Camacho, José. 2024. *Spiderwoman/mujer araña*: N-N compounds and structural symmetry. A view from bilingual heritage speakers. *Glossa: a journal of general linguistics* 9(1). pp. 1–32. DOI: https://doi.org/10.16995/glossa.11055

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Spiderwoman/mujer araña: N-N compounds and structural symmetry. A view from bilingual heritage speakers

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This paper tests the hypothesis that N-N combinations (N-N word compounds and phrasal compounds) share a common underlying structural symmetry that needs to be dissolved through movement of one of the nouns. Certain types of N-N combinations are in complementary distribution in Spanish and English: N-N compounds are more productive in English, N-preposition-N compounds more productive in Spanish, and certain N-N compounds with the meaning of coordination of the nouns are possible in both languages. Bilingual heritage speakers of Spanish with English as the majority language have access to the English-type N-N compound, the Spanish-type NPN phrasal compound and the coordinated N-N type in both languages. Assuming that all three types start out as symmetric mergers of two nouns, we test whether bilinguals will prefer one of the symmetry-breaking strategies by using an acceptability judgement task. First, we found a certain degree of cross-linguistic influence in the higher acceptance of N-N compounds in Spanish vs. English. Second, participants preferred structures that have P (*de*), which we interpreted as the most salient strategy to break the N-N symmetry. We conclude that symmetry-breaking is a highly ranked preference for bilinguals as a result of having two active grammars.

1 Introduction

N-N compounds such as *coconut oil* are defined as a merger of two individual roots to form a complex unit that cannot be separated by functional or lexical elements. They have been analyzed as instances of root composition at least since Chomsky & Halle (1968: 16), as shown in (1). For Anderson (1992: 292), "the formation of compounds seems to involve a genuinely syntactic combination of lexical elements below the level of the word", a property that we will characterize as symmetry (see Delfitto & Fábregas & Melloni 2011).

(1) $[_N\ [_N\ X]\ [_N\ Y]]$

Sharing properties with N-N compounds are combinations of two nominals linked by what seems to be a preposition, such as Spanish *botella de agua* (bottle of water 'water bottle'). This type of combination is very productive in Romance languages, and has been argued to be a phrasal compound, i.e., a combination whose dominating node is N but that is more complex than an N-N compound (see Bustos Gisbert 1986 for Spanish; Voghera 2004; Bisetto 2015 for Italian; Rio-Torto & Ribeiro 2012 for Portuguese; Bernal 2012 for Catalan, Villoing 2012 for French; Guevara 2012 for the view that they are not compounds but syntactic phrases in Spanish).

Although N-N combinations differ in several important aspects, some N-N compounds and NPN phrasal compounds are in complementary distribution in English and Spanish: a subset of N-N compounds is productive and semantically unrestricted in English but semantically restricted and not very productive in Spanish. For example, *coconut oil* expresses that the oil is **made of** coconut, while *lake house* is a house **located** near a lake (see Pustejovsky 1995; Jackendoff 2009; 2016; Toquero-Pérez 2020 on the semantics of compounding). This type of semantic variability is only possible in the corresponding NPN in Spanish (see (2)a-b) but not in the corresponding N-N compounds, which are ungrammatical (see (2)c-d). Because the semantic relationship between the two nouns resembles that of an adjunct in a clause, I will call these adjunctNN.

(2) a. aceite de coco
oil of coconut
'coconut oil'

b. casa de lago
house of lake
'lake house'

c. *Aceite-coco
oil-coconut

d. *Casa-lago
house-lake

A third type of N-N combination has a meaning equivalent to coordination and is equally acceptable in both languages (*poet-painter, pintor-poeta*), so coordinate compounds will serve as a comparison structure for the other two.

Assuming this complementary distribution of combination-types and semantic restrictions, this paper addresses whether bilingual speakers of heritage Spanish (henceforth HS) show cross-linguistic influence in the acceptability of different N-N combinations. I focus on whether the symmetry of N-N combinations can shed light on the conditions that delimit cross-linguistic influence (see Hulk & Müller 2000; Müller & Hulk 2001; Azaz & Frank 2018; Camacho 2018; Camacho & Kirova 2018, among others). Specifically, I propose that breaking a point of symmetry (defined below) is an important driving force in bilinguals' speech that will result in higher acceptability of ratings for nominal combinations that are more clearly asymmetric than for those that are not. This preference may lead to divergence between bilingual and monolingual grammars. I also suggest that the preference for asymmetric structures will be modulated by proficiency in the minority language.

The rest of the paper of is organized as follows: Section 2 presents the different types of compounds and their structure in English and in Spanish, Section 3 introduces the landscape of bilingual grammars and the previous literature on compounds in bilinguals, Section 4 introduces the research questions and hypotheses, Section 5, the experimental design, Section 6 presents results and Section 7 discusses the findings and Section 8 includes conclusions.

2 Compound properties and structure

Several properties distinguish N-N combinations in English and Spanish (see Bustos Gisbert 1986; Piera 1995; Delfitto et al. 2011, among others), most notably the directionality of the head: right-headed in English *spider-<u>woman</u>*, mostly left-headed in Spanish: *<u>mujer</u>-araña* (see Piera 1995 for an analysis of this difference and Moyna 2011 for examples of right-headed compounds in Spanish).

Delfitto et al. (2011) point out that the relationship between the two nouns is semantically less constrained in Germanic languages (see Jackendoff 2009; 2016) compared to Romance languages (see Toquero-Pérez 2020 for Spanish). In Romance languages, the non-head typically establishes a relationship with the head that restricts the properties of that head based on a limited set of semantic relations, as described by Toquero-Pérez (2020) (see also Jackendoff 2009; 2016). For example, *coche-cama* (car-bed 'sleeping car') in Peninsular Spanish refers to a railcar that **contains** beds. In fact, Marqueta-García (2017) argues that all compounds in Spanish can be reduced to an *identifying* semantic relation, "as" (but see Toquero-Pérez 2020 for arguments against this idea). In Germanic languages, on the other hand, the relationship between the two nouns includes a wider range of semantic properties. For example, *spider poison* (Toquero-Pérez 2020) can be interpreted as poison coming from a spider or poison to kill spiders.

Delfitto et al. (2011) link the semantic difference between Romance and Germanic languages to a structural distinction, namely the fact that Germanic compounds have a linking element or compound marker between the two nouns, for example *doom-**s**-man* or *Hund-**e**-futter* ('dogfood', German). Since this linking element is not obligatory, and in fact is generally absent in English (*dogfood*), generalizing this analysis requires assuming a null linking element in the latter cases. By contrast, Romance languages have prepositions in phrasal compounds like *gafas **de** sol* (glasses of sun 'sunglasses'). In other words, prepositional compounds are the most prominent way to express a specificational semantic relation in Romance languages, which typically correspond to what I have called the adjunctNN compound type in English.

2.1 Distributional differences in English-Spanish compounds

As suggested, English and Spanish have different degrees of productivity for N-N compounds: they are highly productive in Germanic languages but not productive in Romance languages (see Liceras & Diaz & Salomaa-Robertson 2002: 210; Nicoladis 2002a: 848; Azaz & Frank 2018: 416, for example). Moyna (2011), on the other hand, considers them very productive and frequent compared to other compound types. On the other hand, Romance languages have productive phrasal NPN compounds, such as the ones illustrated in (3), which tend to be ungrammatical in English.

(3) a. Asiento de ventana
seat of window
'Window seat'

b. Entrada de servicio
entry of service
'Service entry'

(4) a. *Seat of window

b. *Entry of service

Importantly, N*de*N phrasal compounds differ from regular N-PP phrases in that nothing can intervene between the preposition and the second noun in the compound, as seen in (5)a–b (see Bustos Gisbert 1986). This restriction may be related to the fact that the second noun in the N*de*N phrasal compounds is interpreted generically, specifying a subtype of the first noun's meaning. Plurals are also somewhat restricted, as in (6). None of these restrictions apply to regular N-PP phrases.[1]

(5) a. *Elegí asiento de la ventana.
chose seat of the window

[1] I do not distinguish between compounds such as *asiento de ventana* 'window seat' and *ladrón de joyas* 'jewel thief', which could be considered true PPs. I believe the symmetry issue applies equally to both (thanks to an anonymous reviewer for suggesting this comment).

b. *Elegí asiento de una ventana.
chose seat of a window

(6) *Elegí asiento de ventana-s.
chose seat of the window-PL

Toquero-Pérez (2020) compares the semantic relations between the two nouns in N-N compounds and N*de*N phrasal compounds in Spanish. He concludes that the most frequent semantic relationship for N-N compounds is 'X functions as Y', which is very infrequent with N*de*N phrasal compounds. As stated, certain N-N compounds that are grammatical in English tend to be ungrammatical in Spanish, appearing instead as N*de*N compounds in that language. Conversely, certain N*de*N phrasal compounds that are possible in Spanish are ungrammatical in English. In some instances, the two types of compounds are possible in both languages, but with different semantic mappings. Azaz & Frank (2018) note that in N-N combinations such as *coffee cup/cup of coffee* in English, the N-N compound tends to refer to the container (which may be ambiguous for some speakers) but the NPN tends to only refer to the content, while the N*de*N counterpart *taza de café* is ambiguous in Spanish.

