

**LANGUAGE BACKGROUND AND THE REALIZATION OF THE  
INFORMATION STRUCTURE CONSTRAINTS ON ENGLISH  
DITRANSITIVE CONSTRUCTIONS: EVIDENCE FROM  
MONOLINGUAL AND BILINGUAL SPEAKERS**

by

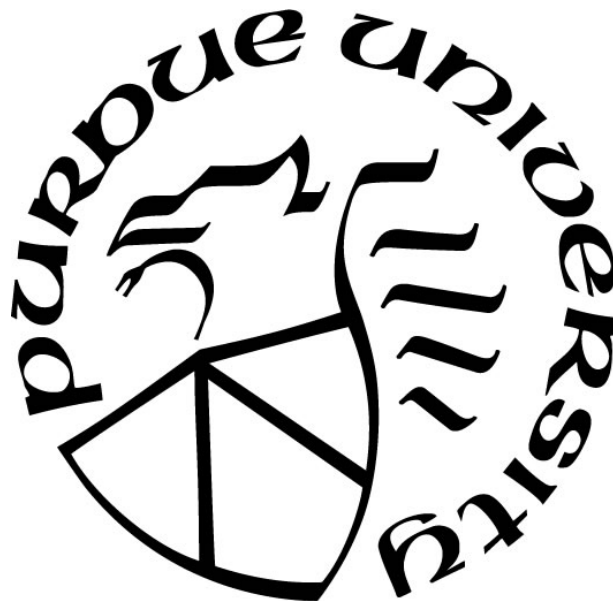
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## **ABSTRACT**

Previous research has shown that the type of ditransitive sentence preferred by English speakers in a particular linguistic context is significantly influenced by the relative ‘givenness’ of the post verbal arguments (i.e. the assumption that the referent of a linguistic expression is known to the speaker/hearer). This ‘givenness constraint’ has also been shown to play a role in the ditransitive sentence preferences of bilingual English speakers. Some have claimed that the realization of the givenness constraint in the ditransitive sentence preferences of bilingual English speakers is significantly influenced by the characteristics of their dominant language; however, no studies that I am aware of have explicitly compared the preferences of speakers whose dominant languages feature different sets of ditransitive sentence types, making this claim difficult to evaluate. Additionally, the effects of task type (i.e. the experimental task(s) employed by a particular study), and variables related to speakers’ experience with English and English proficiency, relative to language background are unclear. This study attempts to clarify the role of language background in the realization of the givenness constraint by recruiting three groups of English speakers: German-English bilingual speakers living in Germany, Spanish-English bilingual speakers living in Mexico, and monolingual English speakers living in the United States. The three groups completed three tasks, all of which were administered over the internet: a scalar acceptability judgement task, a forced choice task, and a self-paced reading task. The results from the two bilingual groups showed significant effects of language background, even after factors related to English proficiency and English experience were taken into account. The results support an interpretation where language background plays a significant role in the realization of the givenness constraint on bilingual speakers’ ditransitive sentence preferences.

## CHAPTER 1. INTRODUCTION

### 1.1 Ditransitive Sentences and the Givenness Constraint

All natural human languages have multiple ways of communicating the same message. This linguistic property is clearly exemplified by syntactic alternations. Syntactic alternations are sets of two or more sentences that are distinct structurally yet are very close paraphrases of one another semantically. For example, consider the English ditransitive sentences shown in (1).

- |   |                           |
|---|---------------------------|
| (1)   |                           |
| a. The student sent a photograph to the botanist. | Prepositional object (PO) |
| b. The student sent the botanist a photograph.    | Double object (DO)        |
| c. The student sent to the botanist a photograph. | 'Heavy' NP shift (HNPS)   |

These three sentence types are formally distinct from one another, but they can generally be used to communicate the same message.

It would be more efficient if only one of these options existed, allowing for a one-to-one mapping of form and meaning; so why do syntactic alternations of this type happen? One way to answer this question is to think of a speaker's word order preference as a choice that is governed by a set of probabilistic, weighted, interacting constraints. For English ditransitive sentences, these constraints mostly have to do with the post-verbal arguments, and include the length of the post verbal arguments, whether the post-verbal arguments are animate, whether they are definite, whether they are pronouns, and whether they are given in the discourse.

This study focuses on the effect of the givenness of the post verbal arguments, which I will call the givenness constraint. By 'givenness,' I mean, roughly, the assumption that the referent of a linguistic expression is known to the speaker/hearer, for instance, because it has already been mentioned in the discourse, and is salient in the speaker/hearer's discourse model as a result. A 'given' referent is therefore one that is assumed to be active or salient in the speaker/hearer's

discourse model, while a ‘new’ (or less given) referent is one that is assumed to be inactive (or only peripherally active) in the speaker/hearer’s discourse model. The ‘givenness constraint’ describes the observation that the givenness of the post-verbal arguments influences English speakers’ preferred ditransitive sentence form. More specifically, some previous studies have shown that PO sentences like (1a) are typically judged to be equally acceptable when the post-verbal constituents occur in new-given ordering compared to given-new ordering, whereas DO and HNPS sentences like (1b) and (1c) are judged to be significantly less acceptable when the post-verbal constituents occur in new-given order (Arnold et al., 2000; Brown et al., 2012; Clifton & Frazier, 2004 *inter alia*).

The givenness constraint is one of several constraints that influence speakers’ preferred ditransitive sentence type in a particular linguistic context; however, much of what is known about these constraints, how they interact, and how they cooperate, comes from data collected from healthy, adult, monolingual speakers of English. While it is known that the level of influence, or ‘weight’, of each constraint may differ between populations of English speakers (American English speakers vs. New Zealand English speakers, for example), differences in the way that these constraints are realized across populations largely remain to be investigated (Bresnan & Hay, 2008).

For example, previous work in the field of bilingualism suggests that the weighting of the givenness constraint by late bilingual speakers/L2 speakers of English is different from that English monolinguals (Chang, 2004; Marefat, 2005; K.-S. Park, 2014, 2011). Since many languages contain a similar kind of dative alternation, some have speculated that differences in the realization of the givenness constraint by late bilingual speakers/L2 speakers is the result of cross-linguistic influence (influence of the dominant language/L1 on comprehension or production in

the non-dominant language/L2); however, speakers from multiple language backgrounds have rarely been compared within the same study, and alternative explanations, such as systematic effects of speakers' experience with English or the experimental task(s) employed in a particular study, have not yet been explored.

The current study will examine the realization of the givenness constraint in bilingual English speakers' ditransitive sentence preferences, with the aim of investigating the role of language background. More specifically, this study will consider whether patterns that appear to be attributable to language background might actually be reduced to the effects of factors related to speakers' experience with English, such as general English proficiency, frequency of English use, and amount of exposure to English. By doing so, this study will consider the role that the givenness constraint plays in the ditransitive sentence preferences of English bilingual speakers, and it will attempt to clarify why the givenness constraint plays the role that it does. Ultimately, this study will also expand our understanding of the way in which the influence of one particular constraint may differ in the ditransitive sentence preferences of speakers from different cognitive-linguistic backgrounds.

## **1.2 Research Questions**

The current study will be guided by two general research questions:

- R1. Do bilingual English speakers demonstrate sensitivity to the givenness constraint in their ditransitive sentence preferences and/or during real-time sentence processing?
- R2. What is the relative importance of language background and speakers' experience with English (English proficiency, frequency of English use, amount of English exposure, etc.) in the realization of the givenness constraint in bilingual speakers' ditransitive sentence preferences?

R1 concerns whether bilingual English speakers do in fact show sensitivity to the givenness constraint, as some previous studies have found; further, R1 concerns whether bilingual speakers' sensitivity to the givenness constraint is consistent across the experimental paradigms that are common in bilingualism research, including potential differences between offline, metalinguistic tasks (e.g. acceptability judgements, sentence choice tasks) and online tasks designed to probe real-time language processing (e.g. self-paced reading).

R2 concerns the relative importance of several factors that could plausibly influence the ways in which the givenness constraint shapes bilingual speakers' sentence preferences. While some previous studies have attributed bilingual speakers' ditransitive sentence preferences to cross-linguistic influence of the dominant language (or L1, in the case of adult L2 acquisition), these studies only tested speakers from the same L1 background. As a result of this limitation, they failed to examine how language background interacts with other factors, such as general English proficiency or frequency of English use. In the current study, R2 seeks to determine whether language background contributes to speakers' ditransitive sentence preferences independently of factors related to speakers' experience with English.

To answer these questions, two groups of bilingual English speakers (German-English bilingual speakers and Spanish-English bilingual speakers), as well as a group of monolingual English speakers, were recruited to take part in this study. These two groups of bilingual speakers were chosen because their dominant languages (German and Spanish) are hypothesized to contain different enough sets of ditransitive constructions as to allow potential effects of cross-linguistic influence to be detected. The three groups completed three experimental tasks designed to assess their ditransitive sentence preferences: (1) an acceptability judgement task (2) a forced-choice

sentence preference task and (3) a self-paced reading task. Task design, participant recruitment and data collection procedures, and statistical analysis will be discussed in Chapter 3.

### **1.3 Chapter Summary**

In summary, the subject of this study will be the realization of the givenness constraint in the ditransitive sentence preferences of bilingual English speakers. While some have speculated that cross-linguistic influence plays an important role in this realization, the importance of language background relative to other factors remains somewhat unclear. This study will attempt to clarify the role of language background by examining the extent to which the givenness constraint influences the ditransitive sentence preferences of different groups of bilingual speakers, and it will consider whether apparent effects of language background may be attributable to other factors. Chapter 2 will expand upon the topics introduced in this chapter by reviewing some of the literature that is relevant to this study. Chapter 3 will then describe the methods, including the hypotheses to be tested, the data collection procedures, and the design of the experimental tasks. Chapter 4 will present the results of each task. Chapter 5 will discuss the results in terms of the experimental hypotheses and will then discuss the larger theoretical implications of the results and potential directions for future research. Chapter 6 will conclude by addressing the two research questions presented in Chapter 1.



## CHAPTER 2. LITERATURE REVIEW

Chapter 2 will review some of the literature that is relevant to the focus of this study: the effect of the givenness constraint on the processing of English ditransitive sentences by monolingual and bilingual English speakers, and the relative importance of language background compared to other factors in the realization of this constraint. Chapter 2 will be organized as follows: Section 2.1 will introduce English ditransitive sentences and will discuss their form and meaning. Section 2.2 will introduce the givenness constraint and a constraint-based approach to understanding speakers' ditransitive sentence preferences. Section 2.3 will outline the theoretical assumptions of this study, and section 2.4 will review previous studies of the givenness constraint in bilingualism/second language acquisition research. Section 2.5 will provide a general summary.

### 2.1 English Ditransitive Sentences: Form and Meaning

#### 2.1.1 Ditransitive Sentence Form

Consider the English ditransitive sentences shown in (1), repeated from Chapter 1.

(1)

- |   |                           |
|---|---------------------------|
| a. The student sent a photograph to the botanist. | Prepositional object (PO) |
| b. The student sent the botanist a photograph.    | Double object (DO)        |
| c. The student sent to the botanist a photograph. | 'Heavy' NP shift (HNPS)   |

Ditransitive sentences include three-place predicates that prototypically describe a transfer event where an agent (such as *the student*) causes the transfer, either literal or metaphorical, of a theme (such as *a photograph*) to a recipient or goal (such as *the botanist*) (Goldberg, 1995; Haspelmath, 2015; Malchukov et al., 2010). The term 'ditransitive' is sometimes used to refer specifically to the sentence type in (1b) (e.g. Goldberg, 2006); however, I will use 'ditransitive' (or 'ditransitive

construction’) to refer more generally to the abstract argument structure frames employed by all three sentences shown in (1).

English allows several types of ditransitive sentences. (1a) is an example of the prepositional object (PO) construction, in which the recipient argument follows the theme and is the complement of a prepositional phrase. (1b) is an example of the double object (DO) construction, in which the recipient argument precedes the theme argument, and both arguments are nominal. (1c) is an example of the ‘heavy’ noun phrase shift (HNPS) construction, in which the positions of the post verbal noun phrase and prepositional phrase are reversed compared to the PO construction. HNPS is so named because it typically occurs when the theme argument is significantly longer, or ‘heavier’, than the recipient argument (Wasow & Arnold, 2003), though HNPS may also occur more often when the recipient is more topical than the theme (Arnold et al., 2000), or when the ditransitive predicate is part of an idiom (Wasow, personal communication). HNPS sentences may in principle contain any ditransitive verb that can occur in a PO sentence, though HNPS sentences may be more likely to contain non-alternating verbs (Goldberg, 2011). The three sentence types in (1) can be formally distinguished from one another by the order of their arguments (1ac), the form of the constituent containing the recipient argument (1bc), or both (1ab).

The possibility that either the PO or DO sentence type may be used to express the same message is an example of an ‘argument structure alternation’, since the two sentence types express the same message but feature different argument structure configurations. In this case, the PO and DO sentence types are differentiated by the form of the constituent containing the recipient argument (NP vs. PP) and the placement of the recipient argument relative to the theme. The term ‘dative alternation’ has been used to describe the possibility that a particular ditransitive verb (such

as *send*) may occur in both the PO and DO sentence types. Such ditransitive verbs are traditionally called ‘alternating’ verbs, in contrast with ‘non-alternating’ verbs, which are heavily biased toward occurring in the PO construction. The possibility that a ditransitive verb may occur in either a PO or a HNPS sentence is traditionally described as a ‘constituent order alternation’, since the two sentence types feature the same argument structure configuration but differ in the linear order of their post verbal constituents.

A great deal work has been devoted to explaining when and why one ditransitive sentence type might be used instead of another one. One line of inquiry has focused on identifying the factors that cause speakers prefer one ditransitive sentence type over another one when multiple options (e.g. PO and DO, PO and HNPS) are possible. The rest of this section will consider two possibilities. The first possibility is that the ditransitive sentence types are semantically distinct, meaning that speakers will simply choose the sentence type that aligns best with their intended message. The second possibility is that the sentence types may be used in the same communicative context, and a speaker’s choice of one over another in a particular context is governed by a set of weighted, probabilistic, interacting constraints.

### **2.1.2 Ditransitive Sentence Meaning**

Despite their formal differences, the three ditransitive sentences in (1) are very close paraphrases of one another semantically. Some have argued that this similarity is only apparent, and that there are actually subtle semantic differences between the PO and DO sentence types (for the purposes of this discussion, I will assume that PO and HNPS sentences have identical semantics). More specifically, it has been claimed that DO sentences are typically associated with a ‘caused possession’ meaning, while PO/HNPS sentences are typically associated with a ‘caused motion’ meaning (Goldberg, 1995; Levin, 1993; Rappaport Hovav & Levin, 2008). For example,

Goldberg (1995) argued that the animacy requirement imposed on the first post-verbal argument in DO sentences is evidence for the association between DO structure and the ‘caused possession’ meaning. The first post-verbal argument in DO sentences is generally required to be animate and capable of possession. Consider the sentences in (2):

- (2)
- |  |      |
|--|------|
| a. ??Nancy sent the building a surprise  | (DO) |
| b. Nancy sent a surprise to the building | (PO) |

In (2a), the interpretation where *the building* itself comes to possess the surprise is not possible; the only felicitous interpretation is the one in which *the building* refers to the group of people who occupy the building. This interpretive restriction on DO sentences is consistent with the claim that they typically encode a ‘caused possession’ meaning, since the only felicitous interpretation is the one in which *the building* refers to a group of people capable of possession. In the PO sentence shown in (2a) it is possible to interpret *the building* as a goal argument (the end point of a transfer event), in line with the ‘caused motion’ meaning that is typically associated with PO sentences. Restrictions like the one in (2) have been presented as evidence that PO and DO sentences generally have distinct meanings: ‘caused motion’ for POs and ‘caused possession’ for DOs.

Harley (2002) captures the distinct semantics of PO and DO sentences by proposing a syntactic difference between the sentence types. Harley’s (2002) approach assumes a high degree of isomorphism between syntax and semantics, meaning that semantic distinctions should map to structural distinctions in a one-to-one fashion. The semantic distinction between PO and DO sentence should therefore be accompanied by a corresponding structural distinction at some level of representation. Harley (2002) proposes that the second post-verbal constituent in English ditransitive sentences (i.e. the constituent containing the recipient in POs and the constituent containing the theme in DOs) is headed by a null preposition ‘P’. Two variants of P, ‘P-LOC’

(locative) and ‘P-HAVE’ (possessive) are mapped to the ‘caused motion’ and the ‘caused possession’ meanings, respectively. To derive the meaning difference between PO and DO sentences, Harley (2002) proposes that the second post-verbal constituent in PO sentences is a prepositional phrase headed by P-LOC with the theme argument as its specifier and the goal argument as its complement. The second post-verbal constituent in DO sentences is a prepositional phrase headed by P-HAVE, with the recipient argument as its specifier and the theme argument as its complement. The lexical semantics of the P-LOC head allow the constituent to be interpreted as a locative prepositional phrase with the goal argument as its end point. Likewise, the lexical semantics of the P-HAVE head allow the constituent to be interpreted as a possessive prepositional phrase with the recipient argument serving as the locus of possession. The prepositional complement selected by the ditransitive verb therefore determines both the structural configuration and the interpretation of the ditransitive sentence. This approach formalizes the difference in meaning between PO and DO sentences by assuming a structural distinction which gives rise to an interpretive distinction via a strict one-to-one mapping between syntax and semantics (see Pesetsky, 1996, for a similar proposal).

