SSLA, **25**, 529–557. Printed in the United States of America.
DOI: 10.1017.S0272263103000238

SYNTACTIC AMBIGUITY RESOLUTION IN L2 LEARNERS

Some Effects of Bilinguality on L1 and L2 Processing Strategies

Paola E. Dussias
The Pennsylvania State University

This study investigates whether proficient second language (L2) speakers of Spanish and English use the same parsing strategies as monolinguals when reading temporarily ambiguous sentences containing a complex noun phrase followed by a relative clause, such as *Peter fell in love with the daughter of the psychologist who studied in California*. Research with monolingual Spanish and English speakers (e.g., Cuetos & Mitchell, 1988) has suggested that, whereas English speakers show a bias to interpret the relative clause locally (i.e., to attach the relative clause to the noun immediately preceding it), Spanish speakers reading Spanish equivalents of English sentences attach the relative clause to the first noun in the complex noun phrase (i.e., nonlocal attachment). In this study, I assess whether speakers whose native language (L1) and L2 differ with respect to processing strategies were able to employ each strategy in the correct context. To this end, L1 Spanish–L2 English and L1 English–L2 Spanish speakers read ambiguous sentences in their L1 and L2. Data collection was carried out using a pencil-and-paper questionnaire and a self-paced reading task. Analyses of both sets of data revealed that both groups of speakers favored local over nonlocal attachment when reading in their L1 and L2. The results are discussed in the

The writing of this article was supported in part by a Research and Graduate Studies Office Grant from the College of the Liberal Arts, The Pennsylvania State University. I would like to express my deep gratitude to Jacqueline Toribio for enlightening comments and discussions on an earlier version of this paper. I would also like to thank five anonymous *SSLA* reviewers for their many constructive comments and helpful suggestions. Any mistakes are, of course, my own.

Address correspondence to: Paola E. Dussias, Department of Spanish, Italian, and Portuguese, 211 Burrowes Building, The Pennsylvania State University, University Park, PA 16802; e-mail: pdussias @psu.edu.

context of models that assume the existence of a fixed, universal set of parsing strategies. The implications of L2 parsing research for the field of SLA are also discussed.

In the area of first language (L1) and second language (L2) acquisition, a considerable amount of research is guided by the assumption that the learner is innately programmed with a predetermined set of decisions to make about the properties of the language being learned (e.g., for L1 acquisition, see Chomsky, 1981, 1995; for L2 acquisition, see White, 1989, 2003). The issue of the correctness of this assumption aside, minimizing the amount of learning that is believed to occur is a worthy goal, as it results in a theory—or theories—with explanatory force (Fodor, 1998). Furthermore, if one accepts the viewpoint that syntactic acquisition is guided by innate principles of language, it seems natural to ask whether the processes that guide syntactic parsing—that is, the assignment of a syntactically licit structure to an incoming string of words that leads to an interpretation of a sentence during real time—are also innate. Although in some sense both the grammar and the parser have a similar task—that of associating a structural analysis with an input string—it seems clear that the principles that guide them are not identical. This is because a string of words may honor the grammar of the language and still cause processing breakdown, whereas other very similar structures present no trouble to the processing mechanism. A case in point is the contrast (from Frazier & Clifton, 1996, p. 12) between the near minimal pairs in (1) and (2).

(1) *John knew the answer to the physics problem was wrong.*

(2) *John knew the answer to the physics problem very well.*

In descriptive terms, at the point when *the answer* is encountered, there is ambiguity as to whether it will ultimately serve as the noun phrase (NP) object of the verb *know* or as the subject of the ensuing clause. Interestingly, it is the parser's preference to initially analyze the ambiguous material as a verbal object that causes the misparse in (1).

A number of explanations have been proposed to account for the parser's preferential choice when faced with structural ambiguity of the type exemplified in (1) and (2). Frazier and her colleagues (Frazier, 1987; Frazier & Clifton, 1996; Frazier & Rayner, 1982; Rayner, Carlson, & Frazier, 1983) have attributed it to the existence of a fully innate set of processing strategies. Alternative explanations to processing difficulty have attributed parsing preferences to an argument preference principle (e.g., Crocker, 1994; Pritchett, 1992).

Although syntactic parsing has been the object of much investigation and heated debate in the monolingual literature, few studies have examined sentence parsing from an L2 perspective. Harrington (2001) offered a number of explanations for the limited attention that sentence processing has received

in SLA literature. Mainstream sentence-processing research is largely interested in the process of structure building by mature speakers and is comparatively less preoccupied with issues related to learning and individual differences. SLA research, on the other hand, is primarily concerned with explaining how individuals acquire proficiency in an L2 and focuses on both the learning process and individual outcomes. The divergent goals in the two fields, coupled with insufficient technical resources and methodological expertise among SLA researchers, have kept L2 sentence-processing research in a peripheral setting. However, as Gregg (2001) rightly pointed out, a theory of L2 acquisition needs both a property theory—a specific theory of linguistic knowledge—and a transition theory, one that accounts for the cognitive mechanisms responsible for explaining changes of state within the L2 learner's linguistic system. It is in the latter that parsing research is relevant to SLA. An L2 learner's encounter with input from the target language is filtered through the parser, a device whose role is to apply the facts of the available grammar to input word strings. The parser acts as a mediator between word strings and the grammatical representation that such strings are assigned during real-time sentence processing. If L2 learners use the available processing strategies from their L1 to process L2 input, and if these processing strategies are not suited for parsing the incoming L2 string (e.g., if they are different from those employed by monolingual speakers of the target language), then L2 learners may draw incorrect conclusions about the target-language grammar and its properties, resulting in an interlanguage grammar that is not restructured in targetlike ways. The empirical question that then stems from this line of reasoning is whether the set of processing strategies used during syntactic parsing may prevent learners from acquiring the L2 grammar (see Fernández, 1999, for a similar argument).

Sentence-processing research in the L2 is useful in another respect. It is a well-known fact that languages vary crosslinguistically with regard to verb-argument structure. Given the assumptions that (a) comprehension processes are guided by rule-based representations used by the parser (Frazier & De Villiers, 1990) and (b) verb-subcategorization and verb-thematic information affect parsing decisions (Gorrell, 1995; Pritchett, 1992; Trueswell, Tanenhaus, & Garnsey, 1994), it follows that sentence-parsing research can be used as an indirect measure of differences in semantics-syntax representations between monolingual and L2 speakers in cases where the L1 and L2 differ with respect to the way in which verbal concepts are lexicalized. In other words, sentence-parsing research can be used to make claims about the competence that learners have at any particular point during the process of L2 acquisition (e.g., see Juffs, 1998b).

Finally, L2 parsing research complements L2 research devoted to the investigation of how language is understood and used in communicative contexts. To best exemplify this, consider the case of understanding written sentences. To understand written text, L2 speakers must, among other things, identify individual words and compute the structural relationships among them. Com-

prehending written sentences can be particularly challenging for L2 learners because printed text lacks the prosodic information that presumably helps listeners make decisions about phrasal groupings during spoken-language comprehension. If one of the goals of communication is to arrive at a common interpretation of the written text, readers must, minimally, parse sentences in ways that are consistent with the intentions of the interlocutor. In other words, L2 learners must be able to parse written sentences in the L2 in a manner similar to that of native speakers of the target language. Although this task may turn out to be successful when the processing routines used to parse the L1 and L2 converge, when a particular reading of a sentence is linked to the application of language-specific parsing strategies, one expects to find differences in sentence interpretation in cases where the L1 parsing routines are not adequate for parsing L2 input.

The aim of the present paper is to investigate how L2 learners parse L2 input in cases where the language-specific information that decides between one type of parse vis-à-vis its alternative competitor differs in the L1 and L2. As a point of departure, I assume that the output of a parser is a parse tree (e.g., a syntactic tree) that is used for subsequent semantic interpretation. The question is whether L2 speakers use the same set of constraints, rules, and principles that native speakers employ to combine words that yield structures that can be interpreted appropriately. Thus, the primary aim of the present study is to investigate whether learners whose L1 and L2 differ with respect to processing strategies are able to parse sentences in the L2 in a manner similar to that of native speakers.

The syntactic structure under investigation in this study contains a complex NP of the type N1-*of*-N2 followed by a relative clause (RC), as in *Peter fell in love with the daughter of the psychologist who studied in California*. This structure is of particular interest because more than one possible parse is associated with it. Specifically, the RC *who studied in California* can be considered a modifier of *the daughter*, the first noun in the complex NP (i.e., the daughter studied in California), or a modifier of *the psychologist*, the second noun in the complex NP (i.e., the psychologist studied in California). Resolutions of the first kind are traditionally labeled *N1 attachment*, *early closure*, or *high attachment* on the basis of the assumption that the first site is located at a higher point in the syntactic tree. Correspondingly, the latter kind of interpretation is referred to as *N2 attachment*, *late closure*, or *low attachment*.

The remainder of this paper is set out as follows. First, some background information is presented from mainstream sentence-parsing literature dealing with modifier attachment ambiguity in N1-*of*-N2-RC constructions along with a brief summary of a range of relevant experimental findings concerning cross-linguistic parsing differences. An overview of L2 sentence-parsing studies relevant for the present discussion follows. The present study is then described, in which an off-line measure and a self-paced reading measure are used to investigate how L2 speakers perform while parsing sentences. Finally, a number

of explanations for the results are provided, and the question as to the relevance of parsing research for the field of SLA is discussed.