Both languages allow for coordinated N-N compounds, i.e. those that are interpreted as a conjunction of the meaning of both nouns (*painter poet/poeta pintora* "a painter and a poet"). With a coordinated meaning (A and B), phrasal compounds are not possible in either language (**painter of poets/*pintora de poetas*). I assume that this is due to the fact that *de* has a meaning incompatible with a coordination.[2]

The situation is summarized in **Table 1**. While this table should not be taken as an exhaustive description of the cross-linguistic distribution of all N-N and phrasal compounds in English and Spanish, for the purposes of this study, the items selected seem to fall under the classification expressed in it.

	English		**Spanish**	
CoordinateDE	*	(*painter of poets*)	*	(*poeta de pintora*)
CoordinateNN	✓	(*Painter poet*)	✓	(*poeta pintora*)
AdjunctNN	✓	**(***window-seat***)**	*	(*asiento ventana*)
AdjunctDE	*	**(***seat of window***)**	✓	*(asiento de ventana)*

Table 1: Complementary compounds in English and Spanish.

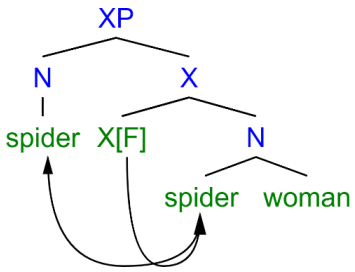
[2] The sequence *painter poet* is ambiguous between an coordinateNN ("painter and poet") and adjunctNN interpretation ("painter of poets"). This second interpretation would be grammatical for *pintora de poetas* (paintor of poets) in Spanish. Unortunately, the images used in the experimental task (see below) did not help disambiguate these meanings. Thanks to an anonymous reviewer for pointing this out.

2.2 The representation of compounds

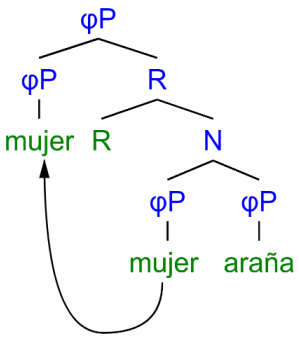
In this section I adopt an account that derives the distribution in **Table 1**. Delfitto et al. (2011) propose an analysis of the difference between Romance and Germanic N-N compounds, specifically the semantic difference noted earlier (restricted vs. unrestricted relations between the two nominals) and the fact that Germanic languages frequently have a linking element between the nominals (*doom-**s**-day*). Their analysis rests on the idea that symmetric structures are generally avoided in grammar and whenever they appear, certain syntactic operations take place to break the symmetry (see Moro's 2000 development of Kayne's 1994 antisymmetry proposal; Den Dikken 2006 and Den Dikken & Singhapreecha 2004). In other words, if a merged structure results in a "point of symmetry", it is transformed by moving one of the two merged items. Delfitto et al. (2011) assume this analysis for compounds, which initially merge as symmetric Roots (List 1 items in Distributed Morphology). In Germanic languages, a category with a formal feature F related to the linking element is then merged with the compound, triggering movement of one of the roots, as in (7)a for English. In Spanish, a different functional category merges with the compound, attracting one of the nouns (notice that Spanish also has a Gender and Number category φ). This functional category semantically restricts the relationship between the two nouns. My revised proposal, which explicitly postulates R as the relational head, is presented in (7)b. Asymmetry can be seen as a way to avoid structural ambiguity.

(7) Compounding structures in English and Spanish

a) English (Delfitto et al. 2011)



b) Spanish

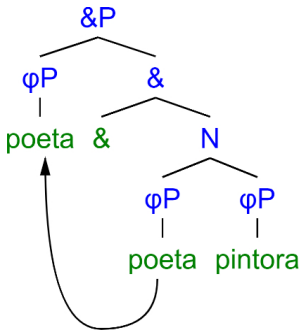


The Relational head breaks symmetry both syntactically and semantically. Moyna (2011: 165) argues that in head-initial N-N compounds, the second N has an identificational relation with the first one or a partitive/prepositional relation (see Nicoladis 2002b for French; Guevara & Scalise 2009; Ntelitheos & Pertsova 2019).

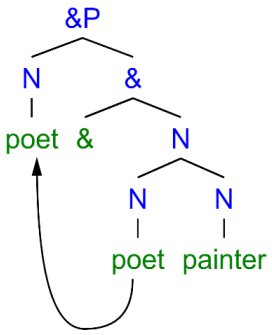
CoordinateNN compounds involve an abstract coordinator "&" that breaks symmetry, as in (8) (see Munn 1987; 1992). Note however, that the head of the compound is not well defined syntactically or semantically. Syntactically, the plural of *poeta-pintora* 'painter poet' could appear on both nouns (*poetas-pintoras* 'paintors poets'), or less frequently on the full compound (*poeta-pintoras* 'painter-poets'), but not on the left head (**poetas-pintora*), unlike with other N-N compounds. Semantically, the meaning of *poeta pintora* is very similar to that of *pintora poeta* ('poet painter') with reversed order. In this sense, coordinated compounds may break the syntactic asymmetry in the regular way, but the fact that they are instances of &P makes them much more symmetric than Adjunct N-N compounds.

(8) Coordinated compound structure

a) Spanish



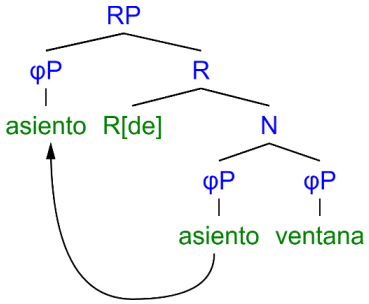
b) English



As mentioned, phrasal compounds share some properties, namely the impossibility of pluralizing or modifying the second nominal (see Rio-Torto & Ribeiro 2012 for similar arguments for Portuguese), suggesting that the compound structure is somewhat similar to adjunct N-N

compounds, as reflected in the underlying structure in (9). However, the Relational head for NPN compounds is typically a preposition (*de* is the default, but we sometimes find others like *a* in *camisa a cuadros* shirt at squares 'plaid shirt' in some Spanish varieties). In this sense, R_p may add certain semantic and/or lexical restrictions to the phrasal compound.[3]

(9) Adjunct phrasal N*de*N compound structure (Spanish)



In sum, all N-N combinations consist of a merger of two nominals. If the head is &, the result is a coordinateNN, as in (8), if R is Ø, the result is an adjunctNN in Spanish, as in (7)b, and if R is *de*, the result is a phrasal adjunct, as in (9). The crucial difference between the three compound types is the lexical specification of the functional head R_{de}, $R_{Ø,}$ &. The first type is less semantically constrained and more productive, the second type is more semantically constrained and less productive. By contrast, N-N compounds in English are less semantically constrained and more productive.

Thinking of antisymmetry as a type of disambiguation strategy, the three types of derivations have different degrees of what we could call antisymmetric saliency: coordinateNN compounds are the most symmetric, because they do not clearly signal what the head of the compound is either syntactically or semantically. Coordinate structures are headed by a conjunction, which traditionally has been represented as a ternary structure to reflect the fact that neither conjunct is dominant -they are reversible- and that the semantic contribution of the conjunction is related to Boolean *and*. CoordinateNN share these properties, they are easily reversible without a substantial change in meaning (*poeta-pintor* 'painter-poet' vs. *pintor-poeta* 'poet-painter'),[4] and the null conjunction does not add any meaningful content to the conjuncts.