While it may be generally true that PO and DO sentences are associated with distinct meanings, it is not clear that there is necessarily a strict one-to-one mapping between sentence type and semantic interpretation. Rappaport Hovav and Levin (2008) argued that ditransitive sentences containing verbs like *throw* and *send* may have both ‘caused possession’ and ‘caused motion’ meanings. Further, the ‘caused possession’ meaning may be realized by either the PO or the DO sentence type. In these cases, the meanings of the two sentence types are identical. Goldberg (1995) made a similar observation: while PO sentences prototypically describe events of physical transfer, they may also be used in some cases to describe abstract transfer of possession. Goldberg (1995)

analyzes this second possibility as a case of constructional polysemy, driven by the metaphorical (in the sense of Lakoff & Johnson, 1980) association between physical transfer and the abstract notion of transfer of possession. “The metaphor”, says Goldberg (1995, p. 90), “allows the [PO] construction to be used to encode transfer of possession. This is precisely the semantics associated with the [DO] construction”. So, while it may generally be the case that PO and DO sentences are associated with distinct meanings, a speakers’ choice between a PO and DO sentence cannot always be straightforwardly attributed to semantics, at least for those ditransitive verbs that allow the ‘caused possession’ meaning to be expressed by either sentence type.

Bresnan et al. (2007) go further by claiming that even those ditransitive verbs that are thought to reliably assign distinct meanings to PO and DO sentences may not always do so. For example, consider the idiom in (3) that uses the ditransitive verb *give*.

- (3)
- |                                       |      |
|---------------------------------------|------|
| a. That movie gave me the creeps.     | (DO) |
| b. *That movie gave the creeps to me. | (PO) |
- (Bresnan et al., 2007, p. 4)

The contrast in (3) supports the hypothesis that PO and DO sentences are typically assigned distinct meanings. Sentence (3a) could be paraphrased as ‘that movie caused me to possess an uncomfortable feeling of nervousness or fear’. This meaning is compatible with the DO sentence type, since it describes an instance of caused possession; however, it is not compatible with the PO sentence type, since *the creeps*, an abstract feeling, cannot be the theme in a physical transfer event. The meaning of the idiom is not compatible with the ‘caused motion’ meaning of the PO, and (3b) sounds odd as a result.

Bresnan et al. (2007) go on to show, however, that the typical meanings assigned to PO and DO sentences can be overridden in certain contexts. For instance, the *give X the creeps* idiom can be found in PO sentences with the ‘caused possession’ meaning in cases where the recipient

is significantly longer than the theme, as in (4a). In fact, in these cases, the PO variant is typically judged to be more acceptable than the DO variant, shown in (4b).

(4)

- a. Stories like these must **give the creeps to people whose idea of heaven is a world without religion...** (PO)
  - b. ??Stories like these must **give people whose idea of heaven is a world without religion the creeps...** (DO)
- (Bresnan et al., 2007, p. 7)

The authors go on to make a similar observation regarding ‘verbs of continuous imparting force’, such as *haul* and *drag*. Verbs of continuous imparting force are hypothesized to only occur in PO sentences with a ‘caused motion’ meaning, and to not be compatible with DO sentences (e.g. *I dragged the crate to Amy* vs. *\*I dragged Amy the crate*). The authors cite several examples demonstrating that verbs of continuous imparting force can in fact occur in DO sentences when the recipient is more definite, more accessible, shorter, and pronominal compared to the theme. Based on these counterexamples, the authors argue that a speaker’s choice of ditransitive sentence in a particular context cannot be reliably predicted based on meaning alone.

Taken together, these accounts suggest that meaning can only go so far in predicting which ditransitive sentence type will occur in a particular context. While PO and DO sentence types may be generally associated with distinct meanings, the sentence type chosen to express the speaker’s message in any particular instance depends significantly on contextual factors, at least for those ditransitive verbs for which PO and DO sentences may carry the same meaning. We will now turn to those contextual factors which influence speakers’ ditransitive sentence preferences.

## **2.2 Predicting the Ditransitive Alternation**

### **2.2.1 Constraints on Ditransitive Sentence Choice**

Previous work suggests that meaning can only go so far in determining ditransitive sentence form, at least for a subset of ditransitive verbs. If speakers' ditransitive sentence preferences cannot be attributed to differences in meaning, why does the ditransitive alternation happen? Why should English allow two different ways of communicating the same message?

One way to think about argument structure alternations is that they are governed by a set of weighted, interacting, probabilistic constraints. In this approach, the choice between two argument structure variants can be predicted by constructing model that incorporates a set of constraints (factors), each of which exert a certain level of influence on the outcome. For example, Bresnan et al. (2007) constructed a model that attempted to predict what kind of ditransitive sentence (PO or DO) speakers chose in a particular context. The model was based on 2360 ditransitive sentences from the Switchboard Corpus (a collection of recorded and transcribed telephone conversations) and incorporated 14 separate predictors based on characteristics of the recipient and theme arguments in each instance. These variables included:

- a) the relative length of the recipient and theme
- b) whether the recipient and theme were animate
- c) whether the recipient and theme were definite
- d) whether the recipient and theme were pronominal
- e) whether the recipient and theme were given in the discourse (i.e. whether the recipient or theme had already been mentioned in the preceding linguistic context)

The results showed that the type of ditransitive sentence chosen was influenced significantly by the degree of “harmonic alignment” (p. 8) between the predictor variables and syntactic position: specifically, ditransitive sentence choices were made such that they allowed:

1. shorter post-verbal constituents to come before longer post-verbal constituents
2. animate post-verbal constituents to come before inanimate post-verbal constituents



3. definite post-verbal constituents to come before indefinite post-verbal constituents
4. pronominal post-verbal constituents to come before non-pronominal post-verbal constituents
5. discourse given post-verbal constituents to come before non-given post-verbal constituents

When these constraints aligned to promote recipient-before-theme ordering, DO sentences were chosen, and when they aligned to promote theme-before-recipient ordering, PO sentences were chosen. When the model was fitted to a series of unseen data sets, it was able to predict ditransitive sentence form with an average accuracy of 92%. Additionally, all of the constraints (a-e) were significant in the model. This suggests that the effect cannot be reduced to one of the constraints individually; instead, the constraints interact, each playing a part in determining which ditransitive sentence type is most probable in a particular context.

The analysis by Bresnan et al. (2007) was based on data from a corpus of spoken English, so it provides evidence that the constraints in (a-e) at least play a role in determining speakers' preferred ditransitive sentence form during language production. Bresnan (2007) conducted two follow up experiments to determine whether these constraints also played a role in speakers' intuitions about the acceptability of ditransitive sentence types in particular contexts. In the first experiment, participants completed a rating task in which they were asked to choose whether a PO or DO sentence was more natural in a particular context. Each experimental item consisted of a short paragraph followed by a ditransitive sentence presented as both a PO and a DO. Participants were asked to indicate which form of the ditransitive sentence seemed most natural in the context by distributing 100 points evenly between the two options (e.g. PO = 0, DO = 100; PO = 60, DO = 40; etc.). Experimental items were sampled from the Switchboard Corpus tokens collected by Bresnan et al. (2007). The sampling procedure was stratified based on probability such that the

items represented five probability bins ranging from ‘very low probability of being a PO’ to ‘very high probability of being a PO.’

The results of the task showed that participants’ ditransitive sentence preferences were nearly identical to the predictions made by the model from Bresnan et al. (2007); when the model predicted high or low probability of a PO sentence occurring, participants indicated a correspondingly strong preference or dispreference for PO sentences compared to DO sentences. When the model was somewhat indeterminate, participants ratings were somewhat indeterminate as well.

The results of experiment 1 suggested that speakers’ intuitions about ditransitive sentence form in context follow the same probabilistic tendencies observed in Bresnan et al.’s (2007) model. Experiment 2 set out to test whether manipulations that raise or lower sentence probabilities also raise or lower acceptability judgements. In experiment 2, double object sentences containing reportedly non-alternating verbs (e.g. *I dragged Amy the crate*), which should be highly unacceptable, were rated in two types of contexts: (1) a context where the DO was more probable, and a context where the DO was less probable. DO probability was manipulated by representing the recipient argument as either a full NP (DO less probable) or as a pronoun (DO more probable). The results showed that ratings for DO sentences with non-alternating verbs were significantly higher in the high probability condition (pronominal recipient) compared to the low probability condition (full NP recipient). Additionally, DO sentences with non-alternating verbs received nearly identical ratings in the high probability condition compared to DO sentences with alternating verbs, which are hypothesized to be fully grammatical. These results suggest that speakers’ linguistic intuitions are sensitive to subtle manipulations of the constraints on ditransitive sentence form in the same way that corpus probabilities are. Additionally, they suggest that verbs

traditionally classified as ‘non-alternating’ may be judged as highly acceptable in DO sentences if the relevant constraints align to favor the DO.

In another study, Bresnan and Hay (2008) demonstrated that the constraints that influence ditransitive sentence preferences may differ in their weights across populations of speakers. By ‘population’, I mean a group of speakers with a shared linguistic background and cognitive-linguistic ability, for example, healthy adult monolingual speakers of American English. Bresnan and Hay (2008) compared the relative influence of the animacy constraint ((b) above) on ditransitive theme arguments between spoken American English and New Zealand English. Recall that the animacy constraint dictates that animate post-verbal constituents should come before inanimate post-verbal constituents. When the theme argument is animate and the recipient argument is inanimate, the DO sentence type should be dispreferred, since using the DO would result in recipient-theme, and thus inanimate-animate, constituent ordering. On the other hand, the probability of the DO occurring should go up when the theme is inanimate and the recipient is animate, since the result would be the preferred animate-inanimate constituent ordering.

Using corpus data, Bresnan and Hay (2008) found that the animacy constraint was stronger in New Zealand English compared to American English. Figure 2-1 shows the log odds of a theme argument occurring in a DO sentence on the Y axis, and it’s animacy status (animate or inanimate), on the X axis. In New Zealand English, inanimate themes were considerably more likely to occur in DO sentences compared to animate themes. In contrast, there was only a slight advantage for inanimate over animate themes in spoken American English. This result shows that, in both dialects, the animacy constraint plays a role in determining the probability of DO sentences, and the effect is in the same direction: DO sentences are more likely to occur when the theme is animate. The two dialects differ, however, in the *weighting* of the animacy constraint: while the animacy

constraint plays a significant role in determining the probability of DOs in New Zealand English, it plays a smaller role in determining the probability of DOs in spoken American English. We might assume that, in spoken American English, some other, more heavily weighted constraint plays a more deterministic role in ditransitive sentence preferences compared to the animacy constraint.

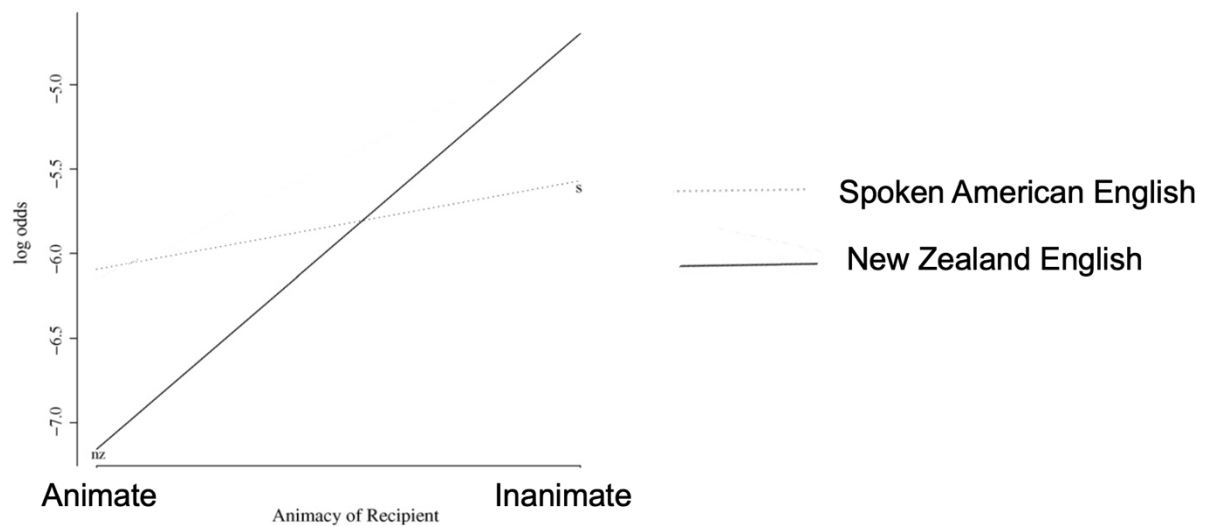


Figure 2-1. Effect of theme animacy in Spoken American and New Zealand English (based on Bresnan & Hay, 2008, p. 252).

The results of Bresnan and Hay (2008) demonstrate that the same set of probabilistic constraints influences ditransitive sentence preferences across dialects of the same language, but they also demonstrate that the weights of the individual constraints may differ across these different populations of speakers (see also Szmrecsanyi et al., 2017).

The studies by Bresnan and colleagues illustrate three important facts about ditransitive sentence preferences: First, they suggest that speakers' choice of ditransitive sentence type may be fruitfully analyzed as a choice that is governed by a set of probabilistic, interacting, weighted constraints. In the case of the English ditransitive alternation, these constraints include:

- a) the relative length of the recipient and theme
- b) whether the recipient and theme were animate
- c) whether the recipient and theme were definite
- d) whether the recipient and theme were pronominal
- e) whether the recipient and theme were given in the discourse (i.e. whether the recipient or theme had already been mentioned in the preceding linguistic context)

Second, the alignment of these constraints plays a significant role in predicting the occurrence of one ditransitive variant over another in corpus data (Bresnan et al., 2007) and in speakers' acceptability judgements (Bresnan, 2007); in fact, manipulating the value of just a single constraint (e.g. pronominality in Bresnan 2007) can significantly influence speakers' intuitions of well-formedness for a particular ditransitive sentence type. As we will see in the next section, manipulating the value of a single constraint may also make particular ditransitive sentence types significantly more difficult to process. In this case the constraint of interest is the givenness of the post verbal arguments. Finally, the results of the corpus study by Bresnan and Hay (2008) demonstrate that the same set of constraints may be active across dialects of the same language, but the weighting of the individual constraints may differ across populations of speakers.

### **2.2.2 The Givenness Constraint**

In the previous section, it was established that a speaker's choice of ditransitive sentence form is influenced by the set of interacting constraints listed in (a-e), among others. One of these constraints, the 'givenness constraint,' states that discourse given post-verbal constituents should come before non-given post-verbal constituents. I will use the term 'givenness constraint' descriptively to refer to the realization of the preference for given-before-new ordering in the processing and production of English ditransitive sentences. The term 'givenness' means, roughly, the assumption that the referent of a linguistic expression is known to the speaker/hearer (for example, because it has already been mentioned in the previous discourse), and as a result is highly

salient (or ‘active’) in the speaker/hearer’s discourse model (givenness will be discussed in more detail in section 2.3.1). According to the givenness constraint, ditransitive sentence types that cause new (or less given) constituents to be ordered before given constituents should be dispreferred. For example, in contexts in which the theme argument is given and the recipient argument is new (or less given), DO sentences should be dispreferred, since using a DO would result in recipient-theme, and thus new-given, constituent ordering. Consider the ditransitive sentences in (5-7):

(5)

PO

- |  |             |
|--|-------------|
| a. The student sent the photograph to a botanist | (given-new) |
| b. The student sent a photograph to the botanist | (new-given) |

(6)

DO

- |   |             |
|---|-------------|
| a. The student sent the botanist a photograph   | (given-new) |
| b. ??The student sent a botanist the photograph | (new-given) |

(7)

HNPS

- |  |             |
|--|-------------|
| a. The student sent to the botanist a photograph   | (given-new) |
| b. ??The student sent to the botanist a photograph | (new-given) |

Interestingly, the PO sentences in (5ab) are typically judged to be equally acceptable, despite sentences like (5b) having new-given constituent ordering. In the PO sentence in (5b), the referent of the first post-verbal argument (*a photograph*), is new. In other words, it is not assumed to be identifiable or familiar to the hearer because it has not yet been mentioned in the discourse. This is signaled by the use of the indefinite article, *a*, in the referent-denoting constituent. The referent of the second post-verbal argument (*the botanist*), is given, which is signaled by the use of definite article, *the*, in the referent-denoting constituent. The post-verbal arguments can be said to be in

‘given-new’ constituent order in (5a), as the first argument is more given/accessible compared to the second argument. The post-verbal arguments in (5b) can be said to be in ‘new-given’ constituent order, since the first argument is less given/accessible compared to the second argument. The DO and HNPS sentences in (6ab) and (7ab) likewise show the post-verbal arguments in given-new and new-given order, but, unlike the PO sentences, (6b) and (7b) are typically judged to be significantly less accessible compared to (6a) and (7a). One possible interpretation of these judgments is that the givenness constraint is weighted more heavily for DO and HNPS sentences compared to PO sentences, or that the givenness constraint is overridden for PO sentences by some property that is not shared with DO and HNPS sentences.

Regardless of interpretation, the contrast shown in (6) and (7) has been found in both language processing and language production, and has generally been attributed to the relative accessibility/givenness of the post-verbal arguments (Arnold et al., 2000; Givón, 1984; Goldberg, 1995, 2006; Kuperman & Bresnan, 2012; Polinsky, 1998; Thompson, 1990, among others). For example, Brown, Savova, and Gibson (2012) conducted a self-paced reading experiment in which the givenness of the post-verbal arguments was manipulated for both DOs and POs. Participants read a one-sentence context in which the givenness of either the theme or the recipient was manipulated. Givenness was marked by both the prior mention of the referent and the definiteness of the constituent. Participants then read a test sentence which contained either a DO or a PO. (8) shows an example token set.

(8)

THEME Context: An understudy for a new Broadway show kept a notebook to document the show’s progress.