RC ATTACHMENT: SOME BASIC FINDINGS

Much of the progress that has been made toward developing an adequate theory of how the human sentence-parsing mechanism behaves has relied on the operations that the parser follows when it is confronted with local or temporary structural ambiguity. It is assumed that the parser's initial choice when faced with an ambiguous fragment will provide insight into the processes underlying its architecture. The sentence in (3) illustrates this temporary ambiguity.

(3) *Someone shot the daughter of the actor who went to a private clinic.*

As previously stated, in structural terms, the RC *who went to a private clinic* is ambiguous in that there are two potential host sites for its attachment. Attachment to the higher noun in the complex NP, *the daughter of the actor*, will result in an interpretation whereby the daughter was at a private clinic. Conversely, if the RC attaches to the lower noun, the actor will be understood as having gone to the clinic.

The basic observation about on-line processing of phrases of this kind is that in English the parser's initial choice is to attach the RC to the lower noun in the complex NP (for research using questionnaire and self-paced reading data, see Cuetos & Mitchell, 1988; Mitchell & Cuetos, 1991; for research using eye-tracking data, see Carreiras & Clifton, 1999; Henstra, 1996). In conventional terms, speakers who exhibit this type of preference are said to favor, show a bias, or display a preference for N2 attachment. The primary evidence for the preference reported in English comes from measures of the difficulty observed when English speakers process sentences containing a temporary ambiguity that is eventually resolved in favor of the presumably dispreferred reading (N1 attachment). Sentence (4) is a case in point.

(4) *Someone shot the daughter of the actor who went to a private clinic to give birth to her first-born child.*

A parser that systematically attaches the RC low into the complex NP will be forced to reanalyze (at a measurable cost in processing) when it reaches the fragment containing the disambiguating information (i.e., *give birth*). As giving birth to humans is a property unique to females, the reanalysis must involve attachment of the RC from *the actor to the daughter* (i.e., from the preferred N2 attachment to the dispreferred N1 attachment).

According to Frazier (1978, 1987) and Frazier and Rayner (1982), the N2 preference in English is largely determined by the application of a universal

parsing principle, termed *late closure*, that ensures that the parser immediately integrates new constituents with prior material to minimize the chances of exceeding the memory limits of the processing mechanism. Late closure is one of a number of parsing principles, also referred to as *parsing heuristics* or *processing strategies*, that are proposed in a parsing model known as the Garden-Path Theory (Frazier, 1978). The model claims the existence of a small set of universal parsing principles that guide syntactic analysis and that are motivated by general cognitive faculties, such as working-memory limitations—that is, time pressure, resulting from the properties of the human short-term memory, requires humans to parse structural material quickly to preserve it in a limited-capacity memory. The task of a parser, then, is to build the simplest, quickest structure to reduce computational effort.

Although late closure has received support from a number of experimental studies that included a variety of structures in different languages, Cuetos and Mitchell (1988) found that monolingual speakers of Spanish display a bias for N1 attachment in sentences in which a complex NP is followed by an RC, as in (3) and (4). Subsequent empirical research conducted with monolingual Dutch, French, Greek, and German speakers has also reported a preference for N1 attachment (see Brysbaert & Mitchell, 1996; Carreiras & Clifton, 1999; Cuetos & Mitchell, 1988; Cuetos, Mitchell, & Corley, 1996; Hemforth, Konieczny, & Scheepers, 1994; Papadopoulou & Clahsen, 2003; Zagar, Pynte, & Rativeau, 1997). The findings of these studies challenge the assumption that RCs are parsed according to the predictions of universal, structural parsing strategies such as late closure.

The Construal Hypothesis

The Construal Hypothesis is a revision of the Garden-Path Theory, which was weakened by the findings for parsing preferences in languages other than English. The central argument of this hypothesis is that the parser distinguishes between two kinds of phrases or structural relations: primary and nonprimary. Primary relations exist between verbs and their core arguments. Nonprimary relations are not defined in terms of the syntactic properties of verbs but rather involve RCs and adjunct predicates. In terms of parsing processes, the crucial difference between primary and nonprimary phrases is that primary phrases are initially analyzed in accordance with universal parsing principles, such as late closure, whereas nonprimary phrases are construed or associated with the current thematic domain, defined in terms of the last constituent introducing a thematic role (Frazier & Clifton, 1996).

The sentence in (4) illustrates how syntactic analysis occurs according to construal. The NP *the daughter of the actor* constitutes the current thematic domain because *of* does not introduce a new thematic role. Hence, the RC is construed in relation to the whole domain with the result that either noun within the thematic domain is a suitable candidate to host the RC. Next, the parser needs to decide whether to adopt high or low attachment (because

nonprimary phrases eventually have to be attached to some constituent in the sentence for the parser to construct a complete analysis of the sentence). According to Frazier and Clifton (1996), discourse principles introduce a bias for high attachment, and the most important principle is the Referentiality Principle:

> The heads of some maximal projections are "referential" in the sense that they introduce entities (e.g., discourse participants) into the discourse model (at least temporarily) or correspond to already existing discourse entities. Restrictive modifiers (e.g., restrictive relative clauses) preferentially seek hosts that are referential in this sense. (p. 74)

In (4), the Referentiality Principle directs the parser to attach the RC high to *the daughter* for two reasons: (a) *the daughter* is the head of the complex NP, and (b) *the daughter* is directly relevant to the main assertion of the sentence. Because the Referentiality Principle is assumed to be universal, English is predicted to show the same preference bias as, for example, Spanish. The fact that it does not is explained by the workings of an additional factor. In English, an RC unambiguously modifies the first noun in a complex NP of the type N1-*of*-N2-RC if the Saxon genitive (i.e., *the actor's daughter*) is used. The ambiguity arises only when the Norman genitive is employed. Frazier and Clifton (p. 80) suggested that, following Grice's maxim of manner (i.e., avoid obscurity and ambiguity), a speaker intending association of the RC to *the daughter* would choose the Saxon genitive over the Norman genitive (i.e., the speaker would choose the grammatical option that best conveys the intended meaning). The fact that the Norman genitive is used instead signals to the reader or listener that the intended interpretation is one in which the RC modifies *the actor*.

To summarize, within the Construal Hypothesis, parsing decisions involving RCs are based on a number of factors: the thematic processing domain, interpretative principles (e.g., the Referentiality Principle and Gricean maxims), and language-specific rules. In English and Spanish, an RC preceded by a complex head will associate with the entire (complex) NP in cases where the second noun is an argument of the first. The parser's final choice to attach the RC high or low will depend on semantic and interpretative considerations as well as on whether the grammar of the language has a grammatical option to block one of the two available interpretations. In English, but not in Spanish, the parser will choose as the attachment site the lower host in a complex NP because English grammaticizes a Gricean effect.

Returning now to sentence parsing by L2 learners, a prediction that stems from the Construal Hypothesis—and the central focus of this paper—is that knowledge of the existence of the Saxon genitive in English should impinge on how Spanish L2 learners of English parse RCs preceded by complex NPs in their L2. Although one possible outcome would be that proficient L2 speakers parse the L2 input in a targetlike manner, it may be the case that, even at high levels of L2 proficiency, L2 speakers transfer the processing strategies from

their L1 while parsing sentences in the L2. As will be discussed in the next section, research findings on the topic of transfer at the level of syntactic parsing are not uncontroversial. I now turn to a brief review of relevant literature on L2 sentence parsing.

PARSING IN AN L2

The past decade has seen a growing interest in the investigation of on-line parsing performance in L2 sentence processing (e.g., Fernández, 1995, 1999, 2000, 2003; Juffs & Harrington, 1995; White & Juffs, 1998). Motivated in part by the viewpoint that certain structural principles of language are innate, much of this work assumes a competence-based theory of human natural-language processing in which the core of syntactic parsing consists of the local application of a number of grammatical principles. Central in these studies is the question as to whether L2 speakers process target-language input in the same manner as their monolingual counterparts or whether the performance of L2 learners is different in certain respects from that of native speakers. Variables such as language proficiency, language exposure, and working-memory capacity have been investigated to arrive at an understanding of the precise nature of L2 sentence processing and to contribute to the understanding of the fundamental properties of the human sentence mechanism.

In a study of syntactic ambiguity resolution in adult L2 speakers, Frenck-Mestre and Pynte (1997) found that native English speakers who learned French after puberty performed syntactic analysis of ambiguous sentences in a manner similar to that of native speakers. They recorded (in exp. 2) subjects' eye movements while reading sentences that were structurally ambiguous in only one of their two languages, as in these examples from their study (p. 148):

(5) a. *Wherever Sarah walked her pretty miniature poodle followed happily behind.*
b. *Où que Sarah marchât son joli caniche nain suivait derrière gaiement.*

(6) a. *Wherever Sarah went her pretty miniature poodle followed happily behind.*
b. *Où que Sarah allât son joli caniche nain suivait derrière gaiement.*

In English, sentence (5a) is ambiguous because the NP *her pretty miniature poodle* can function either as the object of *walk* or as the subject of the following clause. The ambiguity does not exist in (6a), given that *go* is used intransitively. In French, on the other hand, the ambiguity described for (5a) does not arise. As Frenck-Mestre and Pynte state, *marcher* is always intransitive; therefore, French speakers are expected to initially analyze the NP following the subordinate verb in (5b) and (6b) as the subject of the main clause. They reported that both English-dominant and French-dominant bilinguals reading French and English sentences similar to those in (5) and (6) showed very similar patterns of eye movement, which suggests that L2 speakers process L2 input in a manner consistent with the constraints of the L2.