AdjunctNN compounds are inherently asymmetric from a semantic point of view. A *window seat* can only be a type of *seat*. Although the syntactic head is X in English, the ordering of the

[3] Toquero-Pérez (2020) finds that the most common semantic relation between nominals in N-N compounds is "similar": 'N_1 is similar to N_2', which happens to be one of the least common for nominals in N*de*N compounds, but some of the categories in Toquero-Pérez's classification overlap and some seem derivable from other primitives. In this sense, R may range over a smaller set of relations whose specific realization depends on lexical frequency, historical patterns, real-world conditions, etc.

[4] Recall that N-N compound heads are on the left in Spanish and on the right in English.

nominals leads to a fixed semantic interpretation, even though X is null for the most part in English. In other words, only the relative word order of the two nominals with respect to each other signals the head of the compound. Phrasal compounds, on the other hand, have an overt morpheme, realized as a preposition, in addition to a consistent position for the head. Semantic headedness is easily defined, since the preposition unequivocally forces a certain structure. In other words, from a processing point of view, the syntactic structure results in non-ambiguous and semantically compositional. If breaking symmetry is an important derivational factor, we have a scale as in (10). Coordinate phrasal compounds (with *de*) present an interesting challenge: they are inherently antisymmetric because they have a preposition, but the meaning of the preposition is semantically incompatible with the intended conjunctive meaning.

(10) Antisymmetry strategies: N*de*N compounds > adjunctNN > coordinateDE compounds > coordinateNN compounds

This scale should not be seen as absolute, since it will interact with other relevant aspects of the grammar, for example whether R has specific lexical requirements or not. In fact, we have already seen how the inherent lexical meaning of *de* may negatively interact with antisymmetry preferences in coordinated compounds.

3 Balancing more than one language

A broad definition of bilingualism includes distinct realities that differ depending on age and mode of acquisition and social status of the languages, in addition to a proficiency continuum. One important factor that shapes bilingual grammars relates to the age of acquisition of the languages (age of onset), as well as the social context of language acquisition: heritage speakers are generally early bilinguals that tend to learn a minority language first and a majority language later. Since the minority language normally has lower social prestige and speakers have lower exposure to formal education in it, these and other factors shape the trajectory and the heritage grammar. Broadly speaking, however, all bilinguals (early and late) have to represent and process two languages that interact in complex ways.[5] On the one hand, there is evidence that more than one language can constantly be activated in a bilingual's mind and that in order to process the output or input in language A, the mind suppresses language B through mechanisms of inhibitory control (see Linck & Hoshino & Kroll 2008, for example). In the area of compounds, Ko & Wang & Kim (2011) have found evidence of activation of Korean in a decision task about English compounds. On the other hand, cross-linguistic influence constitutes one of the largest areas of research in bilingualism (see, for example, Serratrice 2013; Van Dijk et al. 2022). Van

[5] I use the term "languages" descriptively, without a commitment to the view that bilinguals have two separate grammars. See López (2020) for a discussion.

Dijk et al.'s meta-analysis of research on cross-linguistic influence in child bilingualism found that the socially dominant language was a significant predictor of cross-linguistic influence, but surface overlap and language domain (syntax, semantics, pragmatics, etc.) were not. They note that despite decades of research on cross-linguistic influence, the precise conditions in which it emerges remain elusive.

Theories regarding where and how cross-linguistic influence happens fall into two large types: purely representational influence and representational + processing-based influence. Representational approaches suggest that cross-linguistic influence occurs when some feature or feature-mapping of a language crosses over, or in some cases fails to cross over from one language to another. Lardiere's Feature Reassembly Hypothesis (Lardiere 1998 and much subsequent work) and Prévost & White's Missing surface hypothesis (see Prévost & White 2000), for example, propose that when grammars have different mappings from abstract features to morphological realization, those mapping must be reshaped (see also Slabakova 2009). Hulk & Müller's (2000) and Müller & Hulk's (2001) proposal delimits cross-linguistic influence to cases where a given phenomenon has a single structural analysis in one language but two possible structural analyses in another. The unambiguous grammar will influence the ambiguous one.

Representational + processing-based accounts conceptualize influence as a way to handle the constant activation of the two grammars or as a general processing and acquisition mechanism. For example, Jakubowicz & Strik (2008) propose that constructions that are less derivationally complex emerge before those that are more complex, a framework that Prévost et al. (2010) apply to *wh*-in-situ. Strik & Pérez-Leroux (2011) suggest that derivational simplicity is a condition for grammatical transfer, which they show for question formation by Dutch-French bilingual children. A different strand of research has proposed that bilinguals may maximize outputs that are structurally compatible across the two languages as a kind of cross-linguistic priming effect (see Perez-Leroux & Cuza & Thomas 2011; Camacho & Kirova 2018). In Camacho & Kirova (2018), for example, the higher acceptability of the order Adv-V-O in Spanish is analyzed as preference for a linear representation compatible with two distinct structures, one with verb-raising in Spanish, one without in English.

This view is consistent with recent models of bilingualism, proposed mostly for heritage bilingual grammars, that have shifted the focus from a static outcome to a dynamic process whose status depends on the relative activation of features from any given grammar at any given time. This activation, in turn, depends on input, usage of the language and other relevant factors (see Putnam & Sánchez 2013 and subsequent work). In this sense, rather than seeing cross-linguistic influence as a static phenomenon that permanently changes a representation, the current study focuses on the different factors that may dynamically influence representations. Activation of a grammar can be seen as a continuum that includes not only a static representation, but also the varying degree of strength of a feature and the constraints imposed by real-time

processing. Activation, then, allows for a more dynamic conception of what bilingualism looks like than the more static conception of dominance. For example, bilinguals with lower activation of their minority language may reactivate certain features as they are exposed to and produce more of the language. Similarly, lower activation of features may lead to processing strategies that minimize computation, but as activation increases, those strategies may be reduced.

The current study focuses on how representations of N-N combinations may be affected by the interaction of bilingual activation, semantic markedness and representations that involve different derivational histories. By assuming that N-N combinations share a common inherently ambiguous underlying structural representation, I will explore how bilinguals may show preference for disambiguating those structures, triggered by settings from the two languages in contact and more general principles such as antisymmetry.

3.1 Research on compounds in bilinguals

Early research on N-N compounds in bilinguals found that speakers are able to acquire the headedness of the compound in general (e.g. Liceras & Díaz 2000). This study on the production of N-N and N*de*N compounds by L2-Spanish learners with different L1s (French, English, German, Russian, Polish, Danish, Swedish, Chinese, Japanese and Korean) found a preference for N-N compounds to N*de*N compounds at all proficiency stages, but also production of N*de*N compounds that are not possible in monolingual Spanish (*araña de hombre* spider of man). Nicoladis (2002a) found that Canadian French-English bilingual children produced more NPN than N-N compounds in French and more N-N compounds in English, with limited head directionality reversal. Nicoladis (2002b) confirmed that bilingual children reversed headedness equally frequently in NPN and N-N compounds in French compared to English, suggesting that the preposition in French may be becoming a linking element. In another study on compound headedness, Kutsuki (2019) found cases of transfer of head-directionality among Spanish-Japanese bilinguals in Japanese.

Foroodi-Nejad & Paradis (2009) focused on bi-directional cross-linguistic influence in the context of structural overlap (see Hulk & Müller 2000; Müller & Hulk 2001) in the production of compounds in Persian and English among Persian-English bilingual children. Unlike English compounds, which are primarily right-headed (*spider-woman*), Persian N-N and N-A compounds are more variable. Foroodi-Nejad & Paradis (2009) found that speaking English increased the marked (right-headed) order in Persian, and speaking Persian increased the ungrammatical left-headed option in English. English monolingual children, however, also produced left-headed compounds 25% of the time.

Liceras et al. (2002) confirmed the results of Liceras & Díaz (2000), although language background (Spanish control vs. L2) played a significant role in the directionality of the produced

compounds. Once again, this study documented instances of N*de*N like *hombre de araña* (man of spider) in production that are not attested in monolingual Spanish.

Azaz & Frank (2018) also focused on the conditions for bidirectional cross-linguistic influence among advanced late learners of L2-Arabic (L1-English), L2-English (L1-Arabic or L1-Spanish), L2-Spanish (L1-English), by looking at how the container-content (*cup of coffee*) is instantiated in English (*cup of coffee* or *coffee cup*), Spanish (*taza de café* 'cup of coffee') and Arabic (with the construct state *finjān-u qahwat-in* cup-NOM coffee-GEN 'cup of coffee'). Their results suggest that advanced late learners had similar patterns to native speakers in Spanish but not in English. When they did the task in English, both Arabic speakers and Spanish speakers produced more L1-compatible orders.

