

Critical issues and topics

The existing body of research on SHL that has adopted psycholinguistic methods is comprised of only a handful of investigations, but at least two key issues have emerged thus far. First, the identification of appropriate research methods for the empirical study of SHL has long been of interest, and some recent work suggests that online psycholinguistic measures may be particularly useful in this regard. Second, the question of cross-linguistic influence from English during the processing of Spanish by heritage speakers is of fundamental theoretical significance and has begun to be examined empirically as well.

Research methods for the study of heritage Spanish

Within the linguistic study of heritage languages in general, an important issue is the appropriateness of research methods, which are often adopted from related fields of study with longer research traditions. One specific concern is whether the grammaticality judgments that have been commonly used in linguistics can accurately gauge the implicit knowledge that characterizes heritage speakers (e.g., Benmamoun, Montrul, & Polinsky, 2013), assuming that this is the investigative goal. Grammaticality judgments, in which speakers of a language indicate whether a given phrase or sentence is possible or not, often rely on metalinguistic knowledge about the language, as opposed to the ability to use the language to communicate meaning. A person can speak a language fluently and yet have very little accuracy when it comes to recognizing specific grammar errors in the language, especially if they have not had extensive formal education in the language, as is the case with SHS. It has thus been argued that metalinguistic (i.e., explicit) tasks or tests are generally not the most appropriate for the study of SHL—except where the research goal is to examine explicit knowledge, as may be the case with some studies of instruction in the heritage language—and this claim has begun to be explored empirically.

For instance, researchers and educators alike are continually searching for methods of assessment that are appropriate for use with heritage languages. Proficiency tests are traditionally metalinguistic, offline measures like cloze tests, but there is evidence from Russian that suggests that an alternative measure like speech rate in words per minute may be a more accurate test of general heritage language proficiency (Polinsky, 2008). Speech rate is an example of a psycholinguistic method that is online, because the data reflect how language processing unfolds...
in real time, moment by moment. Online techniques can also be useful in research as well because real-time language tasks are probably less likely to rely on metalinguistic knowledge than those that do not require an immediate response. Although the two factors are not always easy to tease apart, the classification of a particular research methodology as metalinguistic is independent from its classification as online. Thus, both are important methodological issues in the experimental study of SHL.

**Cross-linguistic influence from English**

Beyond the potential contribution with regard to the identification of appropriate research methods, of the three main factors affecting SHL—incomplete acquisition, attrition, and dominant language transfer (Benmamoun, Montrul, & Polinsky, 2013)—psycholinguistic research stands to make a particularly strong contribution in the area of dominant language transfer from English. From a psycholinguistic perspective, constructs related to the notion of linguistic transfer include parallel or non-selective activation and competition within the bilingual mind. The most fundamental question driving the psycholinguistic study of bilingual language processing is regarding selectivity, that is, whether language comprehension involves the selective activation of only the relevant language or the non-selective activation of both languages in parallel, regardless of relevance. More specifically, in the case of heritage Spanish bilinguals, at issue is whether translation equivalents and other related English words are activated as words are accessed in the lexicon in Spanish, and whether sentence processing strategies for English are similarly activated as sentences are processed in Spanish (and vice versa, for both words and sentences). Such non-selective or parallel activation opens the door for competition, which can take the form of either interference or facilitation. Cross-linguistic competition among bilinguals is in general a robust finding in psycholinguistics (see Kroll, Dussias, Bice, & Perrotti, 2015, for a recent overview), particularly with word-level processing or lexical access, probably because online methods can reveal subtle effects that would not be evident in offline measures because such cross-linguistic influence often does not affect the end product of language comprehension.

**Current contributions and research**

This section provides an overview of existing work that has examined Spanish as a heritage language using psycholinguistic research methods. Although processing-oriented research on SHL has been quite limited thus far, two general trends will be discussed. The first part of this section will describe several investigations that have either intentionally or incidentally explored issues in research methodology and will conclude that psycholinguistic methods that are online and meaning-oriented (i.e., not metalinguistic or invoking explicit grammar rules) appear to have the greatest potential to contribute to our existing knowledge of heritage Spanish. The second part of this section will discuss research that has just begun to explore cross-linguistic influence from English during online language processing of Spanish and has shown that such influence is not always evident.