In a similar study, Hoover and Dwivedi (1998) conducted an experiment to

investigate syntactic processing by highly fluent L2 French speakers as they read sentences containing constructions that do not exist in their L1 (English)—namely, preverbal pronominalization in French causative and noncausative constructions, as in these examples from their study (p. 9):

(7) a. *Il le faisait tranquillement goûter avec son fromage doux préféré.*
"He had it be tasted quietly with his favourite mild cheese."
b. *Il aimait tranquillement le goûter avec son fromage doux préféré.*
"He loved to taste it quietly with his favourite mild cheese."

The findings revealed similar patterns of reading times for French L2 learners and French L1 speakers, indicating once again that L2 readers exhibit target-like syntactic processing during the on-line analysis of L2 constructions not found in their L1 (for additional evidence, see Juffs, 1998a).

Although these studies have shown that adult learners process L2 linguistic input in a way similar to that of monolingual speakers of the target language, this finding is not uncontroversial. Juffs (1998b) investigated the effects of L1 verb-argument structure on L2 processing by highly proficient Asian and Romance learners of English who read sentences with verbs that participated in the causative-inchoative alternation—for example, *Sally broke the window* (causative) versus *The window broke* (inchoative). This alternation is of interest because languages use different morphological markings on the verb to denote different construction types. Romance languages, for example, require the inchoative meaning to be marked by the use of the morpheme *se* and a possible change in the auxiliary verb (e.g., from *avere* to *essere* in Italian). In contrast, in Chinese, Japanese, and Korean, the causative construction requires additional morphology. Juffs used a moving-window technique to display sentences in four different conditions, such as those in (8)–(11) where slashes indicate a new window.

(8) *First of all / the cook melted / the chocolate on / the cake.* (p. 417)

(9) *First of all / the chocolate melted / slowly on the / cake.* (p. 417)

(10) *First of all / the cook made / the chocolate melt / on the cake.* (p. 419)

(11) **First of all / the chocolate melted / itself on the / cake.* (p. 417)

He predicted that, if proficient learners have difficulty with argument structure, the causative sentence in (8) should be more difficult for Chinese, Japanese, and Korean learners because their L1 requires additional morphological marking to denote causation. Romance learners should find the inchoative construction in (9) difficult to read because the sentence lacks the additional morphology needed in Romance languages to mark inchoative constructions. Reading times revealed considerable variation among participants. All learners differed significantly from the native speakers, which showed that—unlike in the Frenck-Mestre and Pynte (1997) and Hoover and Dwivedi (1998) stud-

ies—differences in argument structure between the L1 and L2 result in parsing delays.

Additional evidence for differences between L1 and L2 syntactic processing comes from studies that have examined the way in which L2 learners process RC-attachment ambiguities, as previously described. In one such study, Fernández (1999) reported on preliminary results that suggest that nonnative speakers use strategies not suited for processing the target-language input. The subjects were native speakers of Spanish who had learned English either before (early learners) or after (late learners) the age of 10. Both groups were presented with a pencil-and-paper questionnaire designed to determine whether their parsing preferences would be any different from those of a monolingual English group. The questionnaire consisted of ambiguous sentences of the type N1-preposition-N2-RC (e.g., *Roxanne read the review of the play that was written by Diane's friend*). In response to questions such as *What was written by Diane's friend?* the late learners showed a bias to attach the RC to the N1 of the complex NP (due to transfer of language-specific strategies employed to process their L1), whereas the monolingual English speakers showed the conventional bias to attach the RC to the N2 of the complex NP. Results for the early learners varied, with some early learners favoring the high-attachment strategy and other early learners favoring the low-attachment strategy. The results suggest that L2 learners differ from native speakers with regard to the parsing of RC ambiguity.

In a self-paced reading study, Papadopoulou and Clahsen (2003) examined how Spanish, German, and Russian L2 speakers of Greek resolved RC ambiguities when reading Greek equivalents of sentences such as *A man called the student*$_{\text{MASC}}$ *of the teacher*$_{\text{FEM}}$ *who was disappointed*$_{\text{MASC}}$ *by the new educational system*. They reported that, whereas the Greek native speakers showed a preference for N1 attachment, none of the L2 learners showed any consistent preference for either N1 or N2 attachment. The results suggest that even highly proficient L2 learners parse sentences differently from native speakers (for similar results with German and Greek learners of English, see Felser, Roberts, Gross, & Marinis, 2002; for additional literature on differences between L1 and L2 syntactic processing, see Hahne, 2001; Hahne & Friederici, 2001; Hernández, Bates, & Ávila, 1994; Weber-Fox & Neville, 1996; Wulfeck, Juárez, Bates, & Kilborn, 1986).

All in all, the studies reviewed have presented divergent findings about whether L2 speakers parse the L2 in the same way as adult native speakers. Some studies have shown similar parsing decisions by L1 and L2 speakers of the target language; others have reported significant differences between the two groups of speakers. As previously stated, understanding how L2 learners parse the target input is of interest given that lack of ultimate attainment in the L2 might be partly a result of the application of parsing heuristics that are not suitable to parse the L2. More specifically, L2 learners may be transferring processing strategies from their L1 that are not optimal for parsing the L2, and this in turn may prevent them from acquiring the target grammar. There-

fore, answers regarding whether L2 speakers parse target-language input as monolingual speakers do may have important implications for theories of SLA.

THE PRESENT STUDY

The present study builds on previous findings on ambiguity resolution with RCs and aims to further investigate whether (a) proficient L2 speakers of English and Spanish use the same grammatical information and interpretative principles that native speakers employ to combine words that result in structures that can be interpreted appropriately in their L2 or (b) they transfer this information from their L1 when parsing the L2.

Two experiments are reported. In experiment 1, a questionnaire study was carried out in a preliminary attempt to determine whether proficient L2 speakers of Spanish and English use the same processing routines employed by monolingual counterparts when reading temporarily ambiguous sentences that contain a complex NP followed by an RC. Experiment 2 examined whether the structural choices made by the L2 speakers in the questionnaire study were also made during on-line processing (i.e., while participants were actually processing sentence constituents for the first time) when disambiguating information forced the interpretation in one direction versus the other. This measure of parsing preference is especially necessary considering the fact that off-line judgments may be influenced by the interaction of a number of factors that may override structurally based asymmetries.[1]

Experiment 1

Method.

Participants. The participants in this study were divided into two groups: monolingual speakers and L2 speakers. Because I was interested in investigating the parsing strategies of proficient L2 speakers, 99 native Spanish speakers whose L2 was English and 106 native English speakers whose L2 was Spanish participated in a 20-minute, face-to-face oral interview as an initial screening procedure to determine their level of L2 proficiency.[2] Interviews were carried out by native speakers of the language being tested who were trained in the test administration.[3] Only those participants who received a "superior" rating in the oral interview participated in the study. Participants displayed superior command of the language if they were able to discuss extensively, support their opinions by abstracting and hypothesizing, cope with unfamiliar situations that required the use of precise vocabulary and shift of register, speak without patterns of errors, display richness in vocabulary, and speak with minimal nonnative language pronunciation.

Of this original pool of participants, 31 native Spanish learners of English (henceforth L1 Spanish–L2 English) and 32 native English learners of Spanish (henceforth L1 English–L2 Spanish) received a superior score. Therefore, only

these participants were invited to continue with the study. Additionally, 14 monolingual Spanish speakers and 19 monolingual English speakers served as the basis for comparison.[4] At the time of data collection, the L2 speakers were instructors of Spanish or were completing graduate coursework in Spanish and serving as Spanish teaching assistants at a large Midwestern university.

To assess their functional proficiency in the L2, all L2 participants completed a language background survey designed to tap into several aspects of language proficiency and use by self-report (i.e., language dominance, level of proficiency in the four language skills, number of years the L2 was studied, and length of stay in a country where the L2 is spoken). This survey revealed that the L1 Spanish–L2 English participants had studied English for an average of 11 years prior to their arrival in the United States and had lived in the United States for an average of 7.5 years. When asked about their L2 proficiency, 90% of the participants rated their reading and listening comprehension abilities in English and Spanish equally high (i.e., 4 out of a possible 4). The remaining 10% rated reading and listening abilities in English lower than in Spanish. That is, the average rating for reading comprehension was 3.6 for English and 4 for Spanish; the average rating for listening comprehension was 3.7 for English and 4 for Spanish. Seventy-seven percent of the participants rated their speaking abilities in both languages equally high, and 23% averaged a rating of 3.8 in English and 4 in Spanish. With respect to writing, 61% rated their writing abilities in English and Spanish equally high, whereas the remaining 39% averaged a rating of 3.1 in English and 4 in Spanish.

The L1 English–L2 Spanish participants, on the other hand, had studied Spanish for an average of 12 years prior to participating in this study and had lived in a Spanish-speaking country for an average of 2 years. The language survey revealed that 66% rated their reading abilities in Spanish and English equally high (i.e., 4 out of 4), whereas the remaining participants averaged a rating of 3.4. With respect to speaking, 53% rated their speaking ability in Spanish and English equally high (i.e., 4 out of 4), and 47% averaged a rating of 3.7 for Spanish and 4 for English. About half of the participants rated their writing abilities in Spanish as high as in English (again, a score of 4 for both languages), and the remaining half rated Spanish considerably lower than English (2.8 on average). Seventy-five percent of them rated Spanish and English listening comprehension equally high, and 25% averaged a rating of 2.7. On the basis of the results of the self-assessment language questionnaire and the oral interview, those who participated in this study were considered to be proficient in the L2.[5]

Materials. To obtain a preliminary view of processing strategies by these speakers, two questionnaires were constructed, one in English and one in Spanish. Each questionnaire comprised 16 experimental stimuli, 24 distractors, and 24 filler sentences. A sample of each sentence type from the English questionnaire is given in (12)–(14).