Garza-González (2014) studied the interpretation of N-N and V-N compounds by Spanish heritage speakers in Texas, specifically looking at whether they assumed left-headedness in the interpretation. She found an effect for age of acquisition: speakers who learned English later were better at interpreting compounds than those with more exposure to English at an early age.

In sum, the existing research on N-N compounds in bilinguals shows diverging results: reversed directionality is not infrequent in children of different language backgrounds (Spanish-Japanese, French-English). By contrast, late Spanish bilinguals acquire headedness from the outset. In terms of the alternation between N-N and NPN compounds, French-English bilingual children show a preference for NPN over N-N in French, whereas late Spanish bilinguals prefer N-N compounds over N*de*N. Furthermore, adult L2-English speakers showed an extension of the NPN structure from their L1-Spanish in container compounds. In general, several bilingual groups showed creative uses of NPN not possible in the target language.

4 Research questions and hypotheses

Existing research has not converged on a comprehensive account of bilingual patterns for N-N combinations: some bilinguals acquire directionality from the outset, but others have shown direct influence from one of the languages into the other and indirect influence in the form of unexpected production or acceptability ratings, including novel NPN compounds. Studies differ in populations, age of acquisition, social conditions, and methodologies, but other independent factors may be at play. In addition to cross-linguistic influence, it is possible that activation and/or inhibition of one of the languages and processing strategies aimed at optimizing cognitive resources play a role. In this paper I focus on two narrower questions, first, the more traditional one about whether we find clear instances of cross-linguistic influence, as hypothesized in (11). If influence is tempered by the grammatical settings of each language, we expect some movement in the direction of the majority language, as in prediction 1. If cross-linguistic influence were unmitigated, we would predict a full convergence of the two grammatical settings, as in prediction 2, something we do not expect, given the proficient level of bilingualism of these speakers.

(11) H1: Bilingual HS show direct cross-linguistic influence effects in the acceptability rates of N-N combinations.
Prediction 1: HS will accept N-N combinations (N-N and N*de*N compounds) at significantly different rates than a comparison group.
Prediction 2: There will be no difference between ratings in the two languages.

The second question relates to whether symmetry is a driving force in shaping the grammar of bilinguals, as a possible source of what has been termed cross-linguistic influence. If, as suggested in Section 2.2, N-N combinations in English and Spanish share symmetric merger of two roots, bilinguals have different ways to break this symmetry depending on the type of functional head that is merged on the resulting compound and also depending on that head's features. In Spanish, movement is triggered by a Relational head, yielding either a semantically constrained and unproductive adjunctNN (with $R_{\emptyset}$) or a productive and unconstrained R_{de}. In English, the absence of R results in a semantically unconstrained and productive adjunctNN pattern. Finally, & should have similar patterns and productivity in both languages, since it is presumably the same kind of feature in both languages. If antisymmetry is a driving force in derivations, given the scale of antisymmetry strategies in (10), repeated in (12), we should see increased preference for adjunctNN and N*de*N compounds vs. coordinateNN compounds. This leads to H2 and prediction 3 in (13).

(12) Antisymmetry strategies: N*de*N compounds > adjunctNN > coordinateDE compounds > coordinateNN compounds.

(13) H2: Breaking symmetry is a potential source of indirect crosslinguistic influence.
Prediction 3: HS will show acceptability ratings consistent with the antisymmetry strategies over other possible settings.

Prediction 3 directly follows from the scale in (12), and from the fact that $R_{\emptyset}$ is more semantically marked in Spanish than in English.

H3 in (14) assesses how antisymmetry interacts with semantic markedness. Since *de* is never associated with the meaning of a conjunction, will its higher visibility as a symmetry breaker prevail over its semantics?

(14) H3: Inherent semantics prevail over antisymmetric saliency.
Prediction 4: HS will show higher ratings for coordinateNN than coordinateDE in Spanish.

H4 in (15) addresses the role of bilingual activation. We expect the antisymmetry strategy to be more active in bilinguals with lower activation (as indicated by self-rated proficiency and the bilingual score) compared to those with higher activation. This is because bilinguals with lower activation presumably rely more heavily on antisymmetry as a general processing strategy.

(15) H4: Bilinguals with high activation of the minority language will rely less on the antisymmetry strategy than bilinguals with lower activation.
Prediction 5: Antisymmetry strategies will decrease with higher self-proficiency ratings and higher bilingual scores.

H2 and H3 are likely not unique to bilinguals. However, bilinguals have access to features of two languages, so that it is possible that different features may be affected differently depending on how activated they are. H4 is unique to bilinguals, and activation crucially modulates preference for one antisymmetry strategy over another. In this sense, while antisymmetry is supposed to be a general linguistic constraint, I take the view that being bilingual gives it a prominent and potentially visible role that is otherwise not seen in monolingual grammars.

5 Experimental design

5.1 Participants

A total of 118 participants divided into three groups were recruited to participate in the study. 88 participants were bilingual heritage speakers who grew up with Spanish as their first language spoken at home and subsequently acquired English. The first group initially included 58 bilingual heritage speakers, university students in Chicagoland, New Jersey, Virginia, North Carolina, and only did the task in Spanish (henceforth "bilingual one-taskers"), but five participants were eliminated from the bilingual one-tasker group because they reported their Spanish age of onset as being between 11–20 years old, leaving 53 participants. The second group of 30 HS bilinguals recruited in the United States through Prolific did the task both in Spanish and in English ("bilingual two-taskers"). The third group, which included 31 Spanish-dominant participants restricted through the Prolific filters to participants in the Latin-American region, did the task only in Spanish and were used for comparison purposes. The mean age of all the participants was 25.6 ($SD = 8.5$).

All participants responded to a series of linguistic background questions including age of language onset, years spent in a Spanish-speaking country, years speaking Spanish at work (possible answers: 0–4, 5–10, 11–20, 20+), education in Spanish (possible answers: 0, 1–4, 5–10, 10+), a question about which language the participant felt more comfortable with (possible answers: English or Spanish), and which language the participant would choose to address someone who speaks Spanish and English equally well (possible answers: a) English and Spanish, b) Either English or Spanish but not both and c) Alternating English and Spanish). A Bilingual Score was devised as follows: answer 0–4 received 4 points for age of onset, 5–10, 3; 11–2, 2. For the other questions involving time, 10+ received 3 points, 5–10, 2 points, 1–4, 1 point. Preference for Spanish in addressing someone else received 3 points, either Spanish or English 2, alternating 1. The total possible points were 22. To ensure equal weight for all

questions, questions that could receive up to 4 points were multiplied by .785, questions that could receive up to 3 points were multiplied by 1.047. The bilingual score is inspired by the Bilingual Language Profile (see Birdsong & Gertken & Amengual 2012), but slightly simplified. Additionally, rather than a single score that captures dominance in one language or the other, the score used in this paper is relative to each language. Finally, this questionnaire separates the self-rated proficiency components from the bilingual score to see if proficiency has a different impact than use of the two languages. Participants' self-rated proficiency (on a range from 1–4) was averaged across four skills (reading, writing, speaking, listening). The Bilingual Score and Self-rated proficiency showed a moderate relationship for the bilingual two-taskers (Pearson correlation $r(28) = 0.6$, $p < 0.001$) and for the whole bilingual group (Pearson correlation $r(81) = 0.48$, $p < 0.001$).[6] The means of the two bilingual heritage groups were compared using a Welch *t*-test in R with respect to Bilingual Score and Self-rated proficiency. The mean Self-rated proficiency in Spanish for the bilingual one-taskers ($M = 3.28$; $SD = 0.55$) and for the bilingual two-taskers ($M = 3.45$; $SD = 0.5$) was not significantly different ($t(64) = –1.4$, $p = 0.16$). The mean Self-rated proficiency in English for the bilingual one-taskers ($M = 3.77$; $SD = 0.56$) and for the bilingual two-taskers ($M = 3.95$; $SD = 0.5$) was significant ($t(72) = –2.74$, $p = 0.007$). The mean Bilingual Score for the bilingual one-tasker group ($M = 11.1$; $SD = 3.4$) and ($M = 12.52$; $SD = 4.1$) and for the two-tasker group was not significant ($t(52) = –1.61$, $p = 0.11$). This suggests that bilinguals recruited through Prolific (two-taskers) had a slightly more active level of bilingualism and proficiency in Spanish. The details of the three participant groups are presented in **Table 2**.[7]

It is important to note that although the Spanish-dominant group is also bilingual in English to some extent -their mean self-rated proficiency in English is 3.35 ($SD = 0.06$)- they are not heritage speakers because Spanish is the majority language spoken in their countries. Additionally, their daily activation of English is very low (as their bilingual score shows for English).