**Research methods**

There are at least five psycholinguistic studies of SHL that are relevant to the discussion of research methods. In the first of these, Montrul, Davidson, de la Fuente, and Foote (2014) used a series of three different tasks for their descriptive study of gender agreement among heritage and non-native speakers of Spanish. Interestingly, how the two groups compared to each other...
and to a reference group of monolingually raised native Spanish speakers varied according to both the degree of explicitness of the task and, within each task, whether the data were from a timed or untimed measure. The stimuli for all three tasks were three-word noun phrases comprised of a determiner, an adjective, and a noun, as in la quinta calle “the fifth street,” which varied with regard to the grammaticality of the gender agreement between the determiner and the noun. For the first task, an aural monitoring task that was very explicit in its focus on gender agreement, participants listened to the noun phrases and indicated whether the grammatical gender of each noun was masculine or feminine. All three participant groups were affected by the grammaticality of the gender agreement in the stimuli, with higher accuracy scores and faster response times for grammatical stimuli than for ungrammatical stimuli, but accuracy scores among the monolingually raised native speakers were affected the least by grammaticality, followed by the second language learners, followed by the heritage bilinguals. For the second task, a grammaticality judgment that was also clearly metalinguistic, participants again listened to three-word noun phrases and this time indicated whether each was grammatical or ungrammatical. The accuracy scores were highest for the monolingually raised native speakers and lower for the heritage speakers and second language learners, whose scores were statistically similar to each other. The online response time data, however, revealed a difference between the two experimental groups, with the heritage speakers responding faster overall than the non-native speakers. For the third and final task, a word repetition task that was less explicit than the other two tasks in its focus on gender agreement, participants once again listened to three-word noun phrases, but this time were asked to merely repeat the last word of the phrase, the noun, as quickly and accurately as possible. The accuracy scores were unrevealing because of a ceiling effect, in which all three groups correctly repeated the noun 100% of the time. The online response time data did reveal differences, with the monolingually raised native and heritage speakers repeating nouns more quickly when they appeared in grammatical versus ungrammatical phrases and the second language learners showing no overall response time difference for grammatical versus ungrammatical noun phrases.

Overall, across the three experimental tasks in this study, the offline data suggest that the heritage speakers were more similar to second language learners than to monolingually raised native speakers in terms of their knowledge of gender agreement, while the online data suggest that they were more similar to the monolingually raised native speakers in this regard, consistently showing greater sensitivity to agreement than the second language learners. As concerns the explicitness of the tasks, the heritage speakers appeared most similar to the monolingually raised native speakers on the word repetition task, the least explicit of the three, followed by the grammaticality judgment and then the gender monitoring task. The authors concluded that explicit experimental tasks can place heritage speakers at a disadvantage, particularly when they are being compared to second language learners, who typically have more experience with Spanish in the formal instructional settings that build metalinguistic knowledge and familiarity with explicit grammar than do heritage speakers. Thus, the outcome of this three-part investigation highlights the importance of methodology in experimental research on SHL and suggests that measures that are more implicit and online may be more appropriate for most descriptive studies because explicit tasks and offline data can sometimes undershoot heritage language knowledge and ability.

In the second study, similar patterns in online versus offline data were apparent in the interpretation of null and overt pronouns, and heritage bilinguals were more similar to monolinguals when the two were compared on the basis of online data. Keating, Jegerski, and VanPatten (2016) investigated the interpretation of Spanish null and overt pronouns by heritage speakers using a self-paced reading time measure. In contrast with English, Spanish subject pronouns are

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optional; when the pronoun is expressed it is said to be *overt* and when it is omitted but understood it is said to be *null*, as illustrated in (1) and (2). While most contexts allow for either a null or an overt pronoun to appear, the referential tendencies of the two types of pronoun differ. For instance, both the null pronoun in (1) and the overt pronoun in (2) are ambiguous in that they could refer to either *el sospechoso* “the suspect” or *el policía* “the policeman,” but in most varieties of Spanish the null pronoun usually refers to *el sospechoso* because it is the subject of the first clause and the overt pronoun more often refers to *el policía* because it is not the subject.

(1) **Null pronoun**

Después de que el sospechoso habló con el policía, hizo tres llamadas.

“After the suspect spoke with the policeman, Ø made three phone calls.”

(2) **Overt pronoun**

Después de que el sospechoso habló con el policía, él hizo tres llamadas.

“After the suspect spoke with the policeman, he made three phone calls.”