- a. The understudy showed the notebook to a violinist as he explained his ideas (PO, given-new)
- b. The understudy showed a violinist the notebook as he explained his ideas (DO, new-given)

RECIPIENT Context: An understudy for a new Broadway show began conversing with a violinist who played in the orchestra.

- c. The understudy showed a notebook to the violinist as he explained his ideas (PO, new-given)
- d. The understudy showed the violinist a notebook as he explained his ideas (DO, given-new)

Each token set in the experiment contained two contexts. In (8), the theme context mentions *a notebook*, establishing its referent as discourse given. The test sentence in (8a) contains a PO with *the notebook* as the theme. As a result, the given theme argument, *the notebook*, comes before the new recipient argument, *a violinist*. The test sentence in (8b) contains a DO, and so the order of the given-new constituents is reversed: the new recipient argument, *a violinist*, precedes the given theme argument, *the notebook*. The experiment controlled for effects of manipulating the recipient and the theme by also including a recipient context in which the givenness of the recipient argument is manipulated in the context sentence. This results in the PO having new-given constituent order in test sentence (8c) and the DO having a given-new constituent order in (8d). The study design allowed the factors sentence type, thematic role, and givenness to be fully crossed.

Findings from the self-paced reading task provide evidence for the influence of the givenness constraint in sentence processing. The results indicated that, while DO sentences were read more slowly than PO sentences overall, there was a greater slow-down in DO sentences that had a new-given constituent order compared to PO sentences with a new-given constituent order. In fact, PO sentences were read marginally faster when the new argument preceded the given argument. Based on these results, the authors conclude that the DO is more sensitive to the givenness of its arguments, showing a strong dispreference for the new-given order. There were no significant differences between the given-new and new-given orders in the PO sentences. “This interaction” says Brown et al. (2012) “suggests that syntactic and information structures are



represented together in one structure” (p. 723). The authors conclude that the frequently cited given-before-new ordering principle is operative at the level of individual constructions.

The results of Brown et al. (2012) replicate those from a similar study by Clifton and Frazier (2004), who found the same dispreference for new-given ordering in DO sentences. Clifton and Frazier’s (2004) study investigating the effects of the givenness constraint on PO and DO sentences, but also included HNPS sentences. Clifton and Frazier used a manipulation similar to the one in (8) in a speeded acceptability judgement task. The results of this experiment showed the same pattern found by Brown et al. (2012): new-given constituent order was dispreferred in DOs, but there was no difference in response time for POs. These results again suggest that the givenness constraint exerts more influence on DOs compared to POs.

Clifton and Frazier (2004) also conducted a follow-up experiment that investigated the effects of the givenness constraint on HNPS sentences and DO sentences. Using a self-paced reading task, the authors examined the differences in whole-sentence reading times between the sets of sentences shown in (9):

(9)

DO Sentences:

- |   |               |
|---|---------------|
| a. The homeowners threw <u>the detective a key to the apartment</u>   | (given new)   |
| b. The homeowners threw <u>a detective the key to the apartment</u>   | (new-given)   |
| c. The homeowners threw <u>the detective the key to the apartment</u> | (given-given) |
| d. The homeowners threw <u>a detective a key to the apartment</u>     | (new-new)     |

HNPS Sentences:

- |  |               |
|--|---------------|
| e. The pitcher threw to <u>the umpire a badly damaged baseball</u>   | (given-new)   |
| f. The pitcher threw to <u>an umpire the badly damaged baseball</u>  | (new-given)   |
| g. The pitcher threw to <u>the umpire the badly damaged baseball</u> | (given-given) |
| h. The pitcher threw to <u>an umpire a badly damaged baseball</u>    | (new-new)     |

Results of the self-paced reading task showed that DOs with new-given constituent ordering were read significantly more slowly than those with given-new ordering, consistent with the results of

the speeded grammaticality judgment task. The same pattern of results was observed for HNPS sentences: HNPS sentences with new-given ordering were read significantly more slowly than those with given-new ordering, suggesting that HNPS sentences have a similar dispreference for new-given constituent order. These results again indicate that the effects of the givenness constraint are construction-specific in the sense that its effects on PO sentences differ from those on DO and HNPS sentences.

The experiments conducted by Brown et al. (2012) and Clifton and Frazier (2004) point to two general conclusions regarding the effect of the givenness constraint on speakers' ditransitive sentence preferences. First, the givenness constraint does not seem to affect all ditransitive sentence types uniformly. It does not seem to be the case that the presence of a given recipient argument will reliably prompt speakers to prefer a DO, while the presence of a given theme argument will reliably prompt participants to prefer a PO, for example. Instead, the PO seems equally easy for speakers to process with either given-new or new-given constituent ordering, while the DO is significantly more difficult to process with new-given constituent ordering. Second, the givenness constraint seems to affect DO and HNPS sentences similarly, as both show a strong dispreference for the new-given order.

In summary, the givenness constraint plays a role in speakers' ditransitive sentence preferences. Specifically, the givenness constraint dictates that given-new constituent ordering is preferred over new-given constituent ordering. The givenness constraint seems to have a weaker effect on PO sentences compared to DO and HNPS sentences, since POs lack a strong dispreference for new-given constituent ordering. These effects can be found in acceptability judgments and reaction times for both DO and HNPS sentences (Clifton & Frazier, 2004), and in self-paced reading for DO sentences (Brown et al., 2012), though no self-paced reading study that

I am aware of has analyzed word-by-word reading times HNPS sentences. While the studies by Bresnan and colleagues established that the givenness constraint plays a role in predicting which type of ditransitive sentence was likely to occur in a particular context, the studies by Brown et al. (2012) Clifton and Frazier (2004) established that manipulating the givenness constraint has a significant effect on monolingual English speakers' ditransitive sentence preferences and the ease with which they process ditransitive sentences.

## **2.3 Theoretical Assumptions**

Section 2.2 introduced a constraint-based framework for studying speakers' English ditransitive sentence preferences, and it also introduced the givenness constraint, the constraint of interest for this study. Now that these topics have been introduced, Section 2.3 will discuss theoretical assumptions. Section 2.3 will be structured as follows: section 2.3.1 will discuss the model of givenness assumed in this study. Section 2.3.2 will then discuss assumptions regarding the representation of ditransitive sentences in speakers' grammatical knowledge.

### **2.3.1 Model of Givenness**

The givenness constraint significantly influences speakers' intuitions about which ditransitive sentence type is most appropriate in a particular context, as well as the ease with which they process certain ditransitive sentence types. So far, 'givenness' has been defined as follows: roughly, the referent of a syntactic constituent is 'given' if it is highly salient (or 'active') in the speaker/hearer's discourse model. While this concept may seem somewhat straightforward, there is considerable variety in the theoretical literature regarding the definition of 'givenness', the relationship between givenness and other information structure categories, and the relationship between givenness and grammatical knowledge. The purpose of this section is to sketch the theory

of information structure assumed by this study. Specifically, this section will (1) unpack the various components of ‘givenness’ that have been identified in the information structure literature; (2) justify the formal marking of givenness in the experimental materials in this study; (3) contextualize givenness in a larger theory of information structure, including explicating the relationship between givenness and topicality; (4) outline the relationship between the information structure category ‘given’ and the cognitive mechanisms that underlie it, such as memory and attention; and (5) discuss the information structure component of grammatical knowledge vis-à-vis other core components of grammatical knowledge.

Givenness is part of the component of grammatical knowledge referred to as ‘information structure’ or ‘information packaging’. The study of information structure is concerned with how the speaker’s intended message (proposition) is expressed. When speakers need to communicate using language, there are usually several sentence types (or constructions) that could be used to encode the message. The choice of sentence type/construction depends on “such factors as what the interlocutors expect each other to know beforehand, what has and what has not been already mentioned in the same discourse, and the like” (Leino, 2013 p. 331). A theory of information structure describes how these factors influence speakers’ syntactic choices. Such a theory must describe how “propositions as conceptual representations of states of affairs are paired with lexicogrammatical structures in accordance with the mental states of interlocutors” (Lambrecht, 1994 p. 5), and must therefore “deal simultaneously with formal and communicative aspects of language” (Lambrecht, 1994 p. 1). In other words, a theory of information structure should describe why, when presented with two or more sentence types that may express the same message, speakers choose one sentence type instead of another one in a particular linguistic and communicative context. One issue that theories of information structure strive to address is how

speakers use the syntactic structures available to them to form coherent discourses by efficiently connecting new information to what has already been said. In other words, how do speakers' sentence choices serve to connect given information to new information?

Approaches to studying information structure vary in how they deal with the concept of givenness. Some approaches address givenness directly by explicitly assuming information structure categories like 'given' and 'new', while others deal with givenness indirectly by assuming a distinction between 'topic' and 'focus' and treating givenness as a component of topicality (Arnold et al., 2013). The givenness constraint on English ditransitive sentences has been analyzed using both approaches. For example, the contrast has been called a 'topicality effect' in the typological literature on ditransitive alignment (Haspelmath, 2015; Malchukov et al., 2010) and in constructionist approaches (Goldberg, 1995, 2006; Polinsky, 1998; Van Valin, 2007). On the other hand, the contrast has been attributed to the distinction between given/new information in studies of language processing (Brown et al., 2012; Clifton & Frazier, 2004). The current study is concerned with language processing, so I will also frame the discussion in terms of the distinction between given and new information; however, there is a natural relationship between givenness and topicality, which will be discussed in more detail below.

### ***2.3.1.1 Discourse Givenness***

On givenness in its most general sense, Rochemont (2016) says that "in all its uses, givenness ties some linguistic property of an expression, its syntactic form or position or prosody, to the informational or cognitive status of its denotation as already present in the discourse model in some sense" (p. 41). This definition includes several components, each of which will be unpacked in turn. The literature on givenness can be roughly divided into two groups based on how givenness is conceptualized. First, there are those approaches that relate givenness to prosodic

marking and focus assignment (Kratzer & Selkirk, 2020; Rochemont, 2016). Second, there are those that relate givenness to the syntactic form or position of linguistic expressions (e.g. Birner, 2006; Birner & Ward, 2009; Prince, 1992; Ward & Birner, 2019). While these approaches have a great deal in common, they differ both in how they conceptualize givenness and in how they relate givenness to grammatical knowledge more generally (see in particular Kratzer & Selkirk, 2020, who analyze givenness as a bona fide syntactic feature). Since the former group is mainly concerned with givenness as it is concerned with the mapping between prosody and syntax, I will say little more about these approaches here (but see Rochemont, 2016, for an overview). I will focus instead on the approaches which are concerned with the relationship between givenness and syntactic form.

### ***2.3.1.2 Givenness in the Speaker/Hearer's Discourse Model.***

There are several ways in which (the referent of) a linguistic expression can be ‘already present’ in the speaker/hearer’s discourse model. Prince (1992) proposed that the givenness of a referent can be assessed from two perspectives: it can be given/new with regard to the knowledge assumed to be shared by the speaker/hearer, or it can be given/new with regard to the linguistic context established by the preceding discourse. Prince (1992) refers to the former possibility as ‘hearer given/new’ and the latter as ‘discourse given/new.’ For example, a speaker might say (10a) if they assume that the name of their brother is not known to the hearer (hearer-new), but they might say (10b) if the name of their brother is believed to be identifiable to the speaker/hearer, and thus part of the speaker/hearer’s shared knowledge (hearer-given).

(10)

- a. I’m going to see my brother on Thursday
- b. I’m going to see Matt on Thursday

Additionally, a referent may be given/new with regard to whether it has been evoked in the prior discourse. For example, *Matt* in (10b) would be discourse new if its referent had not been evoked in the preceding discourse, while still being hearer-given (identifiable to the speaker/hearer). Assessing givenness from these two perspectives results in four logically possible information statuses: discourse new/hearer new, discourse given/hearer given, discourse new/hearer given, and discourse given/hearer new, though discourse given/hearer new information is not attested, since entities that are mentioned in the discourse are necessarily known to the hearer. Prince (1992) also proposed an additional information status, inferable, where a referents' existence can be inferred from world knowledge and/or the prior mention of a related referent in the discourse. For example, in a sentence like *we snuck down to the kitchen and opened the refrigerator*, the use of the definite article to mark the expression *the refrigerator* as identifiable is felicitous because speaker and hearer can infer the existence of *refrigerator* based on their shared knowledge that kitchens typically have refrigerators. Prince's (1992) original framework has been further elaborated to account for phenomena that are sensitive to different types of inferences (Birner, 2006) and those that rely on the salience of open propositions in the discourse (Ward & Birner, 2019).

### ***2.3.1.3 Categorical vs. Relative Givenness***

Prince's (1992) framework provides a set of binary distinctions (hearer given/new, discourse given/new) that can be used to describe the givenness of a referent with regard to both prior linguistic context and the speaker/hearer's discourse model; however, whether the distinction between given and new information should be considered categorical or relative has been a matter of debate (Arnold, 2016; Arnold et al., 2013). Some approaches to information structure have assumed that the distinction between given/new (or topic/focus) is categorical. The core shared

feature of these approaches is that every utterance connects some new information to something that has already been mentioned in the discourse (Arnold et al., 2013). Once sentence information is categorized as either given or new, the speaker/hearer's discourse model can be updated appropriately.

Other approaches have conceptualized the distinction between given/new as a matter of degree. In these approaches, 'given' and 'new' are opposing ends on a continuum of salience/accessibility (Arnold et al., 2013). For example, we might imagine that each referent in a sentence could fall somewhere on a continuum ranging from 'highly given,' where the referent is present in the discourse model and highly accessible, to 'brand new,' where the referent is not present in the discourse model and is not very accessible. Such an approach seems necessary to account for word order variation (Arnold et al., 2013); for example, consider the short discourse in (11).

(11)

- a. A librarian received a novel for her birthday, but she already owned a copy of it.
- b. ?The librarian gave a student the novel because she had two copies of it.

Using a categorical approach, we might want to say that the subject of (11b), *the librarian*, is the given information, since *the librarian* seems to be who the sentence is about. We might then say that the predicate is the new information, since it tells us something new about *the librarian*, namely that she gave *the student* a book; however, we know that this cannot be the whole story, because the givenness constraint on ditransitive sentences says that the relative givenness of the post-verbal arguments matters for determining which ditransitive sentence type is preferred. In (11b) *the novel* is more given relative to *a student*, which makes a sentence like *the librarian gave the novel to a student* preferable to (11b). The most straightforward way to account for this fact is to adopt a gradient approach that considers the relative givenness (accessibility, salience) of each



argument. Under such an approach we might say that *the librarian* is the most salient/accessible (since it is given and is also the subject), followed by *the novel*, followed by *a student*, which is the least accessible because it has not been previously mentioned.

This account of categorical vs. gradient approaches to givenness is an oversimplification of the issue, but the key point is that the relative givenness of *the novel* and *a student* seems to create infelicity in (11b), which can be easily accounted for in a framework that allows sentences to have multiple given referents that vary in their degree of givenness. Most gradient approaches assume that the information structure category ‘given’ can be described in terms of cognitive notions such as salience and accessibility. The relationship between information structure categories and cognitive status will be described in more detail below.

#### **2.3.1.4 Formal Marking and Givenness.**

Once a referent enters the discourse model and becomes given information, how is its status reflected in the linguistic form of its referring expression? One answer to this question can be found in the Givenness Hierarchy proposed by Gundel et al. (1993). The premise of Gundel et al.’s (1993) theory, of which the Givenness Hierarchy is a component, is that “different determiners and pronominal forms conventionally signal different cognitive statuses... thereby enabling the addressee to restrict the set of possible referents” (p. 274-275). Gundel et al. (1993) propose six cognitive statuses that license six kinds of referring expressions. The cognitive statuses are arranged in an implicational scale such that each point entails the points to its right. The Givenness Hierarchy appears in Table 1. Each cognitive status licenses particular kinds of referring expressions in English, which are shown in the second row.

Table 1. The Givenness Hierarchy (Gundel et al., 1993).

High accessibility/activation/attention			Low accessibility/activation/attention		
<b>in focus</b>	<b>activated</b>	<b>familiar</b>	<b>uniquely identifiable</b>	<b>referential</b>	<b>type identifiable</b>
<i>it</i>	<i>that</i> <i>this</i> <i>this N</i>	<i>that N</i>	<i>the N</i>	indefinite <i>this N</i>	<i>a/an N</i>

Of particular interest in this study are the cognitive statuses ‘uniquely identifiable’ and ‘type identifiable,’ which allow the appropriate use of the definite article *the* and the indefinite article *a/an*, respectively. A referent is uniquely identifiable if the hearer “can identify the speaker’s intended referent on the basis of the nominal alone” (p. 277), as would be the case if the referent was accessible by virtue of being already present in the discourse model. In contrast, referents that are type identifiable require only that the hearer be able to identify the type that the nominal denotes without retrieving a particular referent from the discourse model.

The Givenness Hierarchy claims that the referent of a linguistic expression containing *the* is more given (i.e., more accessible) than the referent of a linguistic expression containing *a/an*. The difference in givenness between the referents of these two expressions can explain why givenness effects arise in DO and HNPS sentences when expressions containing *a/an* precede expressions containing *the*: sentences in which given arguments follow new arguments are dispreferred. The Givenness Hierarchy justifies the assumption that definite and indefinite articles conventionally signal a contrast in givenness, which is the basis for the experimental manipulation that will be used to signal givenness in this study.

### ***2.3.1.5 Givenness and Topicality.***

The givenness constraint results in DO and HNPS sentences being less acceptable/more difficult to process when a new recipient is followed by a given theme. In language production, there is a corresponding statistical tendency for the post-verbal arguments in DO sentences and HNPS sentences to occur in given-new constituent order: Using a corpus of four published novels, Thompson (1990) extracted 128 ditransitive sentences with alternating ditransitive verbs and analyzed their recipient arguments for various properties, including whether they were given (whether they were ‘Active,’ or “presumed to be in the addressee’s consciousness”, p. 245). The results showed that recipient arguments in DO sentences were active in 97% of cases and were never brand new (‘inactive’). Recipient arguments in PO sentences were active in 65% of cases, ‘semi-active’ in 31% of cases, and inactive in 4% of cases.