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[6] While many studies use standardized measures of proficiency, several studies have addressed the validity and limitations of self-rated measurements used with bilingual populations, see Gollan, Weissberger, Runnqvist, Montoya, & Cera (2012), Sheng, Lu, & Gollan (2014) and Tomoschuk, Ferreira, & Gollan (2019). Self-rated proficiency is also one of the measures included in Birdsong, Gertken, & Amengual (2012) Bilingual Language Profile.

[7] An anonymous reviewer notes that five of the participants in the HS group acquired English after age 11 and 8 participants acquired Spanish between 5–10 and wonders whether these are heritage speakers. While the first group acquired Spanish in a Spanish dominant context, they have lived in an English-dominant society for a large portion of their lives, and they have done a substantial part of their education in the US. Regarding the cut-off age to be considered a heritage speaker, while the traditional idea of a critical period is generally implicitly assumed, there is no general consensus on a single critical period or what the age for it is. In general, the challenges of a universal definition of heritage speakers are well-known, as Benmamoun, Montrul, & Polinsky (2013) discuss.

	Age of Acquisition					Bilingual score		Language self-score	
	English			Spanish		English	Spanish	English	Spanish
	0–4	*5–10*	*11+*	*0–4*	*5–10*				
HS 1 taskers	26	25	2	47	6	15.06 (*SD* = 4.1)	11.1 (*SD* = 3.4)	3.77 (SD = 0.56)	3.28 (SD = 0.5)
HS 2 taskers	13	14	3	28	2	14.9 (*SD* = 3.4)	12.5 (*SD* = 4.1)	3.95 (SD = 0.1)	3.45 (SD = 0.5)
Spanish-dominant	0	27	4	31	0	4.05 (*SD* = 1.9)	21.0 (*SD* = 1.6)	3.35 (SD = 0.4)	3.98 (SD = 0.1)

Table 2: Participant age of acquisition and bilingual score.

5.2 Materials

The study consisted of three separate parts: an experimental component, linguistic background questions and proficiency self-ratings, presented online in that order using Qualtrics.

The experimental component was an acceptability judgement task (AJT) using a scale of 1–5 that included 4 conditions on a 2 × 2 design: compound structure (NN/NPN) and compound type (coordinated/adjunct). The distribution of the items is presented in (16).

(16)		Structure	Type	Status (English/Spanish)
a.	Asiento ventana	N-N	adjunct	✓/*
b.	Asiento de ventana	N*de*N	adjunct	*/✓
c.	Pintora poeta	N-N	coordinated	✓/✓
d.	Pintora de poeta	N*de*N	coordinated	*/*

The study included a total of 35 items, 24 of them experimental (6 for each condition)[8,9] presented in both Spanish and in matching English translations[10] (see materials in the OSF repository) and 11 fillers consisting of possessive constructions with *de* (*la hermana de la niña* 'the girl's sister') or its genitive counterpart in English, alternating alienable and inalienable possession and presence/absence of determiner in the second DP. Although coordinated compounds (the only category that is grammatical in both languages) were not matched for frequency, the relative frequency of the compound (as measured in the Davis 2012 corpus) had a low negative correlation with

[8] An anonymous reviewer points out that the number of items may raise power issues detecting an effect.

[9] The English equivalent for *reina leona* 'queen lion' was inadvertently presented as *lion queen*, rather than *queen lion*. Since this is a coordinated compound that is easily reversible, this error is unlikely to alter participants' choices.

[10] Some of the participants only saw the Spanish version, others saw both. See below.

acceptability judgments for Spanish-dominant participants (–0.34) and even lower for bilinguals (–0.08).[11]

Participants were given instructions to mark how sequences sound in Spanish or in English, depending on the task. They were given two practice items before the experimental questions. Items were presented with an image depicting the intended meaning of the compound, and a scale, as in (17).

(17)

Questions in the experimental component were semi-randomly assigned to two blocks. Blocks were randomly presented and items were randomized within each block.

The bilingual one-tasker group and the Spanish-dominant group performed the task only in Spanish, while the bilingual two-tasker group performed the task in English and in Spanish. The order of task presentation was randomized for this group as well.

6 Results

6.1 Bilinguals vs. Spanish-dominant group (task in Spanish)

Mean ratings of the different compound types for the three groups are presented in **Figure 1**. Focusing on the one-tasker bilingual and the Spanish-dominant groups, we find that the mean rating for the adjunctDE compound type for the one-tasker bilingual group was 4.45 (SD = 1.03), for the Spanish-dominant group, 4.3 (SD = 1.15). The one-tasker bilingual group rated the adjunctNN items as 2.65 on average (SD = 1.51), the comparison group as 2.36 (SD = 1.32). coordinateDE compounds were rated 2.66 on average (SD = 1.45) by the one-tasker bilingual

[11] An anonymous reviewer points out that low ratings for coordinated compounds may have been explained by unusual job combinations, however the mean rating for *director actor* 'actor director' was 2.5 for bilingual participants, while *poeta pintor* 'paintor poet' was 3.4 and *niña astronauta* was 3.39, suggesting no clear association between rating and job combination.

group and 2 (SD = 1.3) by the Spanish-dominant participants. Finally, coordinateNN compounds were rated 3.24 (SD = 1.45) by the one-tasker bilingual group and 3.84 (SD = 1.34) by the Spanish-dominant group. The most noticeable differences are in the Coordinate category, both coordinateNN and coordinateDE.[12]

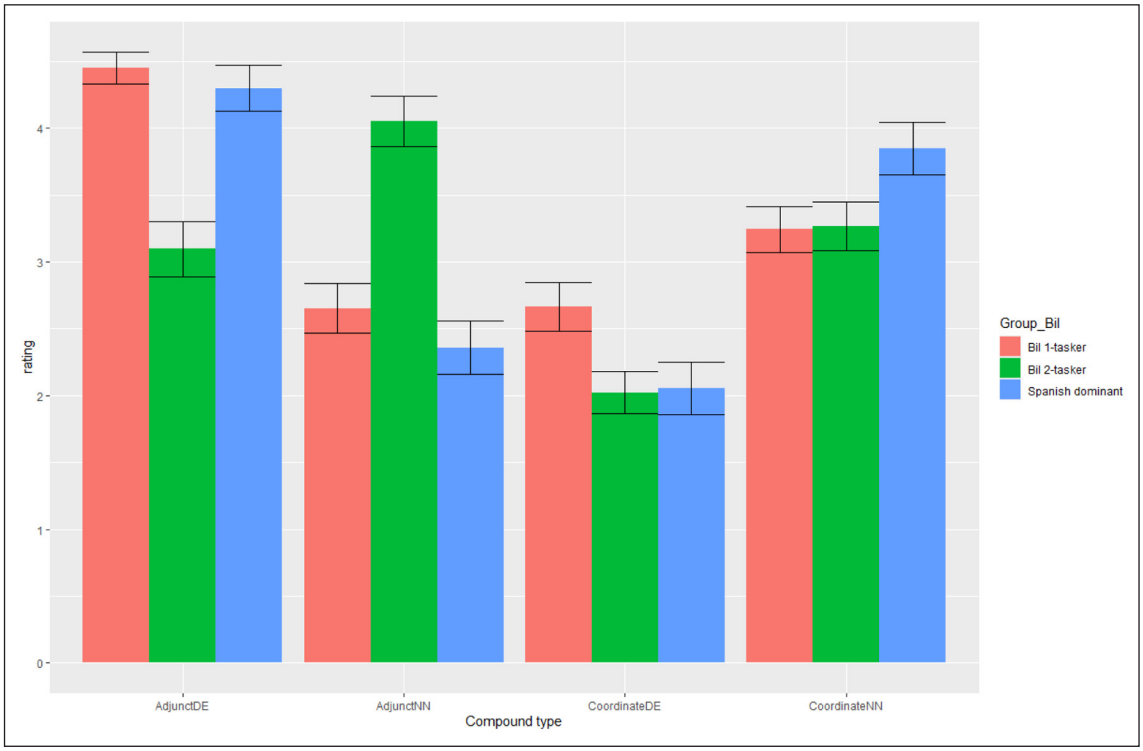

Figure 1: Mean ratings by compound type and group (0 = lowest rating, 5 = highest rating, one tasker bilinguals and Spanish dominant), 95% CI.

