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Agreement attraction in Spanish comprehension

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ABSTRACT

Previous studies have found that English speakers experience attraction effects when comprehending subject–verb agreement, showing eased processing of ungrammatical sentences that contain a syntactically unlicensed but number-matching noun. In four self-paced reading experiments we examine whether attraction effects also occur in Spanish, a language where agreement morphology is richer and functionally more significant. We find that despite having a richer morphology, Spanish speakers show reliable attraction effects in comprehension, and that these effects are strikingly similar to those previously found in English in their magnitude and distributional profile. Further, we use distributional analyses to argue that cue-based memory retrieval is used as an error-driven mechanism in comprehension. We suggest that cross-linguistic similarities in agreement attraction result from speakers deploying repair or error-driven mechanisms uniformly across languages.

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Introduction

Languages differ in the degree to which their morphological systems convey formal and conceptual distinctions. One important unanswered question is: how does this variation affect core language processing mechanisms? For example, speakers may rely on morphological cues to different extents depending on the availability of these cues in their native language (MacWhinney, 1987; MacWhinney, Bates, & Kliegl, 1984). This could affect the processing of grammatical relationships such as agreement: agreement errors in comprehension might be more common in languages with an impoverished morphology, and specific challenges might arise for learners of a morphologically richer second language (Jia, Aaronson, & Wu, 2002; Jiang, 2004, 2007; McDonald, 2000).

The current study investigates whether morphological variation affects a mechanism crucial to language comprehension: the ability to retrieve previous information from memory (Caplan & Waters, 2013; Gordon, Hendrick, & Johnson, 2001; Lewis & Vasishth, 2005; McElree, Foraker, & Dyer, 2003). The comprehension of subject–verb agreement is likely to involve retrieval: since subjects and verbs can be separated by an unlimited number of words, when a verb is encountered speakers may need to retrieve the number features of the subject noun from memory in order to license agreement. We examine whether cross-linguistic variation affects how speakers process agreement and we ask: is retrieval implemented uniformly across languages, or does it vary depending on the properties of each language?

This question is addressed by comparing the computation of subject–verb agreement in Spanish and English. In English, number morphology is limited, so word order and syntactic information are the most reliable cues to resolve subject–verb dependencies (MacWhinney et al., 1984; Severens, Jansma, & Hartsuiker, 2008). In contrast, agreement morphology in Spanish is both more available

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and functionally more significant, as illustrated below (agreement morphology bolded):

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- 1a. And yet the animals never gave up hope. And **they** never lost, even for an instant, **their** sense of honor and privilege in being members of Animal Farm. (George Orwell, *Animal Farm*)
 - 1b. Y aún así, **los** animales nunca renunciaron a la esperanza. Y (**ellos**) nunca perdieron, ni siquiera por **un** instante, **sus** sentidos de honor y privilegio por ser miembros de **la** Granja de Animales.
-

These passages highlight several differences between languages. First, number agreement is more available in Spanish. This is the case in nominal phrases, where nouns and all their modifiers carry agreement information (e.g. “sus sentidos”, ‘their sense’; “los animales”, ‘the animals’), while plural number in English is mainly marked on the head noun. Further, in Spanish verbs mark agreement for all syntactic persons, and singular and plural verb forms often differ sharply (e.g. “renunció vs. “renunciaron”); ‘gave up.3sg’ vs. ‘gave up.3pl’). Second, agreement morphology is functionally more important in Spanish. One reason for this is that Spanish has a freer word order, so sentence initial position is not as reliable a cue to subjecthood as in English. Relatedly, Spanish is a null-subject language, and subjects can be omitted in sentences (e.g. “<they> lost”). These two properties make verb morphology the main cue for subject identification, which has given rise to the claim that morphological cues are more reliable than positional information in Spanish (Kail, 1989; MacWhinney, 2001).

In the current study, we compare the processing of agreement in Spanish and English, with the goal of examining whether retrieval is implemented differently in languages that contrast in the richness and availability of morphological cues. Cross-linguistic variation is expected under frameworks like the Competition Model (e.g. MacWhinney, 1987; MacWhinney & Bates, 1989), where more available cues are predicted to be acquired first and to most strongly affect adult processing. If Spanish comprehenders rely more on morphological cues than English comprehenders, they might be less susceptible to agreement errors. In the rest of the Introduction, we summarize previous findings of agreement attraction in English and describe a retrieval mechanism that has been proposed underlie these errors. We then discuss how this mechanism might be used differently in Spanish, and present an overview of four experiments that were carried out to examine the relationship between morphological richness and agreement computations.

Attraction in comprehension

In comprehension, agreement attraction facilitates the processing of ungrammatical sentences (Dillon, Mishler, Sloggett, & Phillips, 2013; Nicol, Forster, & Veres, 1997; Pearlmutter, Garnsey, & Bock, 1999; Tanner, Nicol, &

Brehm, 2014; Wagers, Lau, & Phillips, 2009). For example, in the ungrammatical sentence “The key to the cabinet(s) are on the table”, comprehenders typically read the words following the plural verb more quickly when there is a noun, called an “attractor”, that matches the verb in number (“cabinets”). This facilitated processing has been attributed to cue-based memory retrieval (Lewis & Vasishth, 2005; Lewis, Vasishth, & Van Dyke, 2006; Wagers et al., 2009). When a verb is encountered, speakers use the syntactic, semantic and morphological cues of the verb to retrieve an appropriate subject from memory. Memory chunks corresponding to preceding words and phrases in the sentence are queried in parallel, and the chunk with the most features matching the cues of the verb is the most likely to be retrieved. In the sentence above, this sometimes results in the incorrect retrieval of “cabinets”, which allows comprehenders to license the verb in number and yields facilitated processing.

A key piece of evidence for the retrieval account in comprehension is the finding that number-matching attractors affect processing in ungrammatical, but not in grammatical sentences. This finding was first described by Wagers, Lau, and Phillips (2009, henceforth WL&P), who used relative clause constructions (RCs) where plural attractors did not intervene linearly between the critical subject-verb pair (see also Clifton, Frazier, & Deevy, 1999; Staub, 2009, 2010). WL&P manipulated sentence grammaticality and attractor number using a self-paced reading paradigm, and found that plural attractors (e.g. “musicians”) resulted in facilitated processing after the verb in ungrammatical sentences (2c vs. 2d) but made no difference in grammatical sentences (2a vs. 2b):

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- 2a. The musician [who the reviewer praises so highly] will probably win a Grammy.
 - 2b. The **musicians** [who the reviewer praises so highly] will probably win a Grammy.
 - 2c. *The musician [who the reviewer praise so highly] will probably win a Grammy.
 - 2d. *The **musicians** [who the reviewer praise so highly] will probably win a Grammy.
-

WL&P argued that the grammatical asymmetry is expected if comprehenders compute agreement using a cued-based retrieval mechanism. They proposed two alternative ways in which retrieval could be deployed during comprehension. One possibility is that retrieval functions as a repair or reanalysis mechanism triggered by the violation of a number prediction. On this view, the subject noun within the RC predicts the number of the verb. When the verb form violates this prediction, participants use cue-based retrieval to check whether the correct feature was somehow missed during first pass. Since the attractor “musicians” matches the verb in number, it is sometimes wrongly retrieved, which allows comprehenders to license of the verb and results in facilitated processing. In contrast, in the grammatical conditions the verb always matches the number prediction made by the subject noun, and

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