Thompson’s (1990) results show a statistical tendency for DO sentences to have given recipient arguments, but where does this tendency come from? Thompson (1990) considered givenness to be a component of topicality and argued that the tendency for recipient arguments to be given in DO sentences follows from their status as topical referents. Broadly speaking, a sentence topic is the entity that the sentence is about, which is typically assumed to be familiar to both speaker and hearer (Roberts, 2019). Thompson (1990) described a cluster of properties that prototypical topics have, and argued that a particular referent could be interpreted as a topic to the extent that it had the properties in the cluster. Thompson (1990) called this goodness fit a referent’s ‘topic worthiness:’

The term topic worthiness refers here to a cluster of properties which influence the information packaging of information in languages of the world, specifically the likelihood of a noun phrase being the topic of discussion. For English, this likelihood can be measured in terms of the typical properties of grammatical subjects... subjects have been shown to be overwhelmingly animate, pronominal, specific, definite, proper, short, and ‘given’, or ‘active’; these, then, will be taken here to be the properties defining topicworthiness” (Thompson, 1990, p. 241).

Some have claimed that topics have properties in addition to those proposed by Thompson (1990), for example, a presupposition of existence at the time of the utterance (Goldberg, 2006; Polinsky, 1998). Givenness in these accounts is a component of topic worthiness, so the likelihood of a referent's givenness follows from its status as a topic (though not all given referents are topics, and not all topics are given).

Like givenness, some have claimed that topicality is a relative property, where each referent in a sentence falls somewhere on a spectrum from 'topical' to 'focal' (e.g. Polinsky, 1998). This kind of framework accommodates the observation that sentences can have topical referents other than the primary sentence topic (which is usually the subject). In both categorical and relative accounts, these referents have been referred to as secondary topics (Givón, 1984; Goldberg, 2006; Polinsky, 1998). Givón (1984) proposed that the referent of the recipient argument in a DO sentence was a secondary topic, a proposal that was elaborated on by Polinsky (1998). Polinsky (1998) claimed that the preferred ordering of constituents in English DO sentences was to have more topical arguments on the left and more focal arguments on the right. According to Polinsky (1998), the subject and recipient referents in a DO sentence are both under the pragmatic presupposition of existence at the time of the utterance, meaning that they both have topical properties. The presupposition of existence is stronger for the subject compared to the recipient, meaning that the subject is more topical, and is labelled as the primary topic, while the recipient is less topical, and is labelled as the secondary topic. In contrast, the theme is not under the presupposition of existence at the time of the utterance and is typically in focus. An analysis where the recipient position in a DO sentence is reserved for a secondary topic can explain the effects of the givenness constraint in DO sentences: a new (indefinite) recipient followed by a given (definite)

theme creates a mismatch between the formal properties of the arguments and the information structure categories associated with their linear positions, leading to infelicity.

Goldberg (2006) argues that the recipient position in English DO sentences is indeed specified for a secondary topic, and further argues that the recipient position in PO sentences is not specified for a secondary topic. According to Goldberg (2006), evidence for this claim can be found in the behavior of the two sentence types regarding simple negation. DO recipients are not understood to be negated by simple negation in sentences without contrastive stress, while this is not the case for PO recipients.

(12)

- |                            |    |
|----------------------------|----|
| a. She gave her a ball     | DO |
| ??No, him                  |    |
| b. She gave a ball to her. | PO |
| No, (to) him.              |    |
- (Goldberg, 2006, p. 140)

In (12a), the recipient (*her*) cannot felicitously be the target of simple negation (absent contrastive stress), while the same is not true of the recipient in (12b). According to Goldberg (2006), this is because the PO recipient in (12b) is within the ‘focus domain’. As a secondary topic, the recipient in (12a) cannot be in the focus domain, and thus cannot be the target of simple negation.

Goldberg (2006) analyzes the mapping between linear position, semantic role and topicality as a construction-specific property, part of the learned pairing of form and meaning that makes up English speaker’s mental representations of DO and PO constructions. The mappings between linear position, semantic role and topicality in Goldberg’s (2006) analysis are schematized in Table 2.

Table 2. Topicality of DO and PO arguments (Goldberg, 2006, p. 140).

DO	<i>she</i> subject agent topic	<i>gave</i> verb	<i>her</i> object 1 recipient secondary topic	<i>a ball</i> object 2 theme new/accessable
PO	<i>she</i> subject agent topic	<i>gave</i> verb	<i>a ball</i> object theme	<i>to her</i> PP recipient

Goldberg's (2006) account has appeal because it explains why the givenness constraint exerts more influence on DO sentences compared to PO sentences: the argument in the recipient position in DO sentences is statistically more likely to be given because it is typically a secondary topic. There is a dispreference in acceptability/processing for new recipients because topics are not typically new information. On the other hand, recipients in PO sentences are not secondary topics, so no dispreference for new recipients is predicted.

In summary, the effects associated with the givenness constraint on English ditransitive sentences have also been accounted for using the topic/focus distinction. In these accounts, givenness is one of several features common to prototypical topics, so it follows that referents that are topical are also typically given. Topicality can be thought of as a spectrum from topical to focal, and referents that are not focal but are less topical than the primary topic are sometimes labelled secondary topics. It has been argued that the recipient argument in DO sentences is a secondary topic, while the recipient in PO sentences is not. If the recipient argument in DO sentences is a secondary topic, it follows that its referent will typically be given, which explains the strong statistical tendency for DO sentences to have given recipients in corpora, and the corresponding dispreference for new recipients found in processing/acceptability judgements.

### 2.3.1.6 Givenness and Cognitive Status.

According to Rochemont's (2016) definition, givenness primarily concerns the cognitive status of a referent in the speaker/hearer's discourse model; however, a referent's status as given is not the same as its cognitive status. That is, givenness is not itself thought to be a cognitive status. Gundel et al. (1993) describe the distinction between givenness and cognitive status as follows:

Researchers have not always distinguished the statuses themselves (e.g., whether or not an addressee already has a mental representation of a referent and whether attention is focused on the referent) from the means by which a referent acquires a particular status (e.g. whether it has been linguistically introduced, whether it is part of general cultural knowledge, and so on). (p. 275)

According to Gundel et al. (1993), givenness, and the means by which a referent becomes given, is not equivalent to the cognitive status of a referent in the speaker/hearer's discourse model.

Arnold (2016) addressed the question of whether information structure notions such as givenness or topicality are represented explicitly in the speaker/hearer's discourse model. According to Arnold (2016), there are two possibilities: information structure categories are either explicit representations or emergent representations. "An explicit representation," according to Arnold (2016), "would be one that marks information status *per se*" (p. 743). In other words, a discourse model where information structure categories are explicitly represented would assign referents explicitly encoded 'tags' that would mark them as 'given' or 'new,' treating givenness as a cognitive status in and of itself, independent of other cognitive mechanisms. Arnold (2016) pointed out that all frameworks that posit a set of information structure categories could claim explicit representation in this way, though most do not make any specific claims regarding the status of information structure categories as cognitive mechanisms. Since information structure phenomena are known to be sensitive to distinctions along several dimensions (e.g. given/new,

topic/focus, theme/rheme, etc.), Arnold (2016) argues that such models would need to explicitly encode all of these categories.

Arnold (2016) argues that a model where information structure categories are emergent is a preferable alternative. In an emergent model, information structure “does not require special representations” (p. 744); instead, an information structure category “would be an interpretation of existing memory or attentional mechanisms, for example, whereby information that is already in my memory is considered given, and information that I am attending to is considered focused” (p. 743). An emergent account claims that all of the cognitive architecture needed to account for the effects associated with information structure categories is present in domain general mechanisms, such as memory and attention. For example, information that is given is assumed to be relevant to the current discourse and present in working memory. Information that is highly activated in working memory is easily accessible (i.e. easier to retrieve from memory) and highly predictable, which we might refer to as ‘more given’ in terms of information structure. Topicality is also related to predictability, but it is additionally related to attention, since topical information is ‘what the discourse is about’ from the perspective of the speaker/hearer (Arnold, 2016). In summary, emergent models do not explicitly represent information structure categories; instead, information structure categories are merely labels that describe the cognitive status of a referent, which is represented in the discourse model via cognitive mechanisms such as memory and attention.

#### ***2.3.1.7 Model of Givenness.***

In summary, the current study assumes a model of givenness along the following lines: given information is that which is highly accessible in the speaker/hearer’s discourse model as a result of its prior mention in the preceding discourse or its salience in the discourse context.



Givenness is a gradient construct, meaning that referents of linguistic expressions can be more or less given relative to one another, and different degrees of givenness are conventionally marked by certain linguistic expressions (e.g. determiners in English) that are mapped to cutoff points along a spectrum of accessibility/salience (such as the Givenness Hierarchy). Givenness follows from topicality, as topics are prototypically given. In DO sentences in English, the statistical tendency for the recipient argument to be given (definite) follows from the tendency for the recipient position to contain a secondary topic. DO sentences with new (indefinite) recipients followed by given (definite) themes result in a mismatch between the form of the arguments and the information structure categories associated with their structural positions, leading to lower acceptability and more processing difficulty. The recipient arguments of PO sentences are not claimed to be secondary topics, so no givenness effects are predicted.

The mapping of linear positions in certain constructions to the information status of the referents which typically occupy those positions is a component of speakers' knowledge of information structure. Following Lambrecht (1994), I will assume that information structure comprises the 'third component' of grammatical knowledge, along with syntax and semantics; that is, I will assume that information structure is situated in the competence grammar, though this assumption is somewhat immaterial to understanding the effect of the givenness constraint in language processing. The assumed positioning of information structure vis à vis syntax and semantics is in keeping with my theoretical approach to representing English ditransitive sentences, which will be discussed in the next section.

### **2.3.2 Representing Ditransitive Sentences**

Now that the ditransitive alternation and the givenness constraint have been discussed in some detail, I will briefly discuss my theoretical assumptions regarding the representation of

English ditransitive sentences in speakers' grammatical knowledge, and how those representations may be used to generate predictions regarding the influence of the givenness constraint on the processing of English ditransitive sentences. The goals of this section are to (1) briefly discuss the various theoretical approaches to representing English ditransitive sentences, and (2) justify my adoption of a constructionist approach for the purposes of this study.

The structure of English ditransitive sentences has been of considerable interest in theoretical linguistics. Many analyses of the syntactic structures associated with PO and DO sentences have been conducted within the framework and formalisms set forth by Noam Chomsky (Chomsky, 1965, 1981, 1995, *inter alia*), which Culicover and Jackendoff (2006) refer to collectively as mainstream generative grammar. Among the issues that have received significant attention in this framework are how the syntax of PO and DO sentences should be represented (e.g. Barss & Lasnik, 1986; Bowers, 1993; Larson, 1988; Marantz, 1993; Oehrle, 1976; Pesetsky, 1996) and the question of whether PO and DO sentences are transformationally related, in other words, whether one sentence type is derived from the other (e.g. Baker, 1988; den Dikken, 2006; Emonds, 1972; Harley, 2002; for an overview of these issues, see Citko et al., 2017).

These analyses have typically relied on acceptability judgements of well-studied syntactic phenomena as their primary data source. These phenomena form the premises for the classic constituency tests that constitute the theoretical linguist's argumentative toolkit. For example, analyses aiming to determine whether the English PO and DO constructions are derivationally related have appealed to acceptability judgements of phenomena such as passivization, scope relations, pronoun binding, *wh*-movement, relativization, and licensing of negative polarity items, among others (For an overview, see Polinsky, 1998). These tests indicate whether a particular position in the target sentence is subject to the grammatical constraint exploited by the test. The

outcome of the test is assumed to reveal the structural properties associated with the position being tested.

For instance, Barss and Lasnik (1986) argue against the ternary-branching, ‘flat’ DO structures proposed in early analyses (e.g. Oehrle, 1976) using the outcomes from classic diagnostics for c-command. For example, the sentences in (13) concern anaphora binding, one such c-command diagnostic.

(13)

a. I sent Mary<sub>i</sub> a picture of herself<sub>i</sub>

b. \*I sent herself<sub>i</sub> a picture of Mary<sub>i</sub>

(Citko et al., 2017, p. 4)

The outcome of this test is different for (13a) compared to (13b). The DO sentence in (13a), where the antecedent *Mary* precedes the reflexive *herself*, is typically judged to be grammatical, while the DO sentence in (13b), where the reflexive *herself* precedes the antecedent *Mary*, is typically judged to be ungrammatical. The logic of this test runs as follows: According to Binding Principle A (Chomsky, 1981), an anaphor ( $\beta$ ) must be bound by (that is, co-indexed with and c-commanded by) its antecedent ( $\alpha$ ). Roughly,  $\alpha$  c-commands  $\beta$  if and only if  $\alpha$  and  $\beta$  do not c-command each other and the first branching node that dominates  $\alpha$  also dominates  $\beta$ . In (13a), the first branching node that dominates *Mary* ( $\alpha$ ) also dominates *herself* ( $\beta$ ), so  $\alpha$  c-commands  $\beta$ , which predicts that (13a) will be judged to be grammatical. In (13b), the first branching node that dominates *Mary* ( $\alpha$ ) does not dominate *herself* ( $\beta$ ), so  $\alpha$  does not c-command  $\beta$ , which predicts that (13b) will be judged to be ungrammatical. The results of this test, in conjunction with the results of other tests concerning phenomena like bound variables, negative polarity items, wh-movement, and so on, provide evidence against an analysis of DO structure where the two post-verbal arguments are sisters of the VP (as in Oehrle, 1976) (but see Culicover & Jackendoff, 2005). This argument was

later taken up and expanded upon by Larson (1988) and others, who argued for a hierarchical relationship between the two post-verbal objects.

Importantly, the syntactic tests used to support the structural analyses of Barss and Lasnik (1986), Larson (1988) and others do not make use of the givenness constraint. This is perhaps because the givenness constraint is a probabilistic constraint, meaning that it concerns which forms are *likely* to occur during language use, rather than which forms are *possible* according to speakers' grammatical knowledge. In Chomsky's view, the goal of syntactic theory is "to describe the knowledge, independent of (and logically prior to) any attempt to describe the role that this knowledge plays in the production, understanding, or judgment of language" (Schütze, 1996, p. 20). In this view, the task of explaining the effects of factors like information structure on sentence form is best left to theories of language processing and language production. In keeping with this perspective, syntactic analyses of PO and DO structure within mainstream generative grammar have not proposed structural explanations for the effects of the givenness constraint. While there are generative accounts that incorporate functional projections corresponding to information structure categories like topic and focus (e.g. Cinque & Rizzi, 2008; Rizzi, 1997, 2004), they are mainly concerned with phenomena that target the left periphery, such as topicalization, focus movement, extraposition, and the like. I know of no mainstream generative approach which provides a structural explanation for discourse-related phenomena that target positions within vP, which would seem to be necessary to explain the effects of the givenness constraint shown in (5-7).

That is not to say that structural analyses of English ditransitive sentences within mainstream generative grammar are incompatible with or irrelevant to the effects of the givenness constraint. Generally speaking, theorists within mainstream generative grammar assume a high

degree of isomorphism between syntax and semantics/information structure; in other words, syntax is assumed to be in close alignment with semantics and information structure (Francis, 2022). This assumption means that, in principle, the effects of the givenness constraint could be hypothesized to ‘fall out’ from proposed structural differences between PO and DO sentences (e.g. Harley, 2002; Ramchand, 2008). If PO and DO sentences are structurally distinct at some level of representation, a theory of information structure that maps those distinctions to different information structure categories could be developed. The contrast in acceptability associated with the givenness constraint could then be explained as a side effect of the processing/production mechanisms having to deal with sub-optimal information structure-syntax mappings, in this case DO/HNPS sentences with new-given constituent order.

For example, Ramchand (2008) argues that PO and DO sentences differ in their event structure representations, citing evidence from the interpretive restrictions on depictive sentences (see Ramchand, 2008, p. 104). Under Ramchand’s analysis, the first post-verbal argument in PO sentences is assigned a composite semantic role: ‘resultee’ plus ‘undergoer’. In contrast, the first post-verbal argument in DO sentences is only assigned only a single semantic role, that of the ‘resultee’. These role assignments are proposed to account for the interpretive asymmetries associated with PO and DO sentences. A theory of information structure could be developed to map different information structure categories to these semantic roles. It seems natural to assume that constituents bearing these semantic roles will occur in different discourse contexts during language use. Specifically, one might hypothesize that the first post-verbal argument in PO sentences will occur in a wider variety of discourse contexts compared to the same argument in DO sentences, since it must be compatible with both the discourse contexts associated with ‘resultee’ arguments and the ones associated with ‘undergoer’ arguments.

Evidence supporting this hypothesis could be found by analyzing the discourse contexts in which arguments with composite semantic roles occur and comparing those contexts to those in which single-role arguments are found. In the study of word order alternations, it is widely accepted that canonical word orders are compatible with a wider range of discourse contexts compared to non-canonical word orders (Ward & Birner, 2019). Likewise, for argument structure alternations, we might predict that arguments with composite semantic roles will occur more frequently in canonical argument structure configurations (e.g. active sentences, PO sentences) than in non-canonical argument structure configurations (e.g. passive sentences, DO sentences). Arguments with composite semantic roles may additionally be subject to weaker information structure constraints, since they must be compatible with a larger set of discourse contexts. As we saw in section 2.2.2, this is in fact the case for the first post-verbal argument in PO sentences, which is subject to weaker givenness effects compared to the first-post verbal argument in DO sentences.