A prior study (Keating, VanPatten, & Jegerski, 2011) with heritage bilinguals had employed an offline interpretation task, in which participants were presented with ambiguous stimuli like those in (1) and (2) and asked to indicate whether they thought it was *el sospechoso* “the suspect” or *el policía* “the policeman” that made the phone call. A group of heritage speakers most often interpreted both null and overt pronouns as referring to subjects, while a monolingual group interpreted the two types of pronoun differently, with null pronouns usually referring to subjects and overt pronouns usually referring to objects. In short, the heritage bilinguals and monolinguals appeared quite different from each other when tested with an offline questionnaire. In the subsequent study with a similar group of heritage bilinguals drawn from the same population (Keating, Jegerski, & VanPatten, 2016), the researchers observed that heritage speakers did interpret the two types of pronoun differently, but this preference was only evident during an online self-paced reading task, and was again absent when the task was offline interpretation. The heritage bilingual group was not identical to the comparison group, with the two differing from each other even online in the case of overt pronouns, but the overall similarity between the groups was greater when pronoun interpretation preferences were observed during sentence processing rather than after (i.e., online versus offline). Thus, the outcome of this study provides further evidence that the choice of research method can be crucial in the study of SLH, and that offline methods can sometimes underestimate heritage speakers’ knowledge and ability in Spanish.

A third investigation that has demonstrated the potential importance of including online psycholinguistic research methods in studies of SLH is that of Foote (2011), which targeted the online processing of subject-verb number agreement and adjective-noun gender agreement during meaning-oriented self-paced reading. Additional aspects of the study will be discussed below in the section on cross-linguistic influence from English, but here the focus is on those details that may be informative with regard to the use of online research methods. While not part of the statistical analysis, the reading time data revealed that the heritage speakers read stimulus sentences more slowly in general than did a group of second language learners, who in turn read at a speed that was similar to or slightly slower than a comparison group of monolingually raised native speakers. On the other hand, all three participant groups were similar with regard to online sensitivity to both types of agreement, which suggests that the difference in global reading speed did not affect this aspect of sentence processing. Still, it is an interesting result that may
reflect the fact that heritage speakers tend to have less experience with Spanish in formal educational contexts and with printed text in Spanish than do second language learners and native speakers raised in Spanish speaking countries. In addition, the results from an offline written test of grammatical agreement that was administered as part of the study suggested that the heritage speakers may have been at a disadvantage there as well. Even though both groups showed similar effects of agreement during the online self-paced reading task, the second language learners scored higher than the heritage speakers on the offline written task, although both groups did score quite high and the significance of the difference (98.7% L2 versus 93.2% heritage) was not confirmed with statistical testing because it was not relevant to the objectives of the study.

In the fourth study, Jegerski (2017) examined the online processing of the *a* marker on direct and indirect objects in SHL. The outcome of this investigation illustrates how online research methods can make important additions to our knowledge of SHL, even when they produce results that are broadly consistent with previous research using offline methods. The particle *a*, commonly referred to as “personal *a,*” marks all indirect objects in Spanish and a select subset of direct objects, primarily based on the animacy of the direct object, in a system referred to as differential object marking, which is illustrated in (3) and (5). Previous research using offline methods had found that monolingual Spanish speakers have strong preferences to mark direct objects that are animate with *a*, as in (3), but this preference is less robust among heritage speakers, who sometimes leave animate direct objects unmarked, as in (4). With direct objects that are inanimate, on the other hand, both groups have clear preferences to leave them unmarked, as in (5).

One factor that has been proposed to partially account for these observations is the non-saliency of the *a* marker, which is just a single letter that could easily be overlooked during reading or not heard during listening and thus contribute to the incomplete acquisition of differential object marking among heritage bilinguals (Montrul, 2014).

(3) **Animate direct object with a**

La estudiante visita a la maestra todos los meses.

“The student visits [a] the teacher every month.”

(4) **Animate direct object without a**

La estudiante visita la maestra todos los meses.

“The student visits the teacher every month.”

(5) **Inanimate direct object without a**

La estudiante visita el museo todos los meses.

“The student visits the museum every month.”