(12) *Peter fell in love with the daughter of the psychologist who studied in California.*

(13) *The seamstress was talking to the apprentice while she was cutting the fabric.*

(14) *The doctor had breakfast with his colleague and then went to work.*

In (12), the RC *who studied in California* can be attached to either the first or second noun in the complex NP. If the first one is selected as the head of the RC, the daughter will be identified as having studied in California. If, on the other hand, the second one is selected as the head, the psychologist will be understood as the person having studied in California. In the distractor in (13), the ambiguity arises because the pronoun in the dependent clause can potentially refer to either the subject NP or the object of the prepositional phrase of the independent clause. Finally, (14) functions as a filler item.

The experimental items used in this study examined the same type of relation between the two nouns in the complex NP (i.e., kinship relations); therefore, the complex NP always contained two nouns with the feature [+human], separated by the preposition *of* or *de*. Additionally, for all experimental items, a subject RC that could be a plausible modifier of the first or second noun immediately followed the complex NP.

Consistent with the procedure followed by Cuetos and Mitchell (1988) and in subsequent work, the sentences (i.e., experimental stimuli, distractors, and fillers) in the English and the Spanish questionnaires were followed by a question and two possible answers. For example, sentence (15) was presented as follows.

(15) *Peter fell in love with the daughter of the psychologist who studied in California.*
Who studied in California?
a. *The daughter studied in California.*
b. *The psychologist studied in California.*

Given that variability in attachment preferences has been reported for individual items as well as for item types (Gilboy, Sopena, Clifton, & Frazier, 1995), all but two of the items used in the Spanish questionnaire were word-for-word translations of the sentences in the English questionnaire.[6] This rules out the possibility that any differential behavior in performance on the two questionnaires stems from variability caused by, for example, individual items rather than from a genuine difference in attachment preferences in each of the participants' languages. A sample of the materials from the Spanish questionnaire is given in (16).

(16) *Pedro se enamoró de la hija del psicólogo que estudió en California.*
"Peter fell in love with the daughter of the psychologist who studied in California."
¿Quién estudió en California?
"Who studied in California?"
a. *La hija estudió en California.*
"The daughter studied in California."

b. *El psicólogo estudió en California.*
"The psychologist studied in California."

Participants were told that their task was to read the sentence silently and to answer the question following it by circling the choice that they thought best answered the question. The materials were counterbalanced so that, for half of the sentences, the first noun in the complex NP occupied the first-choice position in the answers (e.g., *daughter* appeared before *psychologist*), and in the remaining half the second noun appeared in the first-choice position in the answers (e.g., *psychologist* before *daughter*). This was done to avoid results that would be caused by the participants consistently choosing the first or second answer in each set. Additionally, the sentences in the questionnaires were randomized such that no two people read the sentences in the same order (i.e., there were 96 versions of the questionnaire, one for each participant).

If L2 speakers are like native speakers in that they use the same structure-based information (i.e., distinctions between primary and nonprimary phrases and information on theta-role assignment), language-specific information (i.e., knowledge of different genitive constructions in the languages involved), or interpretative and discourse principles when parsing sentences containing a complex genitive NP followed by an RC, then the following can be expected to occur.

First, consistent with previous findings on RC attachment for monolingual Spanish and English speakers, the monolingual Spanish speakers in this study should interpret the RC as referring to the first noun in the complex NP. In behavioral terms, it is anticipated that these participants will choose *la hija estudió en California* "the daughter studied in California" as the correct answer to questions similar to (16). Conversely, the monolingual English speakers should opt for the interpretation in which the RC modifies the second noun in the complex NP. Therefore, when reading sentences in English similar to (15), these speakers are expected to select *the psychologist studied in California* as the correct answer. Second, when reading Spanish sentences, both the L1 Spanish–L2 English and the L1 English–L2 Spanish groups should select answers that are indicative of a decision to attach the RC to the first noun. In other words, both groups are expected to mirror the parsing decisions of monolingual Spanish speakers. Finally, when reading English sentences, both the L1 Spanish–L2 English and the L1 English–L2 Spanish speakers should attach the RC to the second noun, thus performing like native speakers of the target language.

Procedure. Participants were told that they were taking part in a study on memory and retention of information. They were instructed to read the sentences printed on the questionnaire and to answer the question that followed each sentence by circling the choice that they thought was more appropriate. At the end of the questionnaire, they were given a list of 20 sentences and asked to indicate whether they had previously encountered the sentences in

Table 1. High-attachment responses: Spanish and English monolingual participants

Monolingual group	*n*	*M*	*SD*	*SEM*
Spanish	14	11.79	2.36	0.63
English	19	2.26	2.31	0.53

Table 2. *T*-test for independent samples

Assumption	*t*	*df*	Mean difference
Equal variances assumed	11.612*	31	9.52
Equal variances not assumed	11.570*	27.794	9.52

*$p < .0001$ (two-tailed).

the questionnaire. This was done only to be consistent with the information given to participants in relation to the purpose of the experiment. Therefore, their responses to these questions were not taken into account during data analysis.

The monolingual participants answered only one questionnaire. The L2 speakers answered one questionnaire in Spanish and one in English. Half of the L2 speakers answered the Spanish questionnaire first, and the remaining half answered the English one first. Approximately 3 months later, the roles were reversed so that the group that answered the Spanish questionnaire first then took the English one, and the group that answered the English questionnaire first then answered the Spanish one.[7] The time span between the administration of the two questionnaires was intended to prevent participants from reproducing in the second questionnaire the answers that they had given in the first one. A native Spanish speaker administered the Spanish questionnaire, and a native English speaker administered the English questionnaire.

Results. The raw data were the number of selections made for the first and second forced-choice options. As there was a dependent dichotomy in the number of responses (i.e., if a participant scored 5 high-attachment responses, 11 had to be low-attachment ones and vice versa), only the high-attachment responses are reported. Table 1 compares the number of high-attachment responses given by the two monolingual groups.

For the Spanish monolinguals, the mean high-attachment response was 11.79 out of a possible 16. This indicates that, in approximately 74% of the cases, these participants selected the first noun (e.g., *hija* in [16]) rather than the second noun (e.g., *psicólogo* in [16]) as the correct answer. For the English monolinguals, the pattern of results was quite different. On average, only 14% of the cases (2.26 out of 16) received high-attachment responses, which indicated their bias for low attachment. The data were submitted to a *t*-test for independent samples (see Table 2), which revealed a significant difference be-

Table 3. High-attachment responses across groups: Spanish and English questionnaires

Questionnaire	Participant group	*n*	*M*	*SD*
English	English monolingual	19	2.26	2.31
	L1 English–L2 Spanish	32	4.44	3.80
	L1 Spanish–L2 English	31	3.55	3.83
Spanish	Spanish monolingual	14	11.79	2.36
	L1 English–L2 Spanish	32	7.09	4.55
	L1 Spanish–L2 English	31	4.55	3.94

tween the number of high-attachment responses given by the monolingual Spanish speakers and the monolingual English speakers. This result replicates those reported in previous studies of attachment preferences for Spanish and English monolingual speakers (e.g., Carreiras & Clifton, 1999; Cuetos & Mitchell, 1988; Mitchell & Cuetos, 1991) and indicates that Spanish speakers attach the RC to the first noun, whereas monolingual English speakers attach it to the second noun in the complex NP.

Next, I compared the means obtained for each of the monolingual groups with those of the L2 groups. Table 3 presents the means of high-attachment responses across groups in the Spanish and English questionnaires. If we turn to the English results first, we see that Table 3 shows all three groups displayed a strong bias toward low attachment. The English monolingual group showed a preference for high attachment in only 14% of the cases on average; the L1 English–L2 Spanish and L1 Spanish–L2 English groups preferred high attachment 28% and 22% of the time, respectively. Moving on to the Spanish questionnaire, the findings show that on average the L1 English–L2 Spanish and L1 Spanish–L2 English groups preferred high attachment fewer times (44% and 28%, respectively) than the monolingual Spanish group (74%). A 2×3 ANOVA with participant group as one variable and attachment preference as the other variable revealed a significant difference across the means, $F(3, 92) = 10.642$, $p < .0001$. Scheffé post hoc analyses further revealed that, for the Spanish questionnaire, the difference between the means obtained for the Spanish monolingual group and the L1 Spanish–L2 English group were significantly different from each other ($p < .0001$), as was the difference between the means for the Spanish monolingual group and the L1 English–L2 Spanish group ($p < .001$). However, the means for the L1 Spanish–L2 English group and the L1 English–L2 Spanish group were marginally significantly different from each other ($p = .053$). Finally, contrasts between the English monolinguals, the L1 Spanish–L2 English participants, and the L1 English–L2 Spanish participants in the English questionnaire did not reveal a significant difference across any of the mean values (see Table 4).