While this type of syntax-to-information structure mapping account seems compatible with the syntactic representations of mainstream generative grammar, I do not know of any account that describes such a proposal in detail. Given that there is no account that offers a satisfactory structural explanation for the effects of the givenness constraint, I will take the position that structural representations of English ditransitive sentences within mainstream generative grammar are fairly uninformative when it comes to predicting the effects of the givenness constraint in language processing. In my view this is simply because the theoretical purview of mainstream generative grammar places little emphasis on developing structural accounts of phenomena that can be plausibly attributed to constraints on language processing or production. In any case, I will assume that the underlying structures of these sentence types in a generative sense have little

relevance to analyses of the effects of the givenness constraint in language processing and production, and so I will set aside the issue of how to best represent the syntax of English ditransitive sentences from a generative perspective.

Since the givenness constraint is the focus of this study, it would be prudent to adopt a theoretical account of ditransitive sentences that incorporates it. Such an account allows for predictions about how the givenness constraint might influence speakers' preferences for the three types of ditransitive sentences in language processing and production. To this end, I will adopt a constructional approach (Goldberg, 1995, 2006, 2019 *inter alia*) to representing English ditransitive sentences. In constructional approaches, the basic units of linguistic knowledge are constructions, which are "learned pairings of form with semantic or discourse function" (Goldberg, 2006, p. 5). Examples of constructions include morphemes, words, idioms with open slots (e.g. *give X the creeps*), and abstract phrasal patterns, such as argument structure configurations. Under a constructionist account, English ditransitive sentences are analyzed as pairings between a ditransitive verb and a ditransitive argument structure construction (PO, DO, or HNPS).

Crucially for this study, representations of argument structure constructions include information about the information structure contexts in which the constructions typically occur. For English ditransitive constructions, this includes information about the positions in the construction that are subject to the givenness constraint. I will assume Goldberg's (2006) analysis of PO and DO argument structure constructions, which was introduced in section 2.3.1.5. Under this analysis, the first post-verbal argument position in DO sentences is associated with the secondary topic. Since topics are prototypically given (Thompson, 1990), it follows that DO sentences with a new argument in the first post-verbal argument position will be less acceptable/more difficult to process. In PO sentences, the first post-verbal argument position is not

reserved for a secondary topic, so weaker effects of the givenness constraint for arguments in this position are expected, meaning that PO sentences with new-given and given-new constituent order will be similarly acceptable/easy to process.

Goldberg (2006) does not provide a similar analysis for HNPS; however, there is evidence to support the claim that HNPS sentences and DO sentences occur in similar discourse contexts and are therefore subject to similar information structure constraints. As we have seen, DO and HNPS sentences are both dispreferred when the referent of the first post-verbal argument is new/less accessible, which suggests that both sentences serve to allow a comparatively given recipient argument to occur before a comparatively new theme (Arnold et al., 2000, among others). Goldberg (2011) also argues that DO and HNPS constructions share similar information structure properties by hypothesizing that when HNPS occurs with non-alternating verbs, it does so “when the information structure would otherwise suit the [DO]” (p. 20). In other words, when non-alternating verbs occur in an information structure context that favors ordering the recipient before the theme, HNPS functions as a stand-in for the unavailable DO construction. We might therefore say that DO and HNPS share the same information structural constraints; specifically, the first post-verbal argument position in both constructions is specified for a secondary topic.

Following Goldberg (2006, 2011), I will assume the constructional analysis of English ditransitive sentences shown Table 3.



Table 3. Topicality of DO, PO and HNPS arguments (based on Goldberg, 2006, p. 140).

DO	<i>she</i> subject agent topic	<i>gave</i> verb	<i>her</i> object 1 recipient secondary topic/given	<i>a ball</i> object 2 theme accessible/new
HNPS	<i>she</i> subject agent topic	<i>gave</i> verb	<i>to her</i> PP recipient secondary topic/given	<i>a ball</i> object theme accessible/new
PO	<i>she</i> subject agent topic	<i>gave</i> verb	<i>a ball</i> object theme	<i>to her</i> PP recipient

Under this analysis, the first post-verbal argument in DO and HNPS sentences is specified as a secondary topic. Since topics are prototypically given, this position is predicted to be subject to the givenness constraint. Specifically, this analysis predicts that DO and HNPS sentences with new-given constituent order will be less acceptable/more difficult to process compared to these same sentences with given-new constituent order. The first post-verbal argument position in PO sentences is not specified as a secondary topic. As a result, the givenness constraint is predicted to have a comparatively weaker effect on PO sentences, meaning that PO sentences should be similarly acceptable/similarly easy to process in given-new and new-given constituent order.

If DO and HNPS sentences have similar information structure constraints and serve a similar communicative function, it is natural to ask why both sentence types occur in the language. Word order/argument structure alternations seem to occur when the variants each serve a distinct communicative purpose. Leino (2013) describes the state of affairs by analogy with ecology:

biology and ecology speak of *ecological niches*. Those species survive which have a ‘suitable slot’ in the ecosystem: sufficient nutrition, not too many enemies, and so on. Similarly, linguistics could (and sometimes does) speak of *grammatical niches*. Those expression types survive... which have a slot in the language system:

sufficient expressive need, not too many competing expression types, and so on. (p. 333, emphasis original)

This poses a problem for an account where DO and HNPS sentences share the same information structure constraints. If DO and HNPS sentences occupy the same grammatical niche, as their information structure constraints seem to suggest, then why should English allow the unusual HNPS construction when the DO construction is more conventional and serves the same purpose?

Goldberg (2011) analyzes the relationship between DO and HNPS sentences as an instance of statistical preemption. Statistical preemption has been proposed as a mechanism that constrains pairings of verbs and argument structure constructions, which helps speakers learn to avoid possible but unused formulations. The basic idea is that a verb is judged as less acceptable in construction A when it frequently occurs in construction B with an equivalent meaning. For example, consider the two sentences in (14):

- (14)  
a. ??explain me this  
b. explain this to me  
(Goldberg, 2019)

In (14), the verb *explain* is judged as less acceptable in construction A, *explain me this*, because it is frequently witnessed in construction B, *explain this to me*, which is used to communicate the same message. The use of *explain* in B preempts the use of *explain* in A, rendering A unacceptable. Further, the strength of preemption increases with the probability of construction B occurring in a context where construction A might be expected.

DO and HNPS sentences have similar meanings, similar information structure constraints, and a similar communicative function, creating the conditions for statistical preemption. Goldberg (2011) gives an account where HNPS has been preempted by the DO construction for alternating

ditransitive verbs. In other words, the use of an alternating verb in the DO construction preempts its use in the HNPS construction, rendering the use of HNPS unacceptable. Goldberg (2011) supports this account using corpus data: in the Corpus of Contemporary American English (COCA), HNPS occurs infrequently with alternating verbs like *tell* (which frequently occur in both DO and PO sentences) compared to non-alternating verbs, like *explain* (which are heavily biased to occur in PO sentences). Goldberg (2011) found 106 tokens of HNPS containing the verb *explain*, while only 2 tokens of HNPS contained the verb *tell*; in other words, *explain* occurs in HNPS sentences 50 times more often than *tell* does. This is despite the fact that *tell* occurs more frequently overall (166,627 tokens) compared to *explain* (31,886).

If Goldberg's (2011) account is correct, it could explain why DO and HNPS are both allowed in English despite having the same information structure constraints. The 'grammatical niches' occupied by HNPS and DO constructions are differentiated based on the ditransitive verbs that these constructions are paired with: alternating vs. non-alternating. Ditransitive verbs that are allowed to alternate could in principle occur in HNPS sentences, but this is infrequent because a more conventional option that serves the same purpose, the DO construction, is available. Non-alternating verbs do not occur in DO sentences, so for these verbs, the HNPS construction is used in contexts where the recipient argument is significantly more given than the theme argument, thereby allowing the givenness constraint to be respected. Based on this account, we might predict that HNPS sentences will be more acceptable with non-alternating verbs compared to alternating verbs. If the strength of preemption varies according to the probability that a verb will occur in Construction B in a context where Construction A might be expected, we would also predict that preemption effects will vary in strength in accordance with the verb's bias toward occurring in PO sentences, even among verbs traditionally classified as alternating. These hypotheses could be

tested in future research; for now, I will adopt the statistical preemption account of HNPS as a plausible explanation for why DO and HNPS sentences may both exist despite being subject to the same information structure constraints.

In summary, this section has reviewed two approaches to representing English ditransitive sentences in speakers' grammatical knowledge. While the structural analysis of English ditransitive sentence has received considerable interest in mainstream generative grammar, no generative accounts that I am aware of have proposed a structural distinction to account for the effects of the givenness constraint. As a result, I assume a constructional analysis of English ditransitive sentences, which includes the information structure constraints for each sentence type as part of their grammatical representation. Specifically, I assume that the first post-verbal constituent in DO and HNPS constructions is topical, which implies that it is statistically more likely to be given in the discourse. As a result, DO and HNPS sentences are predicted to show effects of the givenness constraint in language processing such that sentences with new-given constituent order will be significantly dispreferred compared to sentences with given-new constituent order. On the other hand, PO sentences are not specified for a secondary topic, and so there is no corresponding statistical tendency for the first post-verbal argument to be given. As a result, PO sentences will be subject to weaker givenness effects compared to DO and HNPS sentences.

Whether information structure constraints are considered to be part of the competence grammar, as assumed here, or considered to be constraints on the language processing system, it is clear that the givenness constraint plays a role in the processing of ditransitive sentences. The main focus of this study is the on the effect of the givenness constraint in language processing across populations, so the study can be understood regardless of one's theoretical perspective

regarding the status of information structure. Now that the theoretical assumptions have been addressed, the next section will turn to the main area of interest for this study: the effects of the givenness constraint in the grammar of late bilingual/second language (L2) speakers of English.

## **2.4 The Current study: The Givenness Constraint in Bilingual/L2 English**

In section 2.2.1, it was established that the same set of probabilistic constraints influences ditransitive sentence preferences across varieties of the same language, but the weights of the individual constraints may differ across different populations of speakers. This section examines another example of a constraint the weight for which may differ across populations of speakers: the givenness constraint in the grammar of late bilingual/second language (L2) speakers of English. By ‘late bilingual speakers,’ I mean speakers who began learning English as children (before the onset of puberty), but only after they began learning their first (or dominant) language(s). By ‘second language (L2) speakers’ I mean speakers who began learning English as adolescents or adults, after the onset of puberty. For now, the term ‘late bilingual/L2 speakers’ will be used to refer collectively to both of these groups.

Previous research in bilingualism suggests that the weighting of the givenness constraint in the English of late bilingual speakers/L2 speakers differs from the weighting of the givenness constraint in the English of monolingual English speakers. This difference can be subject to two types of explanations. One explanation positions similarity between English ditransitive sentences and ditransitive sentences available in the dominant language/L1 as the most influential factor in determining the effects of the givenness constraint on language processing and language production. The second explanation positions the varying frequency with which the three English ditransitive options occur in the language input that bilingual/L2 speakers are exposed as the most influential factor in determining the effects of the givenness constraint on language processing and

language production. This section will first review the evidence for the claim that the effects of the givenness constraint differ between the English spoken by monolingual English speakers and bilingual/L2 English speakers. Potential explanations for this difference will then be considered. Finally, additional factors that could influence the magnitude of the givenness effects observed in language processing by these groups will be considered.

The English ditransitive alternation has been of considerable interest in bilingualism/second language acquisition research (Agirre, 2015; Cuervo, 2007; Hawkins, 1987; Oh, 2010; H. Park & Zhang, 2002; Perpiñán & Montrul, 2006; Tanaka, 1987; Zara et al., 2013). Several studies have specifically investigated how the givenness constraint influences the ditransitive sentence preferences of late bilingual speakers/L2 speakers (Callies & Szczesniak, 2008; Chang, 2004; Marefat, 2005; K.-S. Park, 2014, 2011; Tanaka, 1987). Generally speaking, the results these studies suggest that the givenness constraint does not exert the same level of influence on the sentence preferences of late bilingual speakers/L2 speakers as it does on the preferences of monolingual English speakers. Specifically, previous studies have shown that late bilingual speakers/L2 speakers have a general preference for PO sentences, and either (1) show little sensitivity to the givenness constraint (Chang, 2004; Marefat, 2005), or (2) show a preference for given-new order at high proficiency levels, in addition to a general preference for PO sentences (K.-S. Park, 2014, 2011).

In a recent study, Park (2014, 2011) investigated L1 Korean/L2 English speakers' sensitivity to the givenness constraint on PO and DO sentences using a contextualized forced choice task. Thirty adult L2 speakers and 20 'native' English-speaking adults heard a series of items in which a context paragraph was read aloud by a narrator. They then heard two more sentences (one PO sentence, one DO sentence) read aloud by two additional characters and were

asked to decide which sentence they preferred as a continuation of the narrative by answering the question “which one is the better way to say it?”. For example:

(15)

John liked **his English teacher**. He liked **her** voice and the way **she** explained everything to him. **She** helped him have a good time in **her** class so he never got bored. **She** was always kind and nice to him. So when **she** left for another school, he was very sad. He missed **her** very much.

- |  |                |
|--|----------------|
| (a) John sent some letters to the teacher. | PO (New-given) |
| (b) John sent the teacher some letters.    | DO (Given-new) |

(K.-S. Park, 2014, p. 126)

The independent variable manipulated in the experiment was constituent order (new-given, given-new), and the dependent variable was sentence type chosen as a proportion of the total number of choices. Givenness was manipulated by establishing either the theme argument or the recipient argument as given in the context (e.g. *the teacher* in (15)). This resulted in one test sentence per trial having new-given information order (e.g. 15a) and the other having given-new information order (e.g. 15b). The factors were fully crossed, meaning that both sentence types appeared equally in the new-given and given-new conditions across items. Participants completed two versions of this task: in the first version, the given argument in the test sentences was a definite lexical NP, as in (15). In the second version, the given argument was a pronoun (e.g. *John sent **her** some flowers/John sent some flowers to **her***).

In the lexical NP condition, L2 speakers preferred given-new PO sentences (chosen in 95% of trials) over new-given DO sentences (5% of trials), much like ‘native’ speakers (84% and 16%, respectively); however, L2 speakers also chose new-given PO sentences (72% of trials) over given-new DO sentences (28% of trials), in contrast with ‘native’ speakers (25% and 75% respectively). In other words, in the lexical NP condition, L2 speakers preferred PO sentences across the board, even in contexts where the information order might favor the DO. In the pronoun

condition, L2 speakers preferred PO sentences in the given-new order (100% of choices) over new-given DO sentences but showed no preference for either sentence type when choosing between given-new DOs (51% of trials) and new-given POs (49% of trials). ‘Native’ speakers showed a similar preference for given-new POs (99% of trials) over new-given DOs (1% of trials), but also overwhelmingly preferred given-new DOs (83% of trials) over new-given POs (17% of trials).

Based on the results, Park (2011) proposed an implicational scale characterizing L2 speakers’ sensitivity to the givenness constraint on PO and DO sentences. In the first stage, L2 speakers show a preference for given-new constituent order when the given argument is a theme, whether the theme is a pronoun or a lexical NP. Park speculates that the source of this initial preference for theme-first order in her study could be influence from Korean, since the canonical ditransitive sentence type in Korean corresponds to the English PO (K.-S. Park, 2011, p. 108). In the second stage, L2 speakers extend their preference for given-new order to given recipients, but only when given recipient argument is a pronoun. In the final stage, L2 speakers prefer given-new information order for all arguments regardless of semantic role, even when both arguments are lexical NPs.

This set of studies, exemplified by Park (2011, 2014), suggests that late bilingual/L2 speakers generally prefer PO sentences and show weaker sensitivity to the effects of the givenness constraint in their sentence preferences compared to other populations of English speakers. Within the framework assumed here, this finding can be interpreted as the givenness constraint playing a weaker role in the English varieties spoken by the late bilingual/L2 populations compared to the variety spoken by the English speaker population that served as the basis for comparison. This finding is generally amenable to two types of explanations. The first (and, as far as I can tell, most



common) type of explanation attributes the initial preference for PO sentences mainly to influence from the L1/dominant language (Marefat, 2005; Park, 2014, 2011). I will refer to this as the ‘L1 similarity’ explanation. The second type of explanation attributes the initial preference for PO sentences mainly to the salience of PO sentences in the language input, specifically the fact that POs are the more frequent and less contextually marked English ditransitive sentence type. I will refer to this explanation as the ‘input salience’ explanation.

It is worth tracing these two types of explanations back to their theoretical roots in order to understand why previous studies have tended to gravitate toward L1 transfer (also called cross-linguistic influenced) as the lens through which their results were interpreted. In my view, the L1 similarity explanation is aligned more closely with frameworks that predict strong, perhaps permanent, influence of the L1/dominant language on production and comprehension in the L2/non-dominant language (e.g. Schwartz & Sprouse, 1996, *inter alia*) at the highest levels of proficiency, as in studies of so called ‘ultimate attainment’. Particularly relevant are approaches that predict cross-linguistic influence when there is a structural similarity between L1 and L2 constructions at some level of representation, as in the Surface Overlap Hypothesis (Azaz, 2019; Döpke, 1998; Hulk & Müller, 2000; Müller, 1998; Yip & Matthews, 2000). The Surface Overlap Hypothesis applies in the following scenario: In Language A, one sentence type is available to express a particular message M, while in Language B, two sentence types are available to express M. The Surface Overlap Hypothesis predicts that when a speaker of Language A learns language B, the speaker will favor the sentence option in Language B which overlaps with the sentence option in Language A, and will disfavor the Language B option that does not overlap with language A.