The experimental measures for Jegerski’s (2017) study were an offline scaled acceptability judgment task and a meaning-oriented, online, self-paced reading task. The two tasks were completed by a group of heritage speakers and a comparison group of late Spanish-English bilinguals. Both participant groups demonstrated robust preferences online and offline for marking with *a* for indirect objects and for not marking with *a* for inanimate direct objects. With animate direct objects, both groups also showed the expected preference for marking with *a* offline, but neither showed a significant preference online during meaning-oriented self-paced reading. This outcome was consistent with previous research in that the most dynamic area of object marking in heritage Spanish was with animate direct objects. Nonetheless, three new contributions came specifically from the self-paced reading results: (1) heritage Spanish bilinguals do
reliably notice the marker \( a \) in some contexts during real-time language processing—even though it is only one letter; (2) other bilingual populations in the U.S. can also show attenuated preferences for marking animate direct objects; and (3) offline metalinguistic preferences for object marking are not necessarily evident during online processing for meaningful comprehension.

Thus, even though there had already been multiple research studies targeting differential object marking in Spanish as a heritage language using a variety of research methods, and the outcome of this study was broadly consistent with prior work, the psycholinguistic perspective of the study made it uniquely informative to our understanding of why differential object marking is so interesting in heritage Spanish. We now know that it is not just because the single letter \( a \) is easily missed during reading or listening, we know that the tendency towards indifference to marking with animate direct objects goes beyond heritage Spanish and may be present at the community level (see also Montrul, 2014; Montrul & Sánchez-Walker, 2013), and we know that the type of research method (i.e., online or offline) used to study object marking among heritage speakers can affect the results.

In a related investigation, Jegerski and Sekerina (2017) used the visual world eyetracking method to examine the online processing of the particle \( a \), but this time in questions starting with \( \text{quién} \) “who” or \( a \text{ quién} \) “whom,” where the inclusion of non-canonical word order (i.e., both SVO and OVS vs. just SVO) and the sentence-initial position of the \( a \) case marker might make it more salient and likely to be noticed. Sentence processing was also examined during listening rather than reading, as in previous studies. The participants were a group of SHS and a comparison group of late L1 Spanish – L2 English bilinguals. For the visual world eyetracking procedure, participants listened to a series of brief stories while looking at four pictures of the characters and objects from each story while their eye movements were recorded. After each story, they heard a question about how two of the characters were affected by the main action that occurred in the story (e.g., \( \text{¿A quién salvó el conejo en el hoyo?} \) “Who(m) did the rabbit save in the hole?”) and responded by clicking on one of the four pictures and saying the correct answer aloud. The verbal responses of the comparison group were more accurate than those of the heritage speakers, both in terms of the \( a \) case marker and the picture referent. But the online comprehension measures, meaning the speed and accuracy of mouse clicks and the timing of eye movements across the four pictures, suggested that the two groups processed the stimulus questions similarly. In addition, fine-grained analysis of the online eye movement data revealed that both groups started to look more at the correct picture 200 milliseconds sooner with the object-first than the subject-first questions (i.e., “¿A quién . . . ? vs. ¿Quién . . . ?”), which means that the \( a \) marker was at least noticed during processing, something that was not evident in the other measures. Thus, once again there was a difference between the online data (eye movements) and some of the offline data (verbal responses) from the same experiment.

To summarize the five studies in this section, all provide interesting evidence that online methods may be particularly useful in the study of SHL (or, from a psycholinguistic perspective, heritage Spanish bilingualism), even though most were not intentionally designed to explore the issue. A related outcome was that experimental tasks that are meaning-oriented, as opposed to metalinguistic, can also be especially informative.

**Cross-linguistic influence from English**

The question of cross-linguistic influence in the processing of SHL is not as well represented in the literature, but so far there are at least two published research studies that have explored the issue. A recent investigation by Jegerski, Keating, and VanPatten (2016) targeted a type of
syntactic ambiguity that has long been of interest in the empirical study of sentence processing in main stream psycholinguistics. In sentences such as (6) below, the relative clause *who had a very long moustache* could refer to either *the boss* or *the clerk*. Despite the overall ambiguity, some languages tend towards the first noun and others tend towards the second, preferences that are known as NP1 and NP2 attachment, respectively (NP stands for “noun phrase”). Monolingual Spanish users typically interpret the relative clause *who had a very long moustache* as referring to *the boss*, whereas monolingual English users usually interpret it as referring to *the clerk*, so relative clause attachment preferences are ideal for observing cross-linguistic influence among Spanish–English bilinguals.