6.2 Bilingual group (Spanish vs. English)

Results for the two-tasker bilingual group presented in **Figure 2** show average ratings consistent with what we would expect in each language. CoordinateNN compounds were rated similarly in Spanish (M = 3.6; SD = 1.4) and English (M = 3.1; SD = 1.4), adjunctNN compounds were rated much higher in English (M = 4.9; SD = 0.4) than in Spanish (M = 2.5; SD = 1.6). AdjunctDE compounds, on the other hand, were rated higher in Spanish (M = 4.6; SD = 0.8) than in English (M = 2.2; SD = 1.3), and coordinateDE compounds were rated low

[12] Only the one-tasker bilingual group was used for this comparison, since this group did the task only in Spanish. Conversely, only the two-tasker bilingual group was used to compare English vs. Spanish. The means for all bilinguals (one-taskers and two-taskers) were not substantially different in the Spanish task.

overall, slightly higher in Spanish (M = 2.4; SD = 1.4) than in English (M = 1.8; SD = 1). Rating differences in Spanish and English are consistent with the initial expectations (based on monolingual descriptions summarized in (16)), suggesting little cross-linguistic influence.

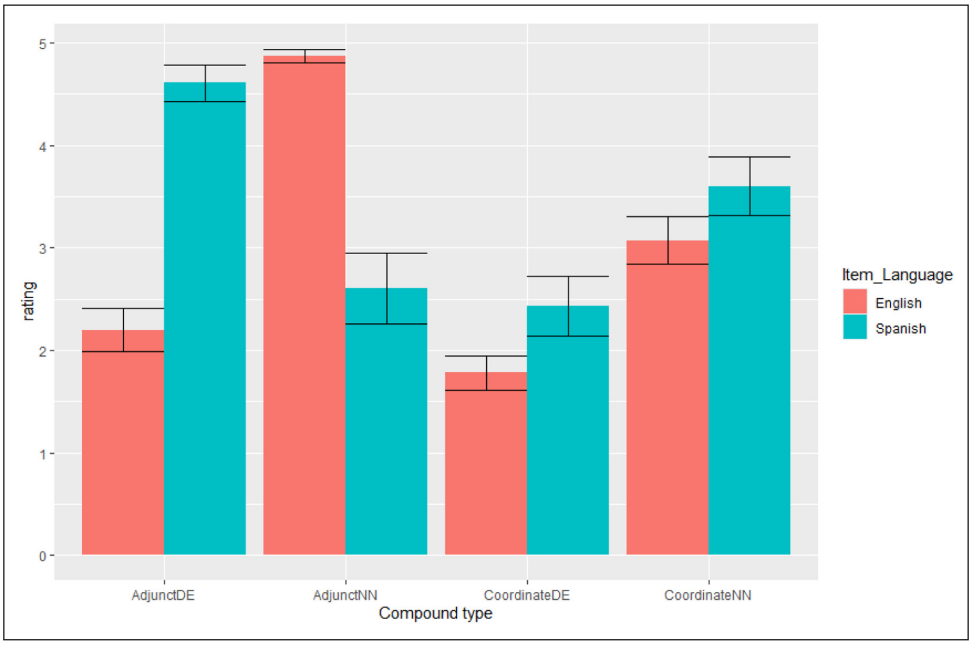

Figure 2: Ratings by task language (0 = lowest rating, 5 = highest rating, bilingual two-tasker group, 95% CI.

The trends we find from the descriptive statistics of the participants are summarized in (18).

(18) a. Rating trends in Spanish are similar for Bilinguals and the comparison group.
b. Bilinguals rate coordinateDE (*mujer de araña* 'woman of spider') and adjunctNN (*asiento ventana* 'window seat) slightly higher than Spanish-dominant participants and coordinateNN (*poeta pintora* 'painter poet') slightly lower.
c. No obvious cross-linguistic effects were observed, perhaps with the exception of higher acceptability for coordinateNN.

6.3 Statistics

We turn now to inferential statistics to confirm the tentative conclusions from the preceding section. In order to determine whether language and compound type interact in a meaningful way, several ordinal logistic regressions were fitted using polr with dummy coding (MASS package in R, see R Core Team 2018; Venables & Ripley 2002).

6.3.1 Spanish ratings by group

The first regression model was fitted to assess the effect of bilingualism (group: Spanish-dominant or bilingual one-taskers) and compound type (coordinateNN, coordinateDE, adjunctNN, adjunctDE) on ratings (see **Table 3**). The model which included the interaction between the factors was a better fit than the one without.

	Coef.	**SE**	**CI 95%**
Group(Bilingual_1T)	0.24	0.2	–0.15 to 0.63
AdjunctNN	–2.58***	0.21	–2.86 to –2.17
CoordinateDE	–3.05***	0.22	–3.5 to –2.63
CoordinateNN	–0.76***	0.2	–1.2 to –0.36
Group*AdjunctNN	0.07***	0.27	–0.45 to 0.6
Group*CoordinateDE	0.6***	0.27	0.05 to 1.11
Group*CoordinateNN	–1.01***	0.26	–1.53 to –0.5

Table 3: Coefficients for group by compound type. Baselines: AdjunctDE and Spanish dominant group.
*p < 0.05, ***p < 0.001.

The Bilingual one-tasker group was more likely to give higher ratings than the Spanish dominant group (baseline). All compound types were less likely to receive a higher rating than the baseline adjunctDE. After relevelling the baseline to adjunctNN, results indicate that coordinateDE compounds were less likely to receive a higher rating, but coordinateNN compounds were more likely.

To visualize the interaction between group and compound type, **Figure 3** presents the predicted probabilities for each rating level (on the y-axis) by compound type and group (on the x-axis). Focusing on the adjunctDE column, we see that higher ratings (5, in pale grey) were very likely, while lower ratings (1–3, in dark to light blue) were not, while the opposite trends hold for adjunctNN and coordinateDE, and to a lesser extent for coordinateNN. In general, the trends are similar across the two groups: the probability of higher ratings followed the scale adjunctDE > coordinateNN > adjunctNN > coordinateDE. Bilinguals tended to accept adjunctDE, adjunctNN and coordinateDE at higher probabilities than the Spanish-dominant group, and coordinateNN at lower probabilities.

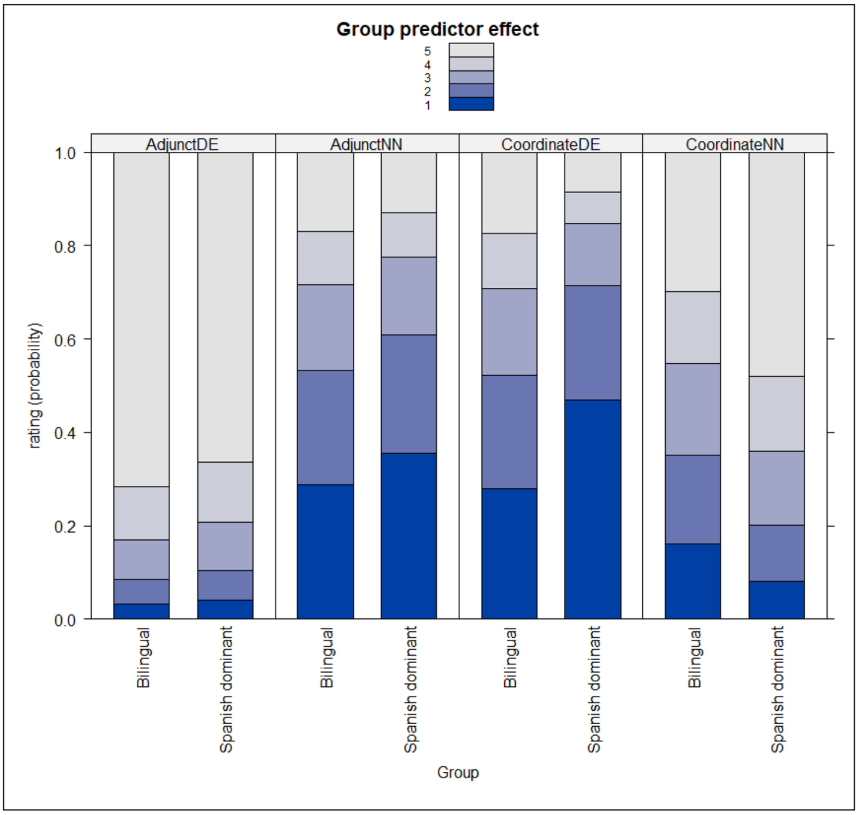

Figure 3: Predicted probabilities for each rating (1 = lowest rating, 5 = highest rating) by group (Bilingual one taskers and Spanish dominant) and compound type for Spanish items.