For example, Hulk and Müller (2000) examined the effect of cross-linguistic influence on the occurrence of object drop in the speech of a French-Dutch bilingual child and a German-Italian bilingual child. In both cases, the language input may suggest to the bilingual child that object drop is licensed under the same conditions in both of their languages. In German and Dutch, object drop is licensed in the adult grammar when the object is topicalized, and there is evidence that monolingual Dutch-speaking and German-speaking children initially extend these conditions to include topical objects in canonical position. In French and Italian, the canonical object position can also be empty, but in these cases the object remains implicit or is replaced by a preverbal object clitic. In short, the input conditions may lead the bilingual child to (incorrectly) conclude that object drop is licensed by discourse constraints in all four languages, when in reality this is only the case in German and Dutch. The Surface Overlap Hypothesis predicts that the ample evidence for discourse-constrained object drop in German and Dutch, combined with the (apparent) evidence of a similar option in French and Italian, should result in increased use of object-drop in the Romance languages of the bilingual children. A longitudinal study of the two bilingual children indicated that this was in fact the case: use of object drop in the Romance languages increased for both bilingual children compared to their monolingual peers. While the Surface Overlap Hypothesis was originally meant to apply to language development in bilingual children, it has also been used to explain the characteristics of adult L2 grammars (e.g. Azaz, 2019).

On the other hand, the input salience explanation is generally more aligned with approaches (e.g. Usage-Based Approaches) that view the language input that speakers are exposed to as the dominant factor shaping the characteristics of highly proficient L2 grammars (e.g. Ellis et al., 2014; Goldberg, 2019; Robenalt & Goldberg, 2016; Tachihara & Goldberg, 2019). Under this explanation, late bilingual/L2 speakers will acquire the constraints on the usage conditions for a

particular sentence type in accordance with how frequently it occurs in the language input that they are exposed to. For abstract argument structure constructions, the argument is that learners are exposed to many instances of a construction, each of which leaves an impression, or ‘trace’, in memory. As traces accumulate, learners generalize over the individual encounters to extract the salient abstract properties of the construction. These properties can include information related to common verb/construction pairings, syntactic form, phonology, discourse context, and social context (Goldberg, 2019). This information forms the usage constraints on the construction. With each additional exposure, the representation is refined and becomes stronger, or more ‘entrenched’. The fine details of this approach are better discussed elsewhere (see Goldberg, 2019 for an overview), but the important point for the purposes of this study is that the quality and quantity of the linguistic input that learners are exposed to is considered to be the dominant factor shaping ‘ultimate attainment’; in cases where the L1/dominant language differs from the target language, influence from the L1/dominant language should be overcomeable given the proper amount and quality of linguistic input.

For example, Römer and Yilmaz (2019) examined verb-argument constructions (e.g. *V with N*, as in *I like to go with the flow*) in L2 English speaker corpus data. They then compared the verbs that learners tend to use in these constructions with the verbs that monolingual English speakers tend to use. The results showed that, in general, the most frequent verb-argument structure pairings were very similar between the monolingual English speaker data and the L2 English speaker data. For example, for the argument structure construction *V about N*, the two most frequent verbs used in the monolingual English speaker data were *talk* (e.g. *talk about it*) followed by *think* (*think about it*). For all three groups of L2 speakers in the study (L1 speakers of German, L1 speakers of Spanish, and L1 speakers of Turkish), the top two verbs paired with the *V about N*

construction were also *talk* and *think* (though not necessarily in that order). Based on these results, the authors conclude that L2 speakers are sensitive to the frequency with which certain verbs are paired with certain argument structure constructions in the English input that they are exposed to, highlighting the influence of statistical patterns from the language input on the development of L2 English grammars. The authors also found evidence of L1 influence: English verb-argument structure pairings that are uncommon in English but had a frequent equivalent in the L1 were common in the L2 English speaker data. For example, the verb-argument structure pairing equivalent to *mention about N* is frequent in Turkish, and *mention about N* was common in the English data from L1 Turkish speakers, despite it being infrequent in the English input.

The major difference between the L1 similarity explanation and the input salience explanation is the point of emphasis: the approaches that are aligned with the L1 similarity explanation consider L1 characteristics to be more important in some respect compared to language input characteristics, as in, for example, approaches where certain features of the L2 are considered to be unlearnable if they are not present (or if they have a different parameter setting) in the L1 (e.g. Tsimpli & Dimitrakopoulou, 2007). On the other hand, the approaches aligned with the input salience hypothesis typically assume that language is learned via domain-general cognitive mechanisms, as opposed to language-specific cognitive mechanisms, such as parameters (Chomsky & Lasnik, 1993 *inter alia*). By extension, these approaches typically assume that grammar can be learned solely on the basis of generalizations over statistical patterns in the language input.

Of course, both the L1 similarity explanation and input salience explanation have a place for the effects of both cross-linguistic influence and the effects of input quality. In some approaches that are more closely aligned with the L1 similarity explanation, language input plays a crucial

role in the process of ‘resetting’ certain linguistic parameters from the L1 setting to the L2 setting (e.g. Cuza et al., 2013). Likewise, approaches that are more closely aligned with the input salience hypothesis typically assume that L1 representations are so strongly entrenched that they can interfere with developing representations of similar constructions in the L2.

Studies of the givenness constraint in late bilingual/L2 ditransitive processing have attributed differences between late bilingual/L2 speakers and monolingual English speakers primarily to cross-linguistic influence, in line with the point of emphasis in L1 similarity explanations. For example, Park (2011, 2014) and Marefat (2005) speculate that their L2 speakers’ weaker sensitivity to the givenness constraint and their general preference for PO sentences could be due to cross-linguistic influence, since the equivalent of the PO construction is the ‘default’ option for ditransitive sentences in Korean (Park) and Persian (Marefat); however, the PO construction is also the most frequently used ditransitive construction in English, so in these cases it is impossible to tease apart potential transfer effects from effects based on statistical patterns in the language input. Additionally, no previous bilingualism study that I am aware of has investigated the effects of the givenness constraint on the processing of HNPS sentences. The corpus study by Callies and Szczesniak (2008) suggests that late bilingual/L2 speakers make use of the HNPS construction, but the relative importance of givenness in motivating these uses remains unclear. Additionally, it is unclear whether language background plays a role in motivating HNPS. As a low-frequency construction, it seems likely that language background could play a larger role in the use of HNPS compare to more frequent ditransitive constructions (see Hopp et al., 2018), but this hypothesis remains untested. To examine the effect of language background more directly, groups of bilingual speakers should be compared whose L1s differ in

the types of ditransitive sentences that are available, and the full range of English ditransitive options should be considered.

For example, consider two populations of English speakers: bilingual German/English speakers, and bilingual Spanish/English speakers. These two populations speak dominant languages/L1s in which different ditransitive sentence options are available. In German, the equivalents of the English PO, DO, and HNPS sentence types are all possible, as shown in (16).

(16)

a. *Oli verkaufte Peter das Buch* ('DO')  
 Oli sold Peter the book

b. *Oli verkaufte das Buch an Peter* ('PO')  
 Oli sold the book to Peter

c. *Oli verkaufte an Peter das Buch* ('HNPS')  
 Oli sold to Peter the book

'send a package to the client'

(Adler, 2011, p. 14, HNPS added)

Sentence (16a) shows the German DO equivalent, in which the recipient argument precedes the theme argument and both arguments are full NPs. (16b) shows the German PO equivalent, in which the theme precedes the recipient and the recipient argument is the complement of a prepositional phrase. These two variants resemble English PO and DO sentences, but they differ from the English options in their distribution. In English, *give*-type verbs, *send*-type verbs and *throw*-type verbs may occur in both PO and DO sentences with a caused possession interpretation (Rappaport Hovav & Levin, 2008); however, in German, *give*-class verbs may only occur in DO sentences (Adler, 2011). This difference in distribution illustrates that PO sentences in German,

while possible, occur with a smaller subset of ditransitive verbs compared to PO sentences in English. Further, according to Adler's (2011) classification, all verbs that can occur in PO sentences in German can also occur in DO sentences, but not the other way around.

German PO sentences also allow constituent order variation. While the theme-recipient order is the unmarked order for PO sentences, the order of the arguments can also be reversed, as in (16c). In (16c), the propositional phrase containing the recipient argument precedes the theme argument, resembling HNPS in English. Scrambling of the type in (16c) is constrained by many of the same factors that constrain the ditransitive alternation in English, including relative differences in "definiteness, animacy, focus and specificity" (Hopp, 2007 p. 93) between the two arguments.

Notice that there are a number of similarities between these constructions and their English counterparts: the German PO equivalent has theme-recipient ordering, while the DO and HNPS equivalents have recipient theme ordering. Additionally, in the PO and HNPS equivalents, the theme argument is an NP, while the recipient argument is the complement of a PP. Given that German allows ditransitive sentences that are formally equivalent to the three options available in English, and given that the use of one option over another is constrained by many of the same factors that constrain ditransitive sentence choice in English, it is reasonable to predict that German/English bilingual speakers will map the English ditransitive options more or less directly to the German ditransitive options, and as a result will demonstrate a similar sensitivity to the givenness constraint compared to monolingual English speakers, all other factors being equal.

Unlike German, it is not clear that Spanish has an equivalent to the English DO construction (Gonçalves, 2015). The sentence in (17a) is similar in form to the English PO construction in the

sense that the theme-denoting argument precedes the recipient-denoting argument, which is typically a prepositional phrase headed by *a* with a dative NP object.

(17)

- a. *Carmen envió el libro a su profesor* ('PO')  
Carmen sent the book to her professor
- b. *Carmen le envió el libro a su profesor* (CL doubled)  
Carmen CL (Dat.) sent the book to her professor
- c. *Carmen envió a su profesor el libro* ('HNPS')  
Carmen sent to her professor the book

'Carmen sent the book to her professor'

(Bleam, 2003, p. 233, 17c added)

(17b) shows an example of a 'clitic doubled' ditransitive, so called because the recipient argument is 'doubled' by the dative clitic *le* (Bleam, 2003). It has been argued that ditransitive sentences with clitic doubling are structurally comparable to the English DO at some level of representation (Bleam, 2003; Demonte, 1995); however, there is disagreement in the literature on this point. Bleam (2003) claims that Spanish ditransitive constructions without clitic doubling (17a) correspond to the English PO, while constructions with clitic doubling, as in (17b), are structurally the same as the English DO. A similar proposal is made by Demonte (1995) based on the behavior of clitic doubled ditransitive sentences regarding binding asymmetries; however, Perpiñán and Montrul (2006) argue against such an analysis and argue instead that the recipient is c-commanded by the theme at some level of representation according to their data from quantifier binding, suggesting that clitic doubled ditransitive sentences are structurally similar to PO constructions. Further, analyzing sentences like (17b) as true double object constructions seems to contradict conventional wisdom about the Romance language family, which is "typically assumed" to not have a structural equivalent to the English DO, according to Gonçalves (2015). The Spanish PO



construction also allows a word order variant where the prepositional phrase precedes the recipient “when informational structure is involved” (Gonçalves, 2015 p. 54), as shown in (17c). This construction is similar to English HNPS in the form and ordering of its post-verbal constituents.

For the purposes of this study, the structural similarities between Spanish ditransitive sentences and English ditransitive sentences only matter insofar as they might result in cross-linguistic influence. Comparing the English PO to the Spanish PO (17a) and the clitic doubling construction (17b), all three constructions allow post-verbal theme-recipient ordering, and the recipient is also the complement of a PP. Comparing the Spanish HNPS construction (17c) to the English HNPS construction, both variants allow the recipient argument to occur as the complement of a PP and feature recipient-theme ordering. I would therefore predict that Spanish-English bilingual speakers will map Spanish ditransitive constructions more closely to the English PO and HNPS constructions than to the English DO, and as a result, I would predict weaker givenness effects for English DOs in the ditransitive preferences of Spanish-English bilingual speakers. The basis for this prediction is the assumption, common in Surface Overlap analyses (e.g. Azaz, 2019), that the preference for the overlapping options (PO and HNPS, in this case) will lead to delayed acquisition of the contextual constraints on the non-overlapping option (the DO construction).

In summary, German and Spanish contain different sets of ditransitive sentence options. While German allows sentence types that are similar in form to the English PO, DO, and HNPS constructions, it is not clear that Spanish allows a sentence type that is straightforwardly similar to the English DO. While clitic doubling constructions have been argued to be underlyingly similar in structure to English DO constructions (Bleam, 2003; Demonte, 1995), these sentences appear to be superficially more similar to the English PO construction in terms of the order of the arguments and the form of the constituent containing the recipient. It could be reasonable to expect

that Spanish/English bilingual speakers will map Spanish ditransitive constructions more closely to the English PO (and HNPS) than the English DO. As a result, investigating the effects of the givenness constraint on the ditransitive sentence preferences of German/English bilingual speakers and Spanish/English bilingual speakers may allow potential effects of cross-linguistic influence to be detected.

While the precise effect of language background on the realization of the givenness constraint is unknown, it is also possible that apparent differences between English monolingual speakers and English bilingual speakers could be attributed to other factors. These factors include general English proficiency, amount of English exposure, frequency of English use, and task type, among others. These factors could plausibly play a role in the realization of the givenness constraint but it is unclear whether/how they interact with language background. For instance, while previous studies have considered potential effects of general English proficiency, proficiency has generally been assessed by proxy, through recruiting speakers from particular courses in an English language course sequence. Proficiency has also been assessed inconsistently by different researchers, making between-study comparisons difficult. For the effects of English exposure and English use, I know of no previous study on the givenness constraint that directly examined the effects of these variables; however, it is plausible that English exposure and use could play a role in the givenness constraint, since the influence of these factors on the three English ditransitive constructions is learnable from statistical patterns in the language input in principle.

Finally, the effect of the givenness constraint could vary in magnitude between different task types. By ‘task type,’ I mean the type of experimental task(s) used to assess the effect of the givenness constraint in a particular study. Previous studies have tended to favor forced-preference

style tasks, where speakers are presented with two types of ditransitive sentences and are asked to choose the one that they prefer (Marefat, 2005; K.-S. Park, 2014, 2011); however, there is some evidence that requiring participants to explicitly compare two sentence types may lead to different results than asking participants to assess a single sentence on its own without presenting an alternative. For example, several acceptability judgement studies on the use of resumptive pronouns in English (e.g. *Maria saw a guy at the meeting who she had met (\*him) once before*) found that resumptives were generally low in acceptability, even in island violating sentences (e.g. *which patient<sub>i</sub> did you report that the doctor who saw (her<sub>i</sub>) destroyed the file?*), where they were hypothesized to be marginally acceptable (e.g. Heestand et al., 2011; Polinsky et al., 2013); However, in a forced-choice experiment by Ackerman et al. (2018), monolingual English speakers consistently chose island-violating sentences with resumptives over island-violating sentences with gaps when given a choice between the two. This suggests that there may actually be a subtle advantage for sentences with resumptives in island violating contexts. We might similarly expect that bilingual speakers could show a sensitivity to givenness when comparing two sentences head-to-head, even if they are not sensitive to givenness in tasks where sentences are presented individually.

An additional issue regarding task type involves the increased cognitive demands placed on bilingual speakers during online (real time) language processing. For example, the Reduced Ability to Generate Expectations (RAGE) hypothesis (Grüter et al., 2014; Grüter & Rohde, 2013; Kaan & Grüter, forthcoming) proposes that L2 processing is characterized by a reduced ability to predict upcoming input based on input that has already been processed. Under this hypothesis, the language processing architecture consists of two processes: integration and anticipation. During integration, a reactive process, new input is integrated into the representation as it is encountered,

and the representation is developed incrementally. Anticipation, a proactive process, predicts upcoming input based on the input that has already been encountered and integrated into the representation. The RAGE Hypothesis predicts that L2 speakers have a reduced ability to anticipate upcoming input based on input that has already been integrated. Goldberg (2019) incorporates the RAGE hypothesis into her account of how L2 speakers develop constructional representations by arguing that reduced ability to generate expectations about upcoming material hinders the ability of L2 speakers to take advantage of error-driven learning. While L1 speakers can fine-tune their knowledge of language by learning from instances where their expectations do not match the input encountered, L2 learners cannot do so because their expectations about the upcoming input are reduced.

Indeed, more generally, research on grammatical overgeneration (Phillips, 2013) shows that even monolingual speakers sometimes produce or accept forms during online tasks that they find to be unacceptable in offline acceptability judgement tasks. Given the increased demands that using an L2 places on language processing, we might expect L2 speakers to be more sensitive to givenness in meta-linguistic judgement and forced-choice tasks compared to online (real-time) processing tasks. The RAGE hypothesis might predict that bilingual speakers will be less sensitive to the givenness constraint in ditransitive sentences during online processing tasks, due to a decreased ability to anticipate the information status of upcoming constituents.

On the other hand, Hopp (2009) found evidence that L2 speakers were sensitive to discourse-driven word order variation during self-paced reading, but were not sensitive to the same contrast in an offline acceptability judgement task. Hopp (2009) tested advanced and ‘near native’ L2 German speakers’ knowledge of the discourse constraints on object scrambling using a self-paced reading task and an acceptability judgment task. The results from the advanced L1

English/L2 German group showed that these speakers were sensitive to discourse context when reading sentences with scrambled word orders, just like ‘native’ German speakers; however, this group showed no sensitivity to context in the acceptability judgement task. Hopp (2009) suggests that this could be because acceptability judgement tasks require speakers to first establish the morphosyntactic well formedness of the sentences (by checking case and agreement features, for example), an extra step that effectively ‘blocks’ sensitivity to information structure. It is unclear whether the same effects would be observed in English, which has reduced case and agreement morphology compared to German, but Hopp’s (2009) findings at least suggest the possibility that L2 speakers may detect information structure/syntax mismatches in self-paced reading without detecting them in offline judgment tasks.