(6) *Ambiguous relative clause*

Miguel argued with the boss of the clerk who had a very long moustache.

(7) *Disambiguated relative clauses*

a. Miguel discutió con el jefe de la vendedora que tenía un bigote muy largo. NP1
b. Miguel discutió con la jefa del vendedor que tenía un bigote muy largo. NP2

“Miguel argued with the bossM/F of the clerkF/M that had a very long moustache.”

Previous research had found that this aspect of bilingual sentence processing was subject to strong cross-linguistic influence. Specifically, late Spanish–English bilinguals, monolingually raised Spanish speakers who had acquired English as adults and experienced long-term immersion in English, were shown to have similar relative clause attachment preferences in both of their languages (Dussias, 2003). These reflected an English-like preference for NP2 attachment, even while reading in their native Spanish (Dussias & Sagarra, 2007). The NP2 attachment preference was evident in longer reading times on NP1 versus NP2 sentences, as illustrated in (7) above. It was therefore proposed that relative clause attachment preferences in either of a bilingual’s languages reflected the preference of the language of greatest exposure, which predicts that heritage Spanish bilinguals would adopt English-like attachment preference in Spanish and that they would have a similar preference in both languages. Interestingly, Jegerski et al. (2016) observed the opposite trend, in which heritage speakers of Spanish demonstrated a monolingual-like preference for NP1 attachment while reading relative clauses in Spanish. In a related study using an offline measure, Jegerski, VanPatten, and Keating (2016) also found that heritage speakers of Spanish had distinct attachment preferences in Spanish and English, each of which was similar to what would be expected of monolingual native speakers of the language. The authors tentatively concluded that heritage Spanish was less susceptible to this type of cross-linguistic influence than was the Spanish of other Spanish–English bilinguals, because heritage bilinguals are *early* bilinguals, having acquired both languages in childhood, whereas the participants in the previous investigations were late bilinguals. Further research is needed to corroborate both the outcome of these studies and the account proposed by the authors, but this one study demonstrates the potential of psycholinguistically oriented research to be uniquely informative with regard to the effects of cross-linguistic influence from English on SHL.

A second psycholinguistic investigation of the effects of English on heritage Spanish also found no evidence of cross-linguistic influence. Foote (2011; also discussed in the above section on research methods) examined the online processing of two types of agreement among heritage bilinguals (and also second language learners of Spanish), subject–verb number agreement and noun–adjective gender agreement. The two types of agreement were selected because subject–verb number agreement also occurs in English, but gender agreement does not, so the latter
might be more likely to be subject to variability in SHL. Nevertheless, the results of a self-paced reading task suggested that this was not the case, as a group of heritage bilingual participants demonstrated online sensitivity to both types of agreement that was similar to that of a monolingually raised comparison group, and so did a group of very advanced second language learners. In addition, the tendency to slow down upon encountering agreement errors while reading diminished as the distance between the two words in the sentence that agreed increased, as illustrated in (8) and (9) below, a pattern that was evident among all three participant groups. Thus, similarity with English did not seem to affect this aspect of sentence processing in SHL because both types of agreement were the same, regardless of their similarity with English.

(8) Gender agreement between adjacent words
   a  Dicen que el libro blanco está en esa mesa.  Grammatical
   b  Dicen que el libro blanca está en esa mesa.  Ungrammatical
   “They say that the white book is on that table.”

(9) Gender agreement between non-adjacent words
   a  El pollo del taco está rico pero picante.  Grammatical
   b  El pollo del taco está rica pero picante.  Ungrammatical
   “The chicken in the taco is tasty but spicy.”

To summarize the two studies reviewed in this section, we cannot assume that cross-linguistic influence from English will always be evident during the processing of Spanish as a heritage language, despite the strong theoretical motivation to make such a prediction. On the contrary, neither of the two studies discussed found evidence of such influence, showing instead that when it comes to online processing, the Spanish of heritage bilinguals can be indistinguishable from the Spanish of those that acquired it abroad as a majority language, at least in some specific contexts. Of course, this is but an interesting observation made on the basis of a few initial investigations, both of which examined language processing at the sentence level. Extensive further research is needed before any consistent trend can emerge.