Discussion. The findings from the Spanish questionnaire suggest that it may be more difficult for the L2 speakers of Spanish to attach a constituent

Table 4. Scheffé post hoc analyses: Monolinguals and L2 participants

Questionnaire	Pairwise comparisons	Mean difference	*SE*
Spanish	Monolingual Spanish vs. L1 Spanish–L2 English	7.24**	1.154
	Monolingual Spanish vs. L1 English–L2 Spanish	4.69*	1.148
	L1 Spanish–L2 English vs. L1 English–L2 Spanish	–2.55	0.903
English	Monolingual English vs. L1 Spanish–L2 English	–1.29	0.952
	Monolingual English vs. L1 English–L2 Spanish	–2.17	0.947
	L1 Spanish–L2 English vs. L1 English–L2 Spanish	–0.89	0.824

*$p < .001$. **$p < .0001$.

high into a structure than to attach it low, at least in ambiguities of the type tested here where parsing decisions are not influenced by lexical information carried by the verb (e.g., argument structure). It has been shown that the L1 English–L2 Spanish participants showed a bias for N2 attachment while reading Spanish sentences, whereas native Spanish speakers preferred N1 attachment. In the context of the Construal Hypothesis, recall that a speaker's (or reader's) RC-attachment decisions are determined initially by structural information (i.e., association of the RC to the extended maximal projection of the last theta-role assigner) and later by grammatical and discourse information. The L1 English–L2 Spanish speakers did, in fact, make use of structural information to determine the domain of association of the RC (i.e., *hija del psicólogo* "daughter of the psychologist"). However, in the absence of a Saxon genitive (or some other equivalent construction) in Spanish, the L2 speakers of Spanish should have preferred N1 as the attachment site. This follows from the proposal made by Frazier and Clifton (1996) that speakers prefer to attach a modifier to a host that is related to the main assertion of a sentence. Given that the first noun in the complex NP is referential in that it introduces or refers to a discourse entity, the L2 speakers should have resolved the ambiguity by attaching the RC to the referential N1. Nonetheless, in spite of their high level of L2 proficiency, these speakers resolved the ambiguity by attaching the RC to the N2, as in their L1. They appear to have used parsing decisions that are linked to L1 influence, and this explanation is supported by the fact that N2 attachment was the preferred parsing decision in the English questionnaire.

I now move to the L1 Spanish–L2 English participants and discuss the results of each questionnaire in turn. In the English questionnaire, speakers exhibited parsing preferences like those of monolingual English speakers. At first glance, one might argue that, unlike the L1 English–L2 Spanish speakers, the L2 speakers of English have indeed used the Saxon genitive cue to resolve the structural ambiguity in the L2. However, this explanation is called into question once the findings on the Spanish questionnaire are taken into account. Contrary to what was expected, when reading in their L1, these speakers preferred to attach the RC low, to the N2, rather than high, to the N1. This was

surprising given that in Spanish the preference is tilted rather consistently toward N1 attachment. The finding also speaks to the importance of testing participants in their L1 and L2.

Overall, these results do not support the predictions made by the Construal Hypothesis. Both groups of L2 speakers failed to use the existence or nonexistence of a Saxon genitive form as an interpretative cue to arrive at a nativelike parse of the ambiguous structure. However, because off-line data does not guarantee that the choices readers make represent actual "first-pass" commitments, I conducted an additional experiment using a timed task to test the L2 speakers' attachment preferences on-line. To study parsing preferences using an on-line task, it is necessary to construct experimental materials that bias the meaning of a sentence toward either high or low attachment. The assumption behind this procedure is that, if participants initially commit to one attachment preference but then encounter a context that biases the interpretation toward the other, there will be a cost associated with the revision of the initial interpretation.

Studies examining this question from the monolingual point of view have relied on gender information to construct the biasing context. Admittedly, there are two ways in which gender information can be manipulated. Sentences can be constructed in which their interpretation is either conceptually or grammatically compatible with only one of two attachment sites. In the first case, the assumption is that readers rely on world-knowledge information about gender roles to arrive at the correct interpretation of the sentence, whereas in the second case they use gender information morphologically encoded in the sentence. To illustrate the first case, take the sentence *Alguien disparó al hermano de la actriz que vivió en España con su esposa* "Someone shot the brother of the actress who lived in Spain with his wife." Here, the bias toward high attachment arises because of a social convention that women typically marry men, not other women. However, a sentence such as *Alguien disparó al hermano de la actriz que estaba deprimido* "Someone shot the brother of the actress who was depressed$_{MASC}$" is biased toward high attachment because of the presence of the masculine morphological marker *o* on the adjective *deprimido*.

As a first attempt toward investigating parsing strategies in L2 speakers, I used conceptual information as the disambiguating factor. However, one consequence was that differences in the Spanish and English possessive determiner systems (i.e., the Spanish possessive determiner *su* is not marked for gender, whereas its English equivalent *his* or *her* carries gender information) would result in differences in the experimental materials. Thus, the Spanish sentences would be conceptually disambiguated (e.g., *hijo de la actriz . . . con su esposa*), whereas the English sentences would be morphologically disambiguated (e.g., *son of the actress . . . with his wife*).[8] Given that any differences observed between on-line Spanish and English data could be argued to result not from a genuine difference in parsing preferences but rather from the different nature of the materials, I decided to examine on-line preferences only

when participants read Spanish sentences, as this could provide a tentative answer to the research question.

Experiment 2

Method.

Participants. Twenty-eight L1 Spanish–L2 English speakers and 28 L1 English–L2 Spanish speakers who took part in experiment 1 also participated in experiment 2. Additionally, 32 Spanish monolinguals were recruited to participate in this study. All speakers were paid for their participation.

Materials. Following Mitchell and Cuetos (1991), the materials for this experiment were constructed by adding a phrase to the end of sentences that were similar to those used in the questionnaire study. For example, sentence (17) was changed to (18) by adding the phrase *con su esposo*.

(17) *El perro mordió al cuñado de la maestra que vivió en Chile*.
"The dog bit the brother-in-law of the teacher$_{FEM}$ who lived in Chile."

(18) *El perro mordió al cuñado de la maestra que vivió en Chile con su esposo*.
"The dog bit the brother-in-law of the teacher$_{FEM}$ who lived in Chile with his/her husband."[9]

In (18), the final phrase *con su esposo* forces low attachment (condition 1) because *cuñado* is masculine and therefore not a suitable candidate for being the head of the RC (which also contains a masculine noun).[10] A variant of (18) was constructed by switching the gender of the noun in the complex NP to force attachment of the RC to the higher noun (condition 2). Finally, two control sentences were added by altering the gender of N1 (condition 3) and removing the possessive phrase entirely (condition 4).[11] The complete set of conditions is as follows:

Condition 1
El perro mordió al cuñado de la maestra / *que vivió en Chile* / *con su esposo*.
"The dog bit the brother-in-law of the teacher$_{FEM}$ who lived in Chile with his/her husband."

Condition 2
El perro mordió a la cuñada del maestro / *que vivió en Chile* / *con su esposo*.
"The dog bit the sister-in-law of the teacher$_{MASC}$ who lived in Chile with his/her husband."

Condition 3
El perro mordió a la cuñada de la maestra / *que vivió en Chile* / *con su esposo*.
"The dog bit the sister-in-law of the teacher$_{FEM}$ who lived in Chile with his/her husband."

Condition 4
El perro mordió a la maestra / *que vivió en Chile* / *con su esposo*.
"The dog bit the teacher$_{FEM}$ who lived in Chile with his/her husband."

Thirty-two item sets[12] were constructed for this experiment, and the four conditions in each item set were assigned to one of four participant files. This ensured that all participants saw all conditions but no single participant saw two variants of the same item set. Additionally, 32 distractor sentences (e.g., *El doctor miraba a la enfermera mientras hablaba por teléfono* "The doctor was looking at the nurse while talking on the phone") and 32 filler sentences (*El hijo de la secretaria le envió flores a nuestra vecina* "The secretary's son sent flowers to our neighbor") were included to divert the participants' attention from the objective of the experiment. The distractor items were ambiguous in that a null pronoun in a dependent clause could refer to either the subject NP or the object NP of the independent clause. The filler items were unambiguous sentences that varied in structural complexity.

In approximately one-third of the trials, an open-ended question appeared on the screen. Participants were instructed to answer the questions before proceeding to the next sentence. The questions were added to ensure that they were reading the sentences and to distract them from the objective of the experiment. Questions were distributed evenly across experimental, distractor, and filler sentences. A sample of each sentence type with its corresponding question is given in (19)–(21).

(19) *El perro mordió al cuñado de la maestra / que vivió en Chile / con su esposo.*
"The dog bit the brother-in-law of the teacher$_{FEM}$ who lived in Chile with his/her husband."
¿Dónde vivió el esposo?
"Where did the husband live?"

(20) *El doctor miraba a la enfermera / mientras hablaba / por teléfono.*
"The doctor was looking at the nurse while talking on the phone."
¿Quién hablaba por teléfono?
"Who was talking on the phone?"

(21) *El hijo de la secretaria / le envió flores / a nuestra vecina.*
"The secretary's son sent flowers to our neighbor."
¿Quién le envió flores a nuestra vecina?
"Who sent flowers to our neighbor?"

Finally, seven additional sentences were generated and presented to the participants at the beginning of the session to familiarize them with the task requirements (but these were not included in the analyses).

Procedure. Data were collected using a self-paced reading task. The program used to run this experiment was DMASTR.[13] All sentences were segmented into three displays (as indicated by the slashes in conditions 1–4 and sentences [19]–[21]).[14] Each time a set of items was presented to a participant, it was pseudo-randomly scrambled. This involved assigning an equal number of experimental, distractor, and filler sentences to a number of different item blocks. Thus, experiment 2 was divided into eight blocks, each containing four experimental items, four distractor items, and four fillers. The sequence of items within each block was then scrambled, as was the sequence

Table 5. Mean reading times (in milliseconds) by display and condition for monolingual Spanish speakers

Display	Condition 1: Favors low attachment	Condition 2: Favors high attachment	Condition 3: Long control	Condition 4: Short control
1	2,853	2,869	2,863	2,229
2	1,686	1,657	1,701	1,790
3	1,603	1,407	1,538	1,510

of blocks. As a result, the items were presented in a different order to each participant, yet the items in each condition were evenly distributed throughout the duration of the experiment. This guarded against the possibility of all items representing one condition being randomly clustered together during the course of the experiment.