6.3.2 Spanish vs. English ratings

A second model was fitted with rating (1–5) as outcome and Item language (Spanish, English) and compound type (coordinateNN, coordinateDE, adjunctNN, adjunctDE) as factors. The model that included an interaction between the factors was a better fit than the one without interactions, as measured by AIC. The model output is presented in **Table 4**.

Participants were more likely to rate compounds higher in Spanish than in English. Compared to adjunctDE, adjunctNN and coordinateNN compounds were more likely to receive a higher rating, while coordinateDE were less likely. In order to visualize the interaction between the two factors, **Figure 4** presents the predicted probabilities for each rating (on the y-axis) by compound type (on the x-axis), and by language of the task. Focusing on the English adjunctNN column, we see that higher ratings (5, in pale grey) were very likely, while lower ratings (1–3, in dark to light blue) were not. For Spanish, on the other hand, lower ratings (1–3) were more likely than higher ratings (5). The adjunctDE columns offer almost the mirror image to the adjunctNN column: higher ratings (5) were more likely in Spanish, lower ratings (1–3) were more likely in English. Probabilities for coordinateDE items were similar in both

languages, tending to lower ratings, with slightly higher ratings in Spanish than in English. Finally, coordinateNN items were rated similarly in English and Spanish, with probabilities more evenly divided across all ratings, although slightly more skewed towards higher ratings in Spanish than in English.

	Coef.	**SE**	**95% CI**
Language (Spanish)	3.55***	0.31	2.97 to 4.18
AdjunctNN	4.51***	0.32	3.91 to 5.17
CoordinateDE	–.57***	0.21	–0.98 to –015
CoordinateNN	1.1***	0.21	0.69 to 1.5
Spanish*AdjunctNN	–7.65***	0.48	–8.61 to –6.73
Spanish*CoordinateDE	–2.7***	0.39	–3.48 to –1.95
Spanish*CoordinateNN	–2.9***	0.38	–3.67 to –2.17

Table 4: Coefficients for Spanish vs. English ratings by compound type, bilingual one task group. Baselines: AdjunctDE and English.
$^{***}p < 0.001$.

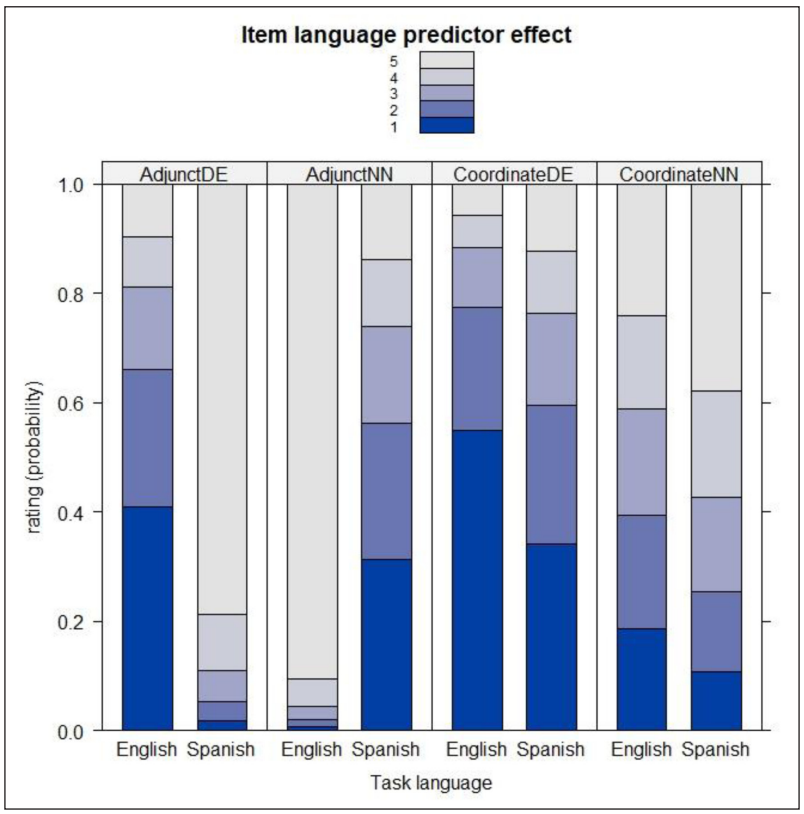

Figure 4: Predicted probabilities for each rating (1 = lowest rating, 5 = highest rating) by Item language and compound type for bilingual two taskers.

6.3.3 Ratings for Spanish items by proficiency level and bilingual score

The next model analyzes the effect of bilingual activation as measured by Self-rated proficiency in Spanish and the Bilingual score of all bilingual participants (excluding Spanish-dominant participants), both variables centered. As before, rating was the outcome variable and compound type, Self-rated proficiency in Spanish and Bilingual score were the factors. The model that included Bilingual score and interactions with compound type were the best fit, as measured by AIC. In other words, including both variables did not account better for the data. For this reason, I present results for the model with interactions between Bilingual score in Spanish and compound type in **Table 5**, including interactions between the two predictors. As expected, adjunctDE items more likely to be rated higher than the other compound-types, since that type is the default in Spanish.

	Coef.	**SE**	**CI 95%**
AdjunctNN	–2.7***	0.16	–3 to –2.4
CoordinateDE	–2.7***	0.16	–3 to –2.4
CoordinateNN	–1.8***	0.15	–2.1 to –1.5
Biling. score (Spanish)	0***	0.21	0 to 0.1
AdjunctNN*Bil_score	–0.1***	0.28	–0.2 to –0.2
CoordinateDE*Bil_score	–0.1***	0.27	–0.2 to 0
CoordinateNN*Bil_score	–0.05***	0.26	–0.1 to 0

Table 5: Coefficients for centered Bilingual score by compound type, bilingual speakers. Baseline: AdjunctDE.
***$p < 0.001$.

Figure 5 presents the probability of rating for each compound type on the y-axis, and for each compound type, the changes in rating probabilities as the centered Bilingual score increases (in the x-axis). The individual compound types and the interaction between them and the centered Bilingual score were statistically significant. As the Bilingual score increased, adjunctDE compounds tended to be rated higher. At the same time, increases in the Bilingual score resulted in lower ratings for adjunctNN, coordinateDE and coordinateNN compounds. The probability of 5 for adjunctDE was higher than for the Spanish-dominant group, while the probabilities for other adjunct types were lower than and closer to the Spanish-dominant group.