While it is not clear precisely how task type may influence ditransitive sentence preferences by bilingual English speakers, in my view an attempt to describe the weighting of the givenness constraint in bilingual English varieties should consider how its realization may be influenced by task type. Having data collected from the same population of speakers on several different tasks, both offline and online, will allow for a more complete characterization of the effects of the givenness constraint in that population.

In summary, previous studies of the givenness constraint in late bilingual/L2 English varieties suggest that the influence of the givenness constraint is weaker for these groups than it is for monolingual English speakers. This effect can be accounted for using two broad types of explanations: the L1 similarity explanation, which emphasizes the influence of the L1 language on the L2, and the input salience explanation, which emphasizes the role that input quality/quantity plays in L2 development. Several studies of the givenness constraint have speculated that differences between late bilingual/L2 English speakers and monolingual English speakers are due

to cross-linguistic influence; however, these studies have tested speakers whose L1s have the English PO equivalent as the default ditransitive option. Since the PO construction is also the most frequent ditransitive construction in English, it is not clear whether the observed effects are actually due to cross-linguistic influence. To address this, groups of bilingual speakers whose L1s differ from English in the types of ditransitive sentences that are available should be compared. I argue that German/English bilingual speakers and Spanish/English bilingual speakers have sufficiently different ditransitive options to allow for effects of language background to be detected. Additionally, HNPS sentences should be included so that the full range of English ditransitive sentence types is investigated. Finally, factors such as general English proficiency, amount of English exposure, frequency of English use, and task type should also be taken into account.

## **2.5 Chapter Summary**

In conclusion, an English speaker's choice of ditransitive sentence type (PO, DO, or HNPS) may be fruitfully modeled as a choice governed by a set of interacting, weighted, probabilistic constraints. One of these constraints, the givenness constraint, dictates that more-given post-verbal arguments should come before less-given post-verbal arguments. Data from sentence processing studies suggests that the givenness constraint influences DO and HNPS sentences more strongly compared to PO sentences. The root of this difference lies in the information structure mappings associated with the three constructions, which are assumed to be a component of speakers' grammatical knowledge, in line with the constructionist approach to representing ditransitive sentences that is assumed in this study.

While the givenness constraint influences the ditransitive sentence preferences of monolingual English speakers, the degree to which it influences the ditransitive sentence choices of late bilingual/L2 speakers is somewhat unclear. Some studies suggest that the givenness

constraint influences bilingual/L2 speakers' sentence preferences to a lesser degree than monolingual English speakers, and several have suggested that this difference can be attributed to crosslinguistic influence (influence of the first/dominant language on production or processing in the non-dominant language); however, it is unclear how important crosslinguistic influence is in the realization of the givenness constraint relative to other factors, such as experience with English or experimental task type.

The present study will examine the effects of the givenness constraint on the ditransitive sentence preferences of three populations of English speakers: monolingual English speakers living in the United States, bilingual German/English speakers living in Germany, and bilingual Spanish/English speakers living in Mexico. The aim of the study is to examine the relative importance of cross-linguistic influence, general English proficiency, amount of English exposure, and frequency of English use on the realization of the givenness constraint. To account for potential effects of task type, the three populations of speakers will complete three experimental tasks: a scalar acceptability judgement task, a two-sentence forced choice task, and a self-paced reading task. The study hypotheses and design will be the subject of Chapter 3.

## CHAPTER 3. METHODS AND ANALYSIS

This chapter describes the methods employed in this study. The chapter is structured as follows: Sections 3.1 will present the hypotheses to be tested. Section 3.2 will describe participant recruitment, and Section 3.3 will describe the materials used in the experimental tasks. Section 3.4 will describe the three experimental tasks: a scalar acceptability judgement task (AJT), a two-sentence forced choice task (FCT), and a self-paced reading (SPR) task. Section 3.5 will discuss some special considerations related to internet-based data collection, and Section 3.6 will summarize the main points of the chapter.

### 3.1 Hypotheses

#### 3.1.1 Hypotheses for Monolingual English speakers

The hypotheses for the monolingual English speaker group are the following:

MLH1. *PO sentences will be easier to process/more acceptable/preferred in all conditions*

*(that is, regardless of givenness) compared to DO sentences and HNPS sentences.*

*DO sentences will be easier to process/more acceptable/preferred in all conditions*

*compared to HNPS sentences (Brown et al., 2012; Clifton & Frazier, 2004).*

MLH2. *PO sentences with new-given order and PO sentences with given-new order will be*

*similarly easy to process/acceptable/preferred (Brown et al., 2012; Clifton & Frazier,*

*2004).*

MLH3. *DO sentences with new-given order will be more difficult to process/less*

*acceptable/dispreferred compared to DO sentences with given-new order (Brown et*

*al., 2012; Clifton & Frazier, 2004).*



MLH4. *HNPS sentences with new-given order will be more difficult to process/less acceptable/dispreferred compared to HNPS sentences with given-new order (Arnold et al., 2000, inter alia; Clifton & Frazier, 2004).*

MLH1 states that, overall, PO sentences will be preferred over DO sentences, which will be preferred over HNPS sentences. Since an interaction is predicted between sentence type and givenness, averaging over givenness to isolate the influence of sentence type would not be informative. As a result, this hypothesis will not be evaluated statistically. MLH2 states that PO sentences will be equally preferred in both the given-new and new-given conditions, while MLH3-4 state that DO and HNPS sentences will be significantly dispreferred in the new-given condition compared to the given-new condition.

### **3.1.2 Hypotheses for Bilingual English speakers**

The null hypotheses for the bilingual groups will be the same as the hypotheses put forth for the monolingual group (repeated below).

BLH1. *PO sentences will be easier to process/more acceptable/preferred in all conditions (that is, regardless of givenness) compared to DO sentences and HNPS sentences. DO sentences will be easier to process/more acceptable/preferred in all conditions compared to HNPS sentences (Brown et al., 2012; Clifton & Frazier, 2004).*

BLH2. *PO sentences with new-given order and PO sentences with given-new order will be similarly easy to process/acceptable/preferred (Brown et al., 2012; Clifton & Frazier, 2004).*

BLH3. *DO sentences with new-given order will be more difficult to process/less acceptable/dispreferred compared to DO sentences with given-new order (Brown et al., 2012; Clifton & Frazier, 2004).*

BLH4. *HNPS sentences with new-given order will be more difficult to process/less acceptable/dispreferred compared to HNPS sentences with given-new order (Arnold et al., 2000, inter alia; Clifton & Frazier, 2004).*

The outcomes of these hypotheses will be used to evaluate the level of similarity between the overall patterns of results for the three groups. For example, if H1-4 are confirmed for two of the groups, but only H2 and H3 are confirmed for the third group, the third group will be considered to pattern differently from the first two groups.

### 3.1.3 Hypotheses Related to Language Background

A key question in this study is whether there is evidence that language background plays a role in the realization of the givenness constraint. One possibility is that language background does not play a role in the realization of the givenness constraint. If this were the case, we might expect the three groups to show the same pattern of results with respect to H1-4. If this is the case, the results of the three groups would pattern as shown in BLH5.

BLH5. *If language background is not a significant factor, German-English bilingual speakers and Spanish-English bilingual speakers will produce an identical pattern of results compared to monolingual English speakers*

Similar	Different
English	
German	
Spanish	

BLH5 states that there will be no differences between the three groups with regard to the outcomes of H1-4. BLH5 corresponds to the possibility that language background does not play an important role in the realization of the givenness constraint; any apparent differences between the three groups should thus be accounted for by other factors.

Another possibility is that language background plays a role in the realization of the givenness constraint, but bilingual speakers' dominant languages (German or Spanish) do not. If this is the case, we might expect the pattern shown in BLH6.

BLH6. *If language background (but not language dominance) is a significant factor, German-English bilingual speakers and Spanish-English bilingual speakers will produce a different pattern of compared to monolingual English speakers*

<b>Similar</b>	<b>Different</b>
German Spanish	English

BLH6 states that the bilingual groups will pattern more similarly to one another than to the monolingual English speaker group, even after variables such as participants' experience with English and age of onset of bilingualism have been taken into account. This hypothesis corresponds to the possibility that language background does indeed play a role in the realization of the givenness constraint, but only the distinction between bilingual and monolingual speakers matters. In other words, bilingual speakers' particular language backgrounds (Spanish dominant vs. German dominant) play no role in the realization of the givenness constraint.

Finally, we might expect that language background plays a significant role in the realization of the givenness constraint. If this is the case, the three groups in the study are predicted

to pattern in a particular way relative to one another. In Chapter 2, I argued that approaches predicting cross-linguistic influence in cases of structural similarity between the dominant and non-dominant languages (such as the Surface Overlap Hypothesis) predict that the Spanish-English bilingual group will perform differently from the other two groups due to the assumed lack of a true DO construction in Spanish. On the other hand, English and German allow similar sets of ditransitive constructions, so the English monolingual and German-English bilingual groups are predicted to pattern together. If this specific conceptualization of cross-linguistic influence is present, the pattern in BLH7 should be observed.

*BLH7. If language background is a significant factor, Spanish-English bilingual speakers will produce a different overall pattern of results compared to German-English bilingual speakers and monolingual English speakers*

<b>Similar</b>	<b>Different</b>
English	Spanish
German	

BLH7 states that, if language background (specifically, structural similarity in the form of Surface Overlap) is the most important factor in the realization of the givenness constraint, the monolingual English and German-English bilingual groups will pattern more similarly to one another than to the Spanish-English bilingual group regarding the outcomes of H1-4, even after other factors (e.g. experience with English, language dominance, and age of onset of bilingualism) have been taken into account.

Unlike H1-4, which can be evaluated by considering the results of statistical tests, BLH5-7 are not hypotheses in a formal sense. Instead, they are idealized possible outcomes, and their

evaluation is necessarily subjective. Evaluating BLH5-7 will require interpreting overall patterns of results instead of looking at any one result individually, and it is likely that the actual results across the three tasks and the three groups will show more variation. Nevertheless, it is necessary to consider the patterns identified by BLH5-7 because those patterns are informative: only by considering the similarities between the three groups in terms of their overall patterns of results can the relative importance of language background be clarified. To that end, BLH5-7 are meant to serve as an informal framework for interpreting patterns of similarity and difference between the three groups.

## **3.2 Participants**

### **3.2.1 Participant Recruitment**

One group of adult German-English bilingual speakers ( $n = 60$ ) and one group of adult Spanish-English bilingual speakers ( $n = 60$ ) was recruited online using Prolific. Prolific allows prescreening of participants based on individual variables, including country of residence and language background. The German-English bilingual group was recruited from among those Prolific users who answered the question “What is your first language?” with “German”, and also answered the question “In what country do you currently reside?” with “Germany”. Likewise, the Spanish-English bilingual group was recruited from among those Prolific users who answered the question “What is your first language?” with “Spanish” and answered the question “In what country do you currently reside?” with “Mexico”. Before being invited to complete the study, prospective participants completed a short screener survey where they answered additional questions about their residency and language background (Appendix B). Prospective participants were invited to complete the study if their responses on the screener survey showed that (1) they

were born in the country in which they currently reside (Germany/Mexico), (2) they learned their first language (German/Spanish) as a child from their parents/caregivers, (3) they re-affirmed that they consider German/Spanish to be their ‘first’ language, and (4) they did not learn English as a child from their parents/caregivers.

In addition to the bilingual groups, a group of monolingual English speakers ( $n=60$ ) was recruited. The monolingual English group was recruited from among those Prolific users who answered the question “Are you an English-speaking monolingual, that is, are you fluent only in English? Or are you also fluent in any other language(s)?” with the response “I only know English” and answered the question “In what country do you currently reside?” with “United States”. These procedures yielded two groups of late bilingual speakers of English living in either Germany or Mexico, as well as a group of monolingual English speakers living in the United States.

### **3.3 Materials**

#### **3.3.1 English Proficiency and Language Experience Measures**

As an independent measure of English proficiency, all participants completed the English version of the LexTALE lexical decision task ([www.lextale.com](http://www.lextale.com)). The LEXTale lexical decision task has been validated as a measure of L2 vocabulary size and has been found to correlate significantly with other measures of general English proficiency, such as the Quick Placement Test (Lemhöfer & Broersma, 2012). The LexTALE was chosen because it was designed specifically to assess the English proficiency of advanced but ‘unbalanced’ bilingual speakers of English, the target population for this study, and has been shown to be a superior measure of English proficiency compared to participants’ self-ratings. It is also easy to implement and requires only 3-4 minutes to complete.

Participants also completed a language background questionnaire (Appendix C), questions for which were based on the adult language history questionnaire used by Cuza, Reyes, and Lustres (2021) and the LEAP-Q (Marian et al., 2007). The language background questionnaire collected participants' self-ratings of English speaking, understanding and reading proficiency, as well as information about reading fluency (e.g. age of initial reading; age of attained fluency), English input and experience (e.g. years of residence in L2 country; average self-estimated use of L1 and L2), and English exposure and use across domains (e.g. time spent watching movies in English; present level of contact with English at work). Questions from the adult language history questionnaire used by Cuza et al. (2021) were chosen because they separately assess English exposure and English use. Questions from the LEAP-Q were chosen because they are a validated means of gathering information about participants' exposure to and use of English as well as their self-perceptions of their English proficiency. Additionally, the LEAP-Q probes English proficiency, exposure and use across modalities, as it includes questions about reading, speaking, and understanding in English. Not all questions from the LEAP-Q were included, so the language background questionnaire should not be interpreted as a holistic assessment of bilingual participants' language profiles. Instead, the questionnaire is simply meant to assess a few factors that may be relevant to participants' performance on the tasks.

### **3.3.2 Experimental Stimuli**

Stimuli of a similar format are used in all three experimental tasks. The majority of the stimuli were borrowed (with permission) from the self-paced reading experiment conducted by Brown, Savova and Gibson (2012). Each item consists of a pair of sentences: a context sentence and a ditransitive test sentence. All ditransitive test sentences contain post-verbal constituents of the form determiner plus common noun, for example, *the photograph* and *a botanist* in the

sentence *the student sent the photograph to a botanist*. Eighteen experimental items include ditransitive test sentences with inanimate theme arguments (e.g. *the professor sent the grant to an administrator*) while 24 include ditransitive test sentences with animate theme arguments (e.g. *the chair offered a statistician the programmer*). Since the stimuli vary with regard to the animacy of the theme argument, the factor theme animacy was included in all statistical analyses. Doing so allowed the effects of sentence type and givenness to be assessed while taking theme animacy into account.

In each item, two independent variables (factors) were manipulated: sentence type (DO, PO, HNPS), and givenness (new-given, given-new). Sentence type was manipulated by varying the form of the ditransitive test sentence. Givenness was manipulated by the prior mention of the given referent in the context sentence and the use of the definite article in the referent-denoting constituent in the ditransitive test sentence. Items that contained an inanimate theme argument required two possible context sentences. One context sentence manipulated the givenness of the theme, and the other context sentence manipulated the givenness of the recipient (Table 4).

Table 4. Context sentences for items containing inanimate themes.

Theme given	Context sentence	A skier was purchasing new equipment for the upcoming winter season, and he found <b>a coupon</b> in a catalog.
	Test sentence	The skier mailed <b>the coupon</b> to a retailer to get a 15% discount.
Recipient given	Context sentence	A skier wanted to purchase some new equipment for the upcoming winter season, so he wrote to <b>a retailer</b> in Wisconsin.
	Test sentence	The skier mailed a coupon to <b>the retailer</b> to get a 15% discount.



In the acceptability judgement task and the self-paced reading task, sentence type and givenness were fully crossed, resulting in six experimental conditions (Table 5). The conditions in the forced-choice task were slightly different and will be described in more detail below. The full set of lexicalizations (pairs of context and test sentences) can be found in Appendix D.

Table 5. Factors, levels and conditions.

<i>Conditions</i>		<b>Givenness</b>	
		Given-New	New-Given
<b>Sentence type</b>	DO	DO, Given-New	DO, New-Given
	PO	PO, Given-New	PO, New-Given
	HNPS	HNPS, Given-New	HNPS, New-Given

The stimuli from Brown et al. (2012) were chosen for use in this study for two reasons. First, these items manipulate the variables of interest (sentence type and givenness) while controlling for a number of other variables known to influence speakers' ditransitive sentence preferences, such as constituent length, verb type, and animacy. For example, length of the post-verbal constituents is known to influence ditransitive sentence preference such that the sentence type which allows the longer constituent to occur second is generally preferred (Bresnan, 2007). The stimuli created by Brown et al. (2012) feature post-verbal constituents that are consistent in length, controlling for the effect of relative constituent length. Second, these items have been used successfully to examine the effects of ditransitive sentence type and givenness in a self-paced reading task completed by other groups of English speakers. As a result, re-using these stimuli reduces the concern that effects (or lack of effects) could be due to the validity of the experimental items.

Additionally, since this study features a self-paced reading task, re-using these stimuli allows a partial replication of the study conducted by Brown et al. (2012). The replication is ‘partial’ in two respects: first, in addition to examining DO and PO sentences, the self-paced reading task in this study also tests HNPS sentences. Second, the stimuli borrowed from Brown et al. (2012) are distributed between three tasks in this study, and as a result the self-paced reading task contains only a subset of the test sentences and filler sentences used in the original experiment.

### 3.3.3 Stimulus Norming

In order to control for effects related to the plausibility of each pair of context and test sentences, a semantic plausibility judgement task was conducted. Thirty participants who did not participate in the main study were recruited from Prolific. Each participant rated each pair of sentences based on plausibility using a 7-point scale. The context sentence with which each test sentence was presented was counterbalanced between participants. In order to reduce potential effects of sentence type, only PO test sentences were used. Participants also rated 72 filler items of varying plausibility. Items were presented pseudo randomly using Ibx Farm.