Before the experiment began, participants were told that they were engaging in a study on reading comprehension and were presented with an instruction sheet that explained the procedure and emphasized the importance of speed while reading and of accuracy in responding to the questions. When the first sentence was requested, the first display of an item appeared centered on the screen and a clock started. The participants read this display and then pressed a key to request the second display. The time that elapsed between the onset of the first display and the request for the second display was recorded. Additionally, the first display was replaced by the second display, and the clock started again. They then read the second display and again pressed a key, this time to request the last display. As before, the time that elapsed between the onset of the second display and the request for the last display was recorded, and the second display was replaced by the last display. Participants then read the last display and indicated that they had finished reading the sentence by pressing a key. This action stopped the clock. This same procedure was continued through the end of the experiment.

Consistent with previous monolingual work, the monolingual Spanish speakers in the present study are expected to take longer to read the display that forces resolution in favor of low attachment (i.e., the last phrase in condition 1). Additionally, if the L1 English–L2 Spanish speakers use the same parsing strategies as monolingual Spanish speakers, the last phrase of condition 1 should take longer to read than the corresponding display in the other three conditions. If, on the other hand, they transfer their parsing strategies from the L1 to the L2, the last phrase in condition 2 should take longer to read. Finally, the L1 Spanish–L2 English participants are expected to parse the experimental items like monolingual Spanish speakers, as they are reading in their L1.

Results. Turning first to the results obtained from the monolingual Spanish speakers, the mean reading times for all three displays are shown in Table 5.

Table 6. Mean reading times (in milliseconds) by condition for display 3: L2 participants

L2 Participants	Condition 1: Favors low attachment	Condition 2: Favors high attachment	Condition 3: Long control	Condition 4: Short control
L1 English–L2 Spanish	1,538	1,592	1,510	1,437
L1 Spanish–L2 English	1,534	1,660	1,411	1,415

For display 1, the only statistically significant albeit trivial result is the finding that reading time is faster when the display length is shorter due to the removal of the first noun in the complex NP along with the preposition *de* "of." A 2×3 repeated measures ANOVA with condition as the within-subjects variable and file as the between-subjects variable revealed that the latency for the short control (condition 4) was significantly shorter than that for the other three conditions, $F(3, 84) = 48.34$, $p < .0001$. None of the remaining pairwise comparisons between the other three conditions approached significance. For display 2, there were no reliable differences between the four conditions. Although condition 4 was numerically larger than the other three conditions, the difference was not statistically significant, $F(3, 84) = 2.19$, $p = .095$.

I now turn to the crucial data—the reading times for display 3. As can be seen, there was a numerical cost for the condition that forces participants to attach low over the other three conditions. A 2×3 repeated measures ANOVA with condition as the within-subjects variable and file as the between-subjects variable revealed that the difference observed across the four means was statistically significant, $F(3, 84) = 10.26$, $p < .0001$. Pairwise comparisons across the four conditions showed that condition 1 took significantly longer to read than condition 2, $F(1, 28) = 78.82$, $p < .0001$. A reliable difference was also observed between reading times for conditions 1 and 4, $F(1, 28) = 5.04$, $p < .05$. Finally, there was a numerical advantage for condition 3 vis-à-vis condition 1. Although no statistically significant difference was found between these two times, it did approach significance, $F(1, 28) = 3.88$, $p = .059$.

The results obtained thus far corroborate the previous findings reported in the literature for attachment preferences in Spanish. In essence, monolingual Spanish speakers take longer to process sentences when the final display forces low attachment of the RC. I now turn to the data of central interest here—the reading times for the L2 speakers—and focus the discussion on the results obtained for display 3 (the disambiguating display), as the results for the other two displays mirror the ones previously reported. These results are shown in Table 6.

Results for the L1 English–L2 Spanish group indicated a numerical advantage for sentences in condition 1 over those in condition 2. A 2×3 repeated measures ANOVA with condition as the within-subjects variable and file as the between-subjects variable revealed a significant difference across the four

means, $F(3, 72) = 3.03$, $p < .05$. However, pairwise contrasts indicated that the difference between conditions 1 and 2 was not statistically significant, $F(1, 24) = 0.637$, $p = .433$. A significant but trivial difference was found between conditions 2 and 4, $F(1, 24) = 6.989$, $p < .05$.[15]

Results for the L1 Spanish–L2 English participants showed that sentences favoring high attachment took longer to read than sentences in the remaining three conditions. A repeated measures ANOVA with condition as the within-subjects variable and file as the between-subjects variable revealed that the difference across the four means was statistically significant, $F(3, 72) = 11.82$, $p < .0001$. Pairwise contrasts indicated that the difference in reading times between conditions 1 and 2 (126 ms) was statistically significant, $F(1, 24) = 6.90$, $p < .05$. This suggests that the L1 Spanish–L2 English participants took longer to read sentences in their L1 that were biased toward a high-attachment interpretation.

GENERAL DISCUSSION

The first question addressed in this study is whether L2 speakers display the same preferences as their monolingual counterparts when processing clauses of the type N1-*of*-N2-RC in their L1 and L2. The results obtained for the L1 English–L2 Spanish speakers are only suggestive. The English questionnaire data showed that these native readers of English displayed the conventional bias for low attachment reported in the literature for English constructions. When reading in their L2, their preferred parsing strategy was also low attachment. As for the on-line data, this same group displayed a lack of preference for one type of attachment site over the other when reading in their L2. Although this lack of statistical significance does not provide conclusive evidence to address the question as to whether the L1 English–L2 Spanish speakers parse L2 input like native speakers, it appears that these speakers are not performing syntactic analysis of L2 sentences in the same way as monolingual Spanish speakers. I hypothesize that this group likely favored N2 attachment even during real-time sentence processing and that the nonsignificance in the on-line data could have resulted from a lack of experimental power. The fact that reading times were numerically smaller for the low-attachment versus the high-attachment condition in the on-line data provides some tentative support for this interpretation. Additionally, previous studies (e.g., see Felser et al., 2002; Fernández, 2000; Papadopoulou & Clahsen, 2003) using intuitions about the preferred reading of ambiguous sentences have shown close correspondence to on-line evidence, which suggests that intuitive techniques such as questionnaires like the one employed here can provide useful information.

The results obtained for the L1 Spanish–L2 English speakers in the questionnaire data indicate that these participants showed a bias for low attachment when processing N1-*of*-N2-RC constructions in their L2. At first glance, it would appear that they were indeed sensitive to the type of structural and nonstructural information that directs the parser to attach either high or low

in the kind of structures examined here. However, this explanation becomes untenable when considering these speakers' performance in their L1. Both the questionnaire data and the on-line data showed that the L1 Spanish–L2 English participants favored N2 over N1 attachment when reading Spanish, a language that is not only their L1 but that also biases a high-attachment interpretation in this type of construction. With regard to the Construal Hypothesis, there is no evidence in these results to suggest that either group of L2 speakers applied the grammatical and discourse focus operations postulated therein in the same way as native speakers in order to make a decision regarding final attachment of the RC to one of the two potential hosts within the complex NP.

At this point the question remains as to why N2 attachment should be preferred by both groups of L2 speakers. A possible explanation may lie in the cognitive demands placed on the bilingual language processor.[16] I start with the assumption that N2 attachment (i.e., local attachment or late closure) is a parsing principle favored by the processing system on the grounds that it allows listeners and readers to immediately integrate new material with prior material and, by way of local attachment, minimizes the chances of exceeding the memory limits of the sentence-processing mechanism (see Frazier, 1978; Frazier & Clifton, 1996; Fodor, 1998). It may be that the bilingual processor favors late closure to minimize delays in processing time that come about from housing two languages. These processing delays arise because the processor is required to manage two linguistic systems, as bilinguals do not completely deactivate one of the two languages even in a monolingual language mode (Grosjean, 1985, 1997).[17] Evidence for residual activation of one of the languages comes from a variety of research perspectives. In speech-perception studies (e.g., Altenberg & Cairns, 1983; Grosjean & Soares, 1986), bilinguals have been shown to access real words as quickly as monolinguals, but they are substantially slower at responding to nonwords. In speech production, comparisons of timed responses on different naming tasks (e.g., the naming of objects and numbers) have shown that bilinguals are slower than monolinguals even when they are strongly dominant in one language, and trilinguals are even slower than bilinguals (Mägiste, 1979). The assumed costs linked with managing two (or more) linguistic systems may arguably decrease the amount of information that the parser can effectively process. Therefore, the bilingual parser will default to operations such as late closure (N2 attachment) that give rise to the most simply and quickly derived analysis, with the result that the processor will have at its disposition additional processing resources and memory capacity to deal with specific, real-time processing constraints encountered by bilingual speakers during language processing.

In short, at points in which the grammar does not dictate a specific analysis of a sentence (e.g., in structures involving RC attachment of the type examined here), the cognitive pressure and memory-load demands associated with housing two linguistic systems constrain the bilingual parser to use operations such as late closure, which ensure that new material is immediately inte-

grated with prior material (by way of local attachment) and minimize the chances of exceeding the memory limits of the sentence-processing mechanism. Some support for this explanation comes from Frenck-Mestre and Pynte (1997, exp. 1), who investigated the way in which advanced English-speaking learners of French and French native speakers resolved attachment ambiguities involving prepositional phrases. Records of eye movements revealed that the L2 speakers experienced greater difficulty than native speakers with verb-phrase attachment (i.e., high attachment) of the prepositional phrase while reading sentences such as *He rejected the manuscript on purpose because he hated its author* in comparison with *He rejected the manuscript on horses because he hated its author*. To account for this finding, Frenck-Mestre and Pynte proposed that nonnative readers may have a general preference for a low-attachment strategy, which, in this case, amounts to attaching the prepositional phrase to the most recently processed constituent (e.g., the noun immediately following the verb).