Recommendations for practice

For the purposes of this chapter, practice will be used to refer to research with heritage Spanish bilinguals that employs online psycholinguistic methods. As discussed in the first part of the previous section surveying existing research, the choice of a research method that relies on online data collected as language is being processed in real time may in and of itself be an important step in advancing our knowledge of Spanish as a heritage language, and particularly our knowledge of what distinguishes a heritage language from a second language. Another important concern for researchers that was discussed is that experimental measures that are less explicit can eliminate a potential source of bias, in which heritage speakers are at a disadvantage as compared to native speakers raised abroad and especially as compared to second language learners. From the perspective of the researcher, the implication of this observation from previous studies is that experimental tasks should be meaning-based to the greatest extent possible. Metalinguistic tasks that ask participants to identify grammar errors can be biased in favor of formally instructed second language learners because they introduce esoteric skills and types of knowledge that are learned primarily in formal educational contexts, in which heritage speakers typically have
had less experience with Spanish. Tasks with responses based on meaningful comprehension (e.g., “Where does the student go?” or “Click on the picture of the beetle”) may serve to minimize or eliminate such biases and thereby create a more level playing field on which to compare data from different participant populations.

Looking beyond the advantages of research methods that are online and meaning-oriented, one additional factor that researchers may want to consider when conducting psycholinguistic studies of heritage Spanish bilingualism, but that has not yet been investigated among this particular bilingual population and therefore was not discussed in the previous section of this chapter, is the role of bilingual language mode. Grosjean’s (1985) notion of language mode proposes that the relative level of mental activation of a bilingual’s two languages varies according to the communicative context in which they find themselves at a given point in time. Activation level is continuous, ranging from monolingual mode, with only one language or the other activated, to completely bilingual mode, with both languages fully activated, and is determined by a number of contextual characteristics such as the language proficiency and use habits of both interlocutors, the physical location and presence of others, the content of the ideas being communicated and the register, and the purpose of the language act. Grosjean (1998) has suggested that language mode is an important concern for researchers, as it can influence the results of psycholinguistic experiments that do not take it into consideration. This may be especially true with online methods, because they rely on reaction times and other types of time-sensitive measures that might be affected by degree of activation. In theory, an experimental procedure determines the language mode of bilingual participants and thus can affect how quickly they can access one or the other of their languages and the degree of cross-linguistic influence from one language to the other. Thus far, the results of the few studies that have tested the proposal empirically have been inconclusive and none of this research has explicitly targeted heritage bilinguals.

Despite this gap in existing research, there are two studies of language mode that appear to have included heritage Spanish bilinguals. Results from the two have been conflicting. First, Dunn and Fox Tree (2014) examined the role of language mode in word recognition among fluent Spanish-English bilinguals, some of whom appeared to be heritage Spanish speakers—age of acquisition was not reported, but there were 75 bilingual participants from Southern California who self-identified as fluent bilinguals dominant in either English or Spanish. For this carefully designed experiment, monolingual and bilingual participants were recruited through a university subject pool database on the basis of existing language background information so that they were not aware that the research targeted bilingualism. For the first part of the experiment, all participants completed a timed lexical decision task in English, in which 100 words and nonwords appeared individually on a computer screen and participants pressed a button to indicate whether each item was a word or not. The second step in the experiment was to watch a five-minute silent cartoon and provide an oral retelling of the story. Half of the bilingual participants completed this second step in Spanish, while the other half of the bilinguals and the monolinguals completed it in English. Finally, the third part of the experiment was another lexical decision task in English. The language of the story re-telling affected the results, as all three groups performed equally on the first lexical decision task, and those who completed the entire experiment in English also took the same amount of time as the monolinguals to recognize words and nonwords in the second lexical decision task, but those who did the story re-telling in Spanish in the interim took longer to reject English nonwords in the second lexical decision task than the other two groups. In addition, this apparent effect of competition from Spanish while in bilingual mode was greatest among those participants who were Spanish dominant, that is, whose proficiency in Spanish outweighed their proficiency in English, and least among
those who were English dominant. The authors concluded that when bilinguals switch from monolingual to bilingual mode, cognitive inhibition of words in the non-relevant language is lowered and cross-linguistic competition occurs.