Additionally, verb subcategorization frequencies for each item used in the study were generated using data from a sentence completion study conducted by Brown et al. (2012). In this study, participants from Amazon Mechanical Turk were provided with a sentence fragment followed by two nouns (e.g. *the understudy showed... VIOLINIST, NOTEBOOK*). Participants were instructed to complete the sentence using the two nouns (e.g. *the understudy showed a notebook to the violinist*). Responses were coded based on the form of the response (PO, DO, or other). This procedure resulted in three subcategorization measures for each item: ditransitive bias, which was the percentage of responses that were coded as either PO or DO as opposed to other;

PO bias, which was the percentage of ditransitive responses that were coded as PO, and DO bias, which was the percentage of ditransitive responses coded as DO.

### **3.4 Experimental Tasks**

#### **3.4.1 The Tasks and Their Dependent Variables**

In each task, participants read several sentences and responded in one of the following ways: (1) indicate the acceptability of a sentence using a rating scale (acceptability judgement task); (2) decide which of two sentences seems more natural (forced choice task); (3) answer a comprehension question (self-paced reading task). The three experimental tasks contain the same type of stimuli but have different dependent variables. Each dependent variable is assumed to tap a different theoretical construct: The acceptability judgement task assesses speakers' intuitions about grammatical well-formedness. The forced choice task measures the proportion of trials in which a certain sentence type is chosen after speakers are prompted to directly compare two sentence types, which assesses the sentence type that is preferred in the context of the task. The self-paced reading task measures 'reading time' (RT) in a particular sentence region, which is assumed to assess the processing ease/difficulty of the word(s) in that region.

Despite the differences in the dependent variables, the three tasks are expected to yield complementary patterns of results. Specifically, some sentence types are expected to be generally 'good' (easier to process, more acceptable, and preferred), while some other sentence types are expected to be generally 'bad' (more difficult to process, less acceptable, and dispreferred). The 'good' and 'bad' sentences are expected to produce consistent patterns of results across the three tasks.

### **3.4.2 Acceptability Judgement Task**

#### **3.4.2.1 Task**

In this task, participants read the context sentence and rated the ditransitive test sentence using a 7-point Likert scale (Bresnan, 2007). The response variable was acceptability rating from 1 (*not at all acceptable*) to 7 (*totally acceptable*). The results of this task indicated whether monolingual and bilingual English speakers were sensitive to givenness when making intuitive judgements about the well-formedness of the three sentence types.

#### **3.4.2.2 Design**

The task used a 3x2 design which fully crossed the factors sentence type (PO, DO, HNPS) and information order (given-new, new-given), resulting in six experimental conditions (see Table 5).

#### **3.4.2.3 Presentation**

Each participant rated 18 test items (6 PO, 6 DO, 6 HNPS), 27 filler items of varying acceptability, 3 practice items, and 2 attention checks. Each ditransitive test sentence contained one of the following ditransitive verbs: *assign, bring, feed, hand, mail, offer, send, show, or throw*. Participants were exposed to each experimental condition three times, and lexicalizations were not repeated within the task. Items were presented pseudo-randomly using Ibex Farm (Drummond, 2013).

#### **3.4.2.4 Procedures**

During each trial, participants first saw the context sentence by itself for 3.5 seconds, after which the test sentence automatically appeared on a new line. Participants were instructed to read

both sentences carefully and then rate the test sentence based on how acceptable it seemed to them as a continuation of the paragraph (that is, how acceptable it seemed based on the context sentence that they just read). Participants submitted their responses by clicking the desired number on the screen or pressing the corresponding number key on the keyboard. A sample item is shown in Figure 3-1.

<p><i>Context sentence:</i> The chair of a physics department met with a programmer to discuss his role in a research project.</p> <p><i>Test sentence:</i> <b>The chair offered a statistician the programmer to help with data analysis.</b></p> <p><i>Scale:</i> (Not at all acceptable) 1 2 3 4 5 6 7 (Totally acceptable) Rate the BOLD SENTENCE using number keys or click boxes.</p> <p><i>Try it:</i> <a href="http://spellout.net/ibexexps/jweiric/ExampleAJT/experiment.html">http://spellout.net/ibexexps/jweiric/ExampleAJT/experiment.html</a></p>
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Figure 3-1. Acceptability judgement task Sample item.

### 3.4.2.5 Statistical Analysis

Results of the acceptability judgement task were analyzed using a series of cumulative link mixed models (CLMM) using package the package ‘ordinal’ (Christensen, R. H. B. 2019) in R. Ordinal regression is appropriate for analyzing ordered categorical data (e.g. school grades, scalar judgements), and assess the probability of a particular condition (e.g. given-new) falling into a particular rating category (e.g. 7). Ordinal regressions are not interpreted in terms of significant differences between condition means but are instead interpreted in terms of the likelihood of a particular condition receiving a particular rating. The independent variables and their interactions were coded as fixed effects. Additional fixed effects included verb, animacy of

the theme argument, sequential stimulus position, and task order. Random effects were included for participants and items.

### **3.4.3 Forced Choice Task**

#### ***3.4.3.1 Task***

In this task, participants read a context sentence and then chose which of two ditransitive test sentences followed it most naturally. The forced-choice task is similar to tasks used in previous studies (e.g. K.-S. Park, 2014, 2011), allowing the results of this study to be compared directly to previous work.

#### ***3.4.3.2 Design***

Test sentences were always either a PO and a DO, or a PO and a HNPS sentence. Type of test sentence pair was crossed with givenness. As a result, in each trial, participants were faced with one of four possible choices: ‘PO<sub>given-new</sub> or DO<sub>new-given</sub>’, ‘PO<sub>new-given</sub> or DO<sub>given-new</sub>’, ‘PO<sub>given-new</sub> or HNPS<sub>new-given</sub>’, or ‘PO<sub>new-given</sub> or HNPS<sub>given-new</sub>’. The four possible choices constituted the four experimental conditions in the task.

#### ***3.4.3.3 Presentation***

Participants rated 12 test items, 24 filler items, 2 practice items, and 2 attention checks. Each ditransitive test sentence contained one of the following ditransitive verbs: *bring*, *give*, *mail*, *offer*, *sell*, *send*, *serve*, *show* or *throw*. For filler items, target sentence pairs differed either in adverb placement (e.g. *the kids quietly left their bedroom and headed down the stairs.* / *Quietly the kids left their bedroom and headed down the stairs.*) or relative clause placement (e.g. *then a man screamed who was pointing at the sky.* / *then a man who was pointing at the sky screamed.*).

Lexicalizations did not appear in multiple conditions within the task; however, 4 lexicalizations from the acceptability judgement task were repeated in the forced-choice task.

#### **3.4.3.4 Procedures**

During each trial, participants first saw the context sentence by itself for 3.5 seconds, after which the target sentences automatically appeared on a new line. Participants were instructed to read both sentences carefully and choose the target sentence that sounded best to them based on the context sentence. A sample item is shown in Figure 3-2.

*Context sentence:* The chair of a physics department met with a programmer to discuss his role in a research project.

*Test sentences:*

- a. The chair offered a statistician to the programmer to help with data analysis.
- b. The chair offered to the programmer a statistician to help with data analysis.

*Try it:* <http://spellout.net/ibexexpr/jweiric/ExampleFCT/experiment.html>

Figure 3-2. Forced-choice sample item.

#### **3.4.3.5 Statistical Analysis**

Data from the forced-choice task were analyzed using a mixed effects binary logistic regression in the lme4 package (Bates et al., 2015) in R. Like ordinal regression, binary logistic regressions are interpreted in terms of the probability of the change in the levels of a response variable (e.g. yes/no, PO/DO) between experimental conditions. Experimental condition was coded as a fixed effect. Additional fixed effects included verb, sequential stimulus position, and task order. Random effects were included for participants and items.

### **3.4.4 Self-paced Reading Task**

#### **3.4.4.1 Task**

Participants completed a non-cumulative, word-by-word self-paced reading task (Just et al., 1982). The ‘reading time’ (RT) corresponding to each word in the sentence was recorded. RT is thought to increase for words or groups of words that are difficult to process. RTs corresponding to critical groups of words in the sentence types of interest across givenness conditions indicate whether/how givenness affects processing difficulty. The self-paced reading task partially replicates experiments 1 and 2 from Brown et al. (2012).

#### **3.4.4.2 Design**

The SPR task used a 3x2 design which fully crossed the factors sentence type (PO, DO, HNPS) and information order (given-new, new-given) resulting in six experimental conditions (see Table 5).

#### **3.4.4.3 Presentation**

Each participant rated 18 test items (6 PO, 6 DO, 6 HNPS), 42 filler items, 3 practice items, and 2 attention checks. Each ditransitive test sentence contained one of the following ditransitive verbs: *assign*, *bring*, *email*, *give*, *hand*, *offer*, *sell*, *send*, *show*, or *throw*. Participants were exposed to each experimental condition three times. Lexicalizations were not repeated in multiple conditions within the task. Items were presented pseudo-randomly using Ibex Farm (Drummond, 2013).



#### 3.4.4.4 Procedures

At the start of each trial, participants viewed a fixation cross for 2.5 seconds, after which they were presented with a series of blanks ('\_\_\_\_') whose positions corresponded to the positions of words in each sentence. Participants began each trial by pressing the spacebar, which revealed the first segment of the context sentence. Context sentences were presented in 'chunks' of 3-5 words. Participants pressed the spacebar again to reveal the next segment of the sentence, and the prior segment disappeared. Participants continued in this manner until the context sentence was read in its entirety. Test sentences were presented on a new line and were presented word-by-word. Participants pressed the space bar to reveal the first word of the test sentence. Upon pressing the spacebar again, the first word of the test sentence disappeared and the second word was revealed. Participants continued in this manner until the test sentence was read completely. The time between spacebar presses, or 'reading time' (RT) was recorded. Each trial was followed by a 'yes/no' comprehension question. A sample item is shown in Figure 3-3.

*Context sentence:* A professor was exhausted because he had been working on the first draft of a grant all day long.

*Test Sentence:* The professor sent the grant to an administrator after he was finally finished.

*Comprehension question:* Did the professor send the grant to the administrator?

- a. Yes
- b. No

*Try it:* <http://spellout.net/ibexeps/jweiric/ExSPR2/experiment.html>

Figure 3-3. Self-paced reading sample item.

### 3.4.4.5 Data Processing

Test sentences were divided into five regions of analysis following the procedure used by Brown et al. (2012). Divisions for each of the three sentence types is shown in Table 6. Region 1 contained the sum of the RTs corresponding to the sentence subject and verb. Region 2 contained the sum of the reading times corresponding to the first post verbal argument (an NP consisting of a determiner followed by a common noun). Region 3 contained the sum of the RTs corresponding to the second post-verbal argument (an NP consisting of a determiner followed by a common noun). For items containing PO and HNPS sentences, the preposition *to* was excluded from the RT for region 2 and region 3 respectively. Region 4 contained the sum of the RTs corresponding to the two words following the second post verbal argument, and region 5 contained the sum of any other words remaining in the sentence. Regions 4 and 5 represent ‘spillover’ regions. Spillover regions are so named because changes in RT caused by a sentence anomaly in region X are known to persist, or ‘spill over,’ into region X+1 or X+2 (Just et al., 1982).

Table 6. The five regions of analysis for the three sentence types.

<i>The retailer sold</i>	<i>the/a physicist</i>	<i>the/a laptop</i>	<i>because hers</i>	<i>was broken.</i>
<i>The retailer sold</i>	<i>the/a laptop</i>	<i>[to]the/a</i> <i>physicist</i>	<i>because hers</i>	<i>was broken.</i>
<i>The retailer sold</i>	<i>[to]the/a</i> <i>physicist</i>	<i>the/a laptop</i>	<i>because hers</i>	<i>was broken.</i>
Region 1	Region 2	Region 3	Region 4	Region 5
Subject and verb	NP1	NP2	Spillover 1	Spillover 2

Before statistical analysis, it is standard to subject self-paced reading data to various ‘trimming’ procedures. These procedures may include removing observations with RTs above or below a pre-determined cutoff value, or excluding observations where the comprehension question was answered incorrectly (Keating & Jegerski, 2015). These data trimming procedures are justified based on the assumption that incorrect answers to comprehension questions and extremely long or short reading times reflect lack of comprehension or lack of attention, both of which introduce noise into the data. In this study, RTs greater than three standard deviations above the group mean were removed, and comprehension question response was included as a fixed effect during statistical analysis, following the procedures of Brown et al. (2012).

#### ***3.4.4.6 Statistical Analysis***

Data from the self-paced reading task were analyzed using a set of linear mixed effects models in the lme4 package (Bates et al., 2015) in R. For each region of analysis, a linear mixed effects model was fitted to the raw (untransformed) RT data. The independent variables and their interactions were coded as fixed effects. Additional fixed effects included lemma frequency of individual lexical items (estimated using the CELEX database, <http://celex.mpi.nl/>), orthographic length of individual lexical items, verb subcategorization frequencies (estimated using sentence completion data from Brown et al 2012), semantic plausibility of each lexicalization (estimated using results of the semantic plausibility study), sequential stimulus position, task order, and accuracy of responses to comprehension questions.

### **3.5 Internet-based Data Collection**

Data collection for this study was carried out entirely online. The three experimental tasks were presented using Ibex (Internet Based EXperiments), a system for running psycholinguistic

experiments online using JavaScript and HTML (Drummond, 2013). The tasks were hosted and administered using Ibex Farm (<https://spellout.net/ibexfarm>), a server dedicated to hosting Ibex experiments. Study participants were recruited online using Prolific ([www.prolific.co](http://www.prolific.co)), an online platform for human subjects data collection.

Many have advocated in favor of internet-based experimentation as a viable means for collecting linguistic data (e.g. Erlewine & Kotek, 2016; Gibson et al., 2011; Myers, 2009; Sprouse, 2011). Online data collection offers several advantages over traditional data collection in a laboratory setting, including potentially lower cost and access to larger and more diverse pools of participants (Erlewine & Kotek, 2016). The broader participant pool includes bilingual/L2 English speakers from a variety of language backgrounds, who can be more easily recruited for studies on bilingual/L2 acquisition (e.g. Robenalt & Goldberg, 2016; Stadthagen-González et al., 2019; Tachihara & Goldberg, 2019). Online data collection also requires far less leg work compared to traditional face-to-face data collection, which requires (at the very least) recruiting participants from the local community, scheduling a time for each of those participants to come to the lab, and finally completing the actual data collection session. But perhaps the most significant advantage of online data collection is speed: online data collection is considerably faster than traditional face-to-face data collection, the process for which can extend over a period of months. By comparison, data collection for a study which takes 15-20 minutes to complete and requires 60 participants can be completed in a matter of days when the participants are recruited from Prolific.

Data collected online also demonstrates a reasonable degree of empirical validity. Participants recruited using online platforms (e.g. Prolific, Amazon Mechanical Turk) perform similarly to participants who completed the task in a controlled setting, as determined by explicit comparison or replication (Enochson & Culbertson, 2015; Erlewine & Kotek, 2016; Pauszek et al.,

2017; Sprouse, 2011). In a series of acceptability judgement experiments targeting English speakers, Sprouse (2011) found similar response patterns when comparing participants who completed the task in the lab to participants who were recruited from Amazon Mechanical Turk. Sprouse also found a similar detectability rate for judgements of syntactic anomalies between the two groups. For example, in a judgement task focused on agreement attraction effects, Sprouse found that for sample sizes of approximately 50 participants, the proportion of significance at  $p < .05$  was above .8 for both groups when each participant contributed four judgments of each experimental condition. In other words, the effects observed in data collected in the lab were also detectable in data from a similar sample size collected online.

Still, there are limitations related to online data collection, and concerns about data quality are prevalent. There is evidence that samples collected online may have higher participant rejection rates (Sprouse, 2011) and that online participants may perform poorly in long experiments, especially if they feel that they are undercompensated (Erlewine & Kotek, 2016). Perhaps the most significant concern about data quality stems from the experimenter having very little control over the experimental setting. For example, during data collection in a laboratory space, the experimenter can encourage a participant to pay careful attention to the task by taking steps to create a minimally-distracting environment, such as providing a private room in which to complete the experiment and requiring the participant to leave potential distractions, such as their cell phone, at the door. The experimenter's presence may also encourage many participants to give their best effort when completing the task, minimizing the number of low-effort responses. Such control is not possible during online data collection because there is no way for the experimenter to ensure that the participant completes the task without succumbing to distractions, and the lack of face-to-face contact with the experimenter may result in some participants feeling uninvested in the task.

Likewise, the experimenter cannot explain the task procedures to the participant directly, the experimenter cannot ask the participant whether they have understood the task procedures, the experimenter cannot answer questions about the task procedures, and the experimenter cannot intervene if there is a problem with the experiment. Because of these limitations, online experimenters must take additional steps to ensure that data quality is protected. The remainder of this section will describe the special considerations deemed necessary for high data quality in this study.

### **3.5.1 Participant Recruitment Platform**

Researchers engaging in online data collection have several participant recruitment platforms to choose from, such as Amazon Mechanical Turk, (MTurk), Prolific, and Appen. Some experiment builders, such as Gorilla, also maintain their own participant pools. Prolific was chosen for this study due to its broad participant pool and its policies aimed at maintaining data quality. In terms of the participant pool, Prolific had an adequate number of active users belonging to each of the experimental groups (monolingual English speakers, English/German bilingual speakers, and English/Spanish bilingual speakers). It was then easy to target these three groups using users' answers to Prolific's pre-screening questions. In terms of data quality, Prolific maintains a policy of 'ethical rewards', which requires that participants be compensated at a