A competing explanation for the results of the present study appeals to the notion of language exposure. As previously stated, at the time of data collection the participants were living in a predominantly English-speaking environment. It may be that exposure to a preponderance of N1-*of*-N2-RC English constructions resolved in favor of low attachment may have rendered this interpretation more available, ultimately resulting in the preference for low attachment observed in these results. Naturally, the adequacy of this explanation depends in part on evidence showing that low attachment in the construction at issue is a prevalent parsing routine in the host language (English in this case) as a whole. Mitchell, Cuetos, and Corley (1992) reported results suggesting that this is indeed the case: In a small-scale, corpus study of modifier-attachment preferences in English, using the million-word Lancaster-Oslo/Bergen corpus, they found that 62% of the (resolvable) RC-attachment constructions were linked to N2. Gibson and Pearlmutter (1994) also reported convergent findings. They analyzed all occurrences in the Brown corpus of constructions in which an RC was attached to N1, N2, or N3, and they found that N3 was the preferred attachment site. Although language exposure plays some role, at the present time it is not possible to decide between one type of proposal over the other. The crucial comparison needed is with a group of L1 Spanish–L2 English speakers who are not living in a predominantly English-speaking environment but rather in a primarily Spanish-speaking one. If environment is the deciding variable, these speakers ought to show a bias for N1 attachment when parsing in the L1 and L2. If, on the other hand, economy in parsing is the deciding factor, these speakers should prefer N2 attachment both in their L1 and L2. Such a study is now in progress (Dussias & Sagarra, 2003).

To conclude, I outline some implications of these findings for SLA in general. It seems incontrovertible that an L2 learner's encounter with input from the target language is filtered through the parsing mechanism: In the process of L2 acquisition, the parser supplies information to the learning mechanism,

enabling it to work appropriately. If, as the present study suggests, L2 learners analyze L2 input using parsing routines unsuitable for the L2, they may fail to make the correct hypothesis about the L2 grammar. In short, one source for the linguistic differences observed between monolingual speakers and L2 speakers of the target language may be in linguistic performance and not in access to principles of Universal Grammar. Therefore, a multidisciplinary research program that brings to bear both theories of modern linguistics and psycholinguistic evidence is needed to develop rich and explanatory accounts of SLA.

(*Received 25 February 2003*)

NOTES

1. An anonymous *SSLA* reviewer pointed out that on-line data may be influenced by the same type of information that could affect off-line judgments. There is pervasive evidence in the monolingual sentence-parsing literature that the syntactic analysis of a sentence can be influenced by nonsyntactic information such as lexical-semantic, discourse, frequency, or other sources of information. However, the time course of access to the different types of information is still at the core of sentence-parsing research. To investigate how the parsing mechanism integrates words into the current sentence context, research on syntactic parsing systematically employs behavioral measures that are time constrained (reaction-time methodology and eye-movement data) and electrophysiological measures (event-related brain potentials) because it is believed that these methodologies provide a more direct window onto how the parser assigns an initial, syntactically licit structure to an incoming string of words. This paper follows the same methodological tradition.

2. The test employed was the Simulated Oral Proficiency Interview.

3. An anonymous *SSLA* reviewer indicated that the use of one judge compromises interrater reliability. Although I agree with this statement, L2 proficiency level was triangulated through the additional use of the self-assessment language background questionnaire. Furthermore, all participants were fluent enough to conduct classes in their L2 and to be successful at university courses taught in their L2.

4. Both groups of monolingual speakers reported having less than 1 year of study in an L2. The Spanish monolingual group was recruited and tested in a Spanish-speaking country.

5. In this paper, I follow Kroll and Dussias (in press) and take anyone who actively uses two languages at some level of proficiency to be bilingual. Because few bilinguals are genuinely balanced in their use of two languages, I assume that for most bilinguals there will be one dominant language, although it need not necessarily be the L1.

6. Two experimental sentences had to be slightly modified because of awkward pragmatic effects that resulted from the translation.

7. An anonymous *SSLA* reviewer pointed out that testing participants in their L1 is unnecessary once a monolingual control group is included. Results from several studies performed in the framework of the Competition Model (Bates & MacWhinney, 1982; Hernández et al., 1994) revealed that, during sentence processing, bilinguals use a set of amalgamated processing strategies from their L1 and L2 to process two different linguistic systems. This behavior differentiates them from monolingual speakers of the languages involved. Additionally, in a study of text comprehension, Kozminski and Graetz (1986) showed that advanced L2 learners processed text quite differently in their L1 and L2. Frenck-Mestre and Pynte (1997) also reported that L1 French–L2 English speakers parsed sentences in their L1 differently than what would be expected of French monolingual speakers. Finally, there is now compelling evidence to suggest that words in both of the bilinguals' languages are active during comprehension and production (e.g., Costa, Miozzo, & Caramazza, 1999; Dijkstra & van Heuven, 1998). This suggests that the information associated with lexical entries in the L2 may well become active when bilinguals read in their L1. Given these findings and the fact that parsing falls under the domain of *performance* and not *competence*, it was critical to ensure that performance in the bilinguals' L1 be similar to that of the monolingual group in all relevant respects.

8. An anonymous *SSLA* reviewer pointed out that the phrase *with his wife* is both morphologically and conceptually disambiguated. Although this is in fact the case, the sentence becomes disambigu-

ated as soon as the word *his* enters the parse. Therefore, for the purposes of this paper, I adhere to the distinction of morphological and conceptual disambiguation presented here.

9. As previously stated, unlike *his* and *her* in English, the possessive determiner *su* in Spanish is used for both males and females and does not carry gender information.

10. An anonymous *SSLA* reviewer pointed out that sentence (18) does not force low attachment because the sentence could potentially mean that (a) *la maestra* "the teacher" lived in Chile with her husband or (b) *el cuñado* "the brother-in-law" lived in Chile with the teacher's husband. If participants were consistently opting for reading (b), one would not expect condition 3 (the long control) to be numerically smaller than condition 1. Additionally, to this author, association of the RC to *el cuñado* and of the pronoun *su* to *la maestra* appears to be intuitively more costly to process than association of both the RC and the pronoun to the same referent. Therefore, one would not expect to see a large difference in processing times between conditions 1 and 2.

11. An anonymous *SSLA* reviewer pointed out that the materials used in experiment 2 may not really provide an answer as to whether monolingual Spanish speakers take longer to process sentences when the final display forces low attachment. More specifically, it is not clear if readers revise their initial parse because of new information provided by the lexical items or because of the fact that the new information forces low attachment. However, note that, if the mere presence of new information causes revision, we would expect speakers to revise both in the condition forcing low attachment and in the condition forcing high attachment, given that in both conditions new information is introduced at the end of the sentence. Furthermore, unless the participants have made a commitment to attach the RC low (to N2) prior to reaching the disambiguating region, one would not expect a syntactic revision to occur in condition 2.

12. An item set consisted of a sentence in each of the four versions, corresponding to each of the four experimental conditions.

13. This program was created by Kenneth I. Forster and Jonathan C. Forster (University of Arizona).

14. Sentences were presented in fragments to obtain a more precise measure of reading-time costs at the disambiguating region.

15. I do not discuss these results here, as they are of little interest for the purpose of this paper.

16. I use the term *bilingual* here to refer to the housing of two languages in one single mind and do not intend any explicit or implicit reference to language proficiency, fluency, or both.

17. An anonymous *SSLA* reviewer rightly pointed out that not all scholars agree with the notion that the bilingual has two linguistic systems. For instance, MacSwan (2000) argued that the bilingual mind has two phonological systems and two lexicons but only one computational system. The view adopted in the current work is one that differentiates between *representation* and *processing* and argues that processing on-line implies two different realizations of the computational system.

REFERENCES

Altenberg, E. P., & Cairns, H. S. (1983). The effects of phonotactic constraints on lexical processing in bilingual and monolingual subjects. *Journal of Verbal Learning and Verbal Behavior, 22*, 174–188.

Bates, W., & MacWhinney, B. (1982). Functionalist approaches to grammar. In E. Wanner & L. R. Gleitman (Eds.), *Language acquisition: The state of the art* (pp. 173–218). New York: Cambridge University Press.

Brysbaert, M., & Mitchell, D. C. (1996). Modifier attachment in sentence processing: Evidence from Dutch. *Quarterly Journal of Experimental Psychology, 49A*, 664–695.

Carreiras, M., & Clifton, C. (1999). Another word on parsing relative clauses: Eyetracking evidence from Spanish and English. *Memory and Cognition, 27*, 826–833.

Chomsky, N. (1981). *Lectures on government and binding*. Dordrecht: Foris.

Chomsky, N. (1995). *The Minimalist Program*. Cambridge, MA: MIT Press.

Costa, A., Miozzo, M., & Caramazza, A. (1999). Lexical selection in bilinguals: Do words in the bilingual's two languages compete for selection? *Journal of Memory and Language, 41*, 365–397.