The second of the two existing studies of language mode that have included heritage Spanish bilinguals was an eyetracking study that targeted cross-linguistic competition in English from words that sound similar in Spanish (Canseco-González et al., 2010). Participants saw three pictures on a computer screen and heard instructions to click on one of the three pictures while their eye movements were recorded. In one example, the instructions were *click on the beetle* and the three pictures on the screen were of a beetle, a moustache (the Spanish *bigote* starts with sounds that are very similar to those at the beginning of *beetle*), and a jail cell. Cross-linguistic competition from Spanish was evident when participants were more distracted by the competitor picture of the moustache (*bigote*) than the neutral picture of the jail cell (*cárcel*) before finally clicking on the target picture of the beetle. This type of distraction is presumably unconscious and is very short-lived, occurring over a span of around a third of a second (i.e., 300–400 milliseconds), but it can be observed in eye movements because participants look around very quickly at the different pictures before focusing in on one and clicking on it, and these eye movements are believed to reflect the cognitive processes involved in word recognition. The heritage bilingual participant group in this study did show evidence of subtle competition from words in Spanish while listening to and identifying words in English, but less so than a comparison group of Spanish dominant bilinguals raised abroad. Crucially, the manipulation of language mode did not appear to affect the level of cross-linguistic competition with either participant group.

Thus, the two existing studies that can speak to the role of bilingual language mode in research on heritage Spanish bilinguals have contradicted each other in terms of outcome. Nevertheless, because neither of these studies was explicitly designed to target heritage bilinguals, they have some important limitations that warrant further empirical investigation of this issue. First, both studies examined the role of language mode on cross-linguistic competition from Spanish while the bilinguals were processing English, but competition would likely be weaker in this direction among heritage speakers than in the opposite direction, from English during the processing of Spanish, because proficiency and bilingual language dominance affect the degree of cross-linguistic influence. This may explain why the competition effects in general were not robust in either study. Second, the construct of language mode might be more relevant to the Spanish of heritage bilinguals than in other bilingual contexts because, as adults, they are most often in communicative contexts that call for either monolingual English mode or bilingual mode and not nearly as often in monolingual Spanish mode. In fact, given the prevalence and pervasiveness of English in the U.S., it may not be even possible to create a context that is conducive to monolingual Spanish mode. Still, language mode is a continuum, so even if the procedure for an experiment conducted in the U.S. cannot put a bilingual participant in completely monolingual Spanish mode, it still may be possible to create relative degrees of activation of their two languages. This also highlights the importance of research on SHL in other communicative contexts, such as in heritage language immersion abroad.

**Future directions**

So far, there has been very little research on SHL that has adopted psycholinguistic methods, so there are numerous potential avenues for future research. Two areas that seem promising are those discussed in this chapter, the issue of online psycholinguistic research methods in the study of SHL and that of cross-linguistic influence from English during online processing. Compiled below are these and other broad, unanswered questions that might serve as inspiration for future investigations.
I How do experimental outcomes vary according to whether a measure is online or offline? If timed tasks rely less on explicit knowledge and heritage Spanish is characterized by primarily implicit knowledge, then future research will continue to support the proposal that online methods are especially appropriate for use with heritage bilinguals.

II How does online processing vary according to whether an experimental task is metalinguistic or meaning-oriented (e.g., whether sentential stimuli are followed by a grammaticality judgment or a comprehension question)? If heritage bilinguals typically have less explicit knowledge than L2 learners and native speakers with schooling in Spanish-majority contexts, then inclusion of any metalinguistic component in an experimental task introduces a potential source of bias.

III How does online processing vary according to whether linguistic stimuli are presented in written or auditory form? Given that heritage bilinguals typically have much more experience with oral language than with written text, then text-based measures might undershoot their Spanish ability.

IV Is there cross-linguistic influence or competition from English during online processing among heritage Spanish bilinguals? The exposure based Tuning Hypothesis (Cuetos, Mitchell, & Corley, 1996), for instance, claims that sentence processing behavior reflects past exposure to input, so extensive exposure to English would lead to pronounced cross-linguistic influence on sentence processing in heritage Spanish.

V Can language mode affect online processing among heritage Spanish bilinguals? If heritage speakers are most often in bilingual mode or monolingual English mode, including while participating in research studies, this could be a mechanism of cross-linguistic influence from English.

Further reading


The chapters in this volume cover a variety of issues pertaining to the experimental study of language processing in children and provide an introduction to the four online research methods that are most commonly used in psycholinguistic and neurolinguistic research on children: reaction time techniques, visual world eyetracking, free viewing eyetracking and event-related brain potentials (ERPs).
References