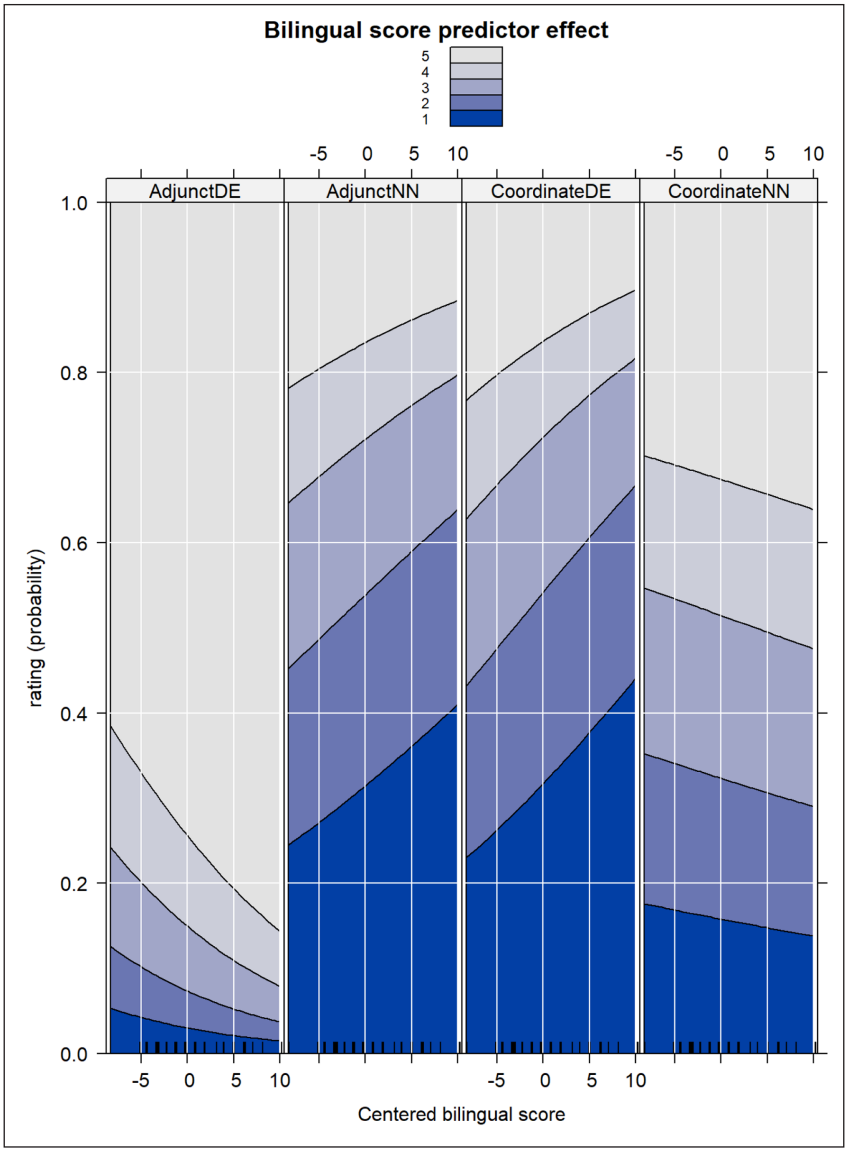

Figure 5: Rating for Spanish items and centered Bilingual score (–8 = low, 10 = high, all bilinguals).

7 Discussion

The results presented in the previous section show that bilingual participants's Spanish patterns are similar to those of Spanish-dominant participants, and at the same time, substantially different from English patterns, as expected.[13] Specifically, adjunctNN compounds were rated consistently

[13] An English L1 comparison group would confirm that ratings are due to the language difference and not specific to bilinguals, as an anonymous reviewer points out. Unfortunately, it was logistically difficult to carry out this additional task, so this is one limitation of this study.

lower in Spanish compared to adjunctDE compounds. The bilingual HS group and the Spanish-dominant group did not show large differences in their ratings, but bilinguals showed higher ratings for coordinateDE and lower ratings for coordinateNN than the Spanish-dominant group, somewhat unexpectedly.

Bilinguals sharply differed in their preferences in English and Spanish. They disliked adjunctDE compounds and coordinateDE in English, strongly favored adjunctNN in English and had no strong preferences for coordinateNN. Results are summarized in **Table 6**.

	Two-task bilinguals (English)	**Two-task bilinguals (Spanish)**	**Spanish-dominant (Spanish)**
AdjunctDE	2.2 (SD = 1.3)	4.6 (SD = 0.8)	4.3 (SD = 1.1)
AdjunctNN	4.9 (SD = 0.4)	2.5 (SD = 1.6)	2.3 (SD = 1.3)
CoordinateDE	1.8 (SD = 1.0)	2.4 (SD = 1.4)	2.0 (SD = 1.3)
CoordinateNN	3.1 (SD = 1.4)	3.6 (SD = 1.4)	3.8 (SD = 1.3)

Table 6: Summary of results.

Note several interesting patterns: bilinguals seem to have a bias in favor of *de* compounds, above and beyond the Spanish-dominant group's results. However, their rating for N-N compounds in Spanish seems to be pulled towards the English rating. In other words, N-N compound ratings seem to reflect cross-linguistic influence from English, but *de* compound ratings overcompensate in the direction of Spanish-dominant patterns.

In terms of H1 in Section 4, only ratings for adjunctNN compounds are consistent with cross-linguistic influence. HS participants showed a slightly higher acceptability for adjunctNN than the Spanish-dominant group (M = 2.5 vs. M = 2.3 respectively), although the difference was not statistically significant. Since this option was highly rated in English (4.9), cross-linguistic influence may account for the HS group's increased rating.

The second prediction that the English and Spanish results would not be different was not confirmed, since participants rated the items significantly differently, both by language (English vs. Spanish) and when looking at the interaction between language and compound type.

H2 focused on whether breaking symmetry is the driving force in the derivation of N-N combinations. It predicted that HS would accept adjunctDE compounds at higher rates than adjunctNN compounds. This was confirmed for Spanish but not for English. Bilinguals had higher ratings for adjunctDE (M = 4.6) and adjunctNN (M = 2.5) than Spanish-dominant participants (M = 4.3 and M = 2.3 respectively) in Spanish. These results are compatible with a strategy that both maximizes antisymmetry, resulting in a higher rating for adjunctDE, and also shows

cross-linguistic influence from English, resulting in a slightly higher rating for adjunctNN for the bilinguals.

The predictions of H3 about the interaction between antisymmetry and semantic markedness stated that inherent semantics would prevail over antisymmetric saliency, predicting that coordinateNN compounds would be rated higher than coordinateDE compounds, because of the clash between the higher antisymmetry saliency of *de* and its inherent incompatibility with a conjunctive meaning. Two facts are noticeable: first, the bilingual group rated coordinateDE compounds as 2.4, higher than the Spanish-dominant group (2.0). This contrast is interesting because their lower rating in English (1.8) discards cross-linguistic influence. One possible interpretation of this result would be that bilinguals bleach any semantic component from *de*, so that it becomes more compatible with a conjunctive meaning (see Nicoladis 2002b).

The second result worth pointing out is that bilinguals rated coordinateNN compounds lower than the Spanish-dominant group (3.6 vs. 3.8 respectively), a result that is compatible with the antisymmetry strategy, since coordinateNN is the most symmetric option.

H4 in (15), which predicted that bilingual activation would modulate HS's preferences, was not confirmed in general. Self-rated proficiency changes had no clear effect, perhaps because the proficiency range may not have been wide enough to detect meaningful changes in ratings; second, self-rating is an imperfect measure of proficiency. In terms of the Bilingual score, results are more mixed. As the Bilingual score raises, rating patterns tend to converge between HS and Spanish-dominant participants for most compound types. However, HS speakers tended to favor higher ratings for adjunctDE compounds beyond what Spanish-dominant participants did, suggesting that the preferred antisymmetry strategy remains strong even for bilinguals with high activation levels. Once again, these results depend on how well the Bilingual score represents activation of the language.

8 Conclusion

In conclusion, N-N combinations provide a unique window into the possible mechanisms that bilinguals use to handle two languages. I have hypothesized that due to the process of inhibition, speakers may show a preference for strategies that break structural asymmetry in the most conspicuous way, but this preference interacts with other important factors, such as the prevalence of a semantic feature. In this sense, although the forces at play –merger, antisymmetry, semantic markedness– are basic building blocks of all grammars (those of monolinguals and bilinguals), the way in which they interact in bilinguals may be different because of the competing pressures of handling grammatical features that may have different values in each of the languages.

Specifically, results from this study suggest that some of the observed patterns may be attributed to cross-linguistic influence -the increased rating for adjunctNN compounds in Spanish

as influence from English-, but others cannot. Specifically, higher adjunctDE and coordinateDE ratings cannot be attributed to English grammar influence because monolingual English lacks productive adjunctDE and monolingual Spanish and English lack productive coordinateDE. I have argued that these cases result from two parallel processes: on the one hand, the high symmetry-breaking value of the DE strategy; on the other hand, semantic bleaching for DE in coordinateDE that makes the linker compatible with a conjunctive meaning.

More generally, this study contributes to a program that attempts to provide a more nuanced picture of how bilingual speakers prioritize certain features or structures in the context of having two active grammatical settings.

Data availability

The files containing the experimental items and anonymized results from participants are available in Open Science Framework repository (DOI 10.17605/OSF.IO/HNZ3E)

Ethics and consent

This research was approved by the University of Illinois Chicago IRB under the protocol 2020-0228.

Acknowledgements

I wish to thank two anonymous Glossa reviewers, and Vera Heyer, whose comments and suggestions have greatly improved this paper, and Sol Lago, the Associate Editor of Glossa, for her help and patience.

Competing interests

The author has no competing interests to declare.

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