Crocker, M. W. (1994). On the nature of the principle-based processor. In C. Clifton, L. Frazier, & K. Rayner (Eds.), *Perspectives on sentence processing* (pp. 245–266). Mahwah, NJ: Erlbaum.

Cuetos, F., & Mitchell, D. C. (1988). Cross-linguistic differences in parsing: Restrictions on the use of the Late Closure strategy in Spanish. *Cognition, 30*, 73–105.

Cuetos, F., Mitchell, D. C., & Corley, M. M. B. (1996). Parsing in different languages. In M. Carreiras, J. E. García-Albea, & N. Sebastián-Gallés (Eds.), *Language processing in Spanish* (pp. 145–187). Mahwah, NJ: Erlbaum.

Dijkstra, A., & van Heuven, W. J. B. (1998). The BIA model and bilingual word recognition. In J. Grain-

ger & A. M. Jacobs (Eds.), *Localist connectionist approach to human cognition* (pp. 189–225). Mahwah, NJ: Erlbaum.
Dussias, P. E., & Sagarra, N. (2003). *The effect of language exposure on syntactic parsing*. Manuscript in preparation.
Felser, C., Roberts, L., Gross, R., & Marinis, T. (2002). The processing of ambiguous sentences by first and second language learners of English. *Essex Research Reports in Linguistics, 40*, 1–38.
Fernández, E. M. (1995, May). *Processing strategies in second language acquisition: Some preliminary results*. Paper presented at 1995 Generative Approaches to Second Language Acquisition conference, CUNY Graduate School and University Center, New York.
Fernández, E. M. (1999). Processing strategies in second language acquisition: Some preliminary results. In E. C. Klein & G. Martohardjono (Eds.), *The development of second language grammars: A generative approach* (pp. 217–239). Amsterdam: Benjamins.
Fernández, E. M. (2000). *Bilingual sentence processing: Relative clause attachment in English and Spanish*. Unpublished doctoral dissertation, City University of New York.
Fernández, E. M. (2003). *Bilingual sentence processing: Relative clause attachment in English and Spanish*. Amsterdam: Benjamins.
Fodor, J. D. (1998). Learning to parse? *Journal of Psycholinguistic Research, 27*, 285–319.
Frazier, L. (1978). *On comprehending sentences: Syntactic parsing strategies*. Unpublished doctoral dissertation, University of Connecticut, Storrs.
Frazier, L. (1987). Sentence processing: A tutorial overview. In M. Colheart (Ed.), *Attention and performance XII: The psychology of reading* (pp. 559–586). Mahwah, NJ: Erlbaum.
Frazier, L., & Clifton, C. (1996). *Construal*. Cambridge, MA: MIT Press.
Frazier, L., & De Villiers, J. (1990). *Language processing and language acquisition*. Dordrecht: Kluwer.
Frazier, L., & Rayner, K. (1982). Making and correcting errors during sentence comprehension: Eye movements in the analysis of structurally ambiguous sentences. *Cognitive Psychology, 14*, 178–210.
Frenck-Mestre, C., & Pynte, J. (1997). Syntactic ambiguity resolution while reading in second and native languages. *Quarterly Journal of Experimental Psychology, 50A*, 119–148.
Gibson, E., & Pearlmutter, N. (1994). A corpus-based analysis of psycholinguistic constraints on prepositional-phrase attachment. In C. Clifton, L. Frazier, & K. Rayner (Eds.), *Perspectives on sentence processing* (pp. 181–198). Mahwah, NJ: Erlbaum.
Gilboy, E., Sopena, J. M., Clifton, C., Jr., & Frazier, L. (1995). Argument structure and association preferences in Spanish and English complex NPs. *Cognition, 54*, 131–167.
Gorrell, P. (1995). *Syntax and perception*. New York: Cambridge University Press.
Gregg, K. R. (2001). Learnability and second language acquisition theory. In P. Robinson (Ed.), *Cognition and second language instruction* (pp. 152–180). New York: Cambridge University Press.
Grosjean, F. (1985). The recognition of words after their acoustic offset: Evidence and implications. *Perception & Psychophysics, 38*, 299–310.
Grosjean, F. (1997). Processing mixed languages: Issues, findings, and models. In A. M. B. de Groot & J. F. Kroll (Eds.), *Tutorials in bilingualism: Psycholinguistic perspectives* (pp. 225–254). Mahwah, NJ: Erlbaum.
Grosjean, F., & Soares, C. (1986). Processing mixed languages: Some preliminary findings. In J. Vaid (Ed.), *Language processing in bilinguals: Psycholinguistic and neuropsychological perspectives* (pp. 145–179). Mahwah, NJ: Erlbaum.
Hahne, A. (2001). What's the difference in second-language processing? Evidence from event-related brain potentials. *Journal of Psycholinguistic Research, 30*, 251–266.
Hahne, A., & Friederici, A. (2001). Processing a second language: Late learners' comprehension mechanisms as revealed by event-related brain potentials. *Bilingualism: Language and Cognition, 4*, 123–141.
Harrington, M. (2001). Sentence processing. In P. Robinson (Ed.), *Cognition and second language instruction* (pp. 91–124). New York: Cambridge University Press.
Hemforth, B., Konieczny, L., & Scheepers, C. (1994). Principle-based or probabilistic approaches to human sentence processing. In B. Hemforth, L. Konieczny, & C. Scheepers (Eds.), *First analysis, reanalysis, and repair* (pp. 79–90). Freiburg, Germany: Albert-Ludwigs Universität.
Henstra, J. (1996, September). *Relative clause attachment in English: Eyetracking versus self-paced reading*. Poster presented at the Architecture and Mechanisms of Language Processing conference, Turin, Italy.
Hernández, A. E., Bates, E. A., & Ávila, L. X. (1994). On-line sentence interpretation in Spanish-English bilinguals: What does it mean to be "in between"? *Applied Psycholinguistics, 15*, 417–446.

Hoover, M., & Dwivedi, V. (1998). Syntactic processing by skilled bilinguals. *Language Learning, 48*, 1–29.

Juffs, A. (1998a). Main verb versus reduced relative clause ambiguity resolution in L2 sentence processing. *Language Learning, 48*, 107–147.

Juffs, A. (1998b). Some effects of first language argument structure and morphosyntax on second language sentence processing. *Second Language Research, 14*, 406–424.

Juffs, A., & Harrington, M. (1995). Parsing effects in second language sentence processing: Subject and object asymmetries in *wh*-extraction. *Studies in Second Language Acquisition, 17*, 483–516.

Kozminski, E., & Graetz, N. (1986). First vs. second language comprehension: Some evidence from text summarizing. *Journal of Research in Reading, 9*, 3–21.

Kroll, J. F., & Dussias, P. E. (in press). The comprehension of words and sentences in two languages. In T. Bhatia & W. Ritchie (Eds.), *Handbook of bilingualism*. Oxford: Blackwell.

MacSwan, J. (2000). The architecture of the bilingual language faculty: Evidence from codeswitching. *Bilingualism: Language and Cognition, 3*, 37–54.

Mägiste, E. (1979). The competing language systems of the multilingual: A developmental study of decoding and encoding processes. *Journal of Verbal Learning and Verbal Behavior, 18*, 79–89.

Mitchell, D. C., & Cuetos, F. (1991). *Restrictions on late closure: The computational underpinnings of parsing strategies in Spanish and English*. Unpublished manuscript, University of Exeter, UK.

Mitchell, D. C., Cuetos, F., & Corley, M. M. B. (1992, March). *Statistical versus linguistic determinants of parsing bias: Cross-linguistic evidence*. Paper presented at the 5th annual CUNY Conference on Human Sentence Processing, New York.

Papadopoulou, D., & Clahsen, H. (2003). Parsing strategies in L1 and L2 sentence processing: A study of relative clause attachment in Greek. Unpublished manuscript, University of Exeter, UK.

Pritchett, B. L. (1992). *Grammatical competence and parsing performance*. Chicago: University of Chicago Press.

Rayner, K., Carlson, M., & Frazier, L. (1983). The interaction of syntax and semantics during sentence processing: Eye-movements in the analysis of semantically biased sentences. *Journal of Verbal Learning and Verbal Behavior, 22*, 358–374.

Trueswell, J. C., Tanenhaus, M. K., & Garnsey, S. (1994). Semantic influences of parsing: Use of thematic role information in syntactic ambiguity resolution. *Journal of Memory and Language, 33*, 285–318.

Weber-Fox, C., & Neville, H. J. (1996). Maturational constraints on functional specialization for language processing: ERP and behavioral evidence in bilingual speakers. *Journal of Cognitive Neuroscience, 8*, 231–256.

White, L. (1989). *Universal Grammar and second language acquisition*. Amsterdam: Benjamins.

White, L. (2003). *Second language acquisition and Universal Grammar*. New York: Cambridge University Press.

White, L., & Juffs, A. (1998). Constraints on *wh*-movement in two different contexts of nonnative language acquisition: Competence and processing. In S. Flynn, G. Martohardjono, & W. O'Neil (Eds.), *The generative study of second language acquisition* (pp. 111–129). Mahwah, NJ: Erlbaum.

Wulfeck, B., Juárez, L., Bates, E., & Kilborn, K. (1986). Sentence interpretation strategies in healthy and aphasic bilingual adults. In J. Vaid (Ed.), *Language processing in bilinguals: Psycholinguistic and neuropsychological perspectives* (pp. 199–219). Mahwah, NJ: Erlbaum.

Zagar, D., Pynte, J., & Rativeau, S. (1997). Evidence for early closure attachment on first-pass reading times in French. *Quarterly Journal of Experimental Psychology, 50A*, 421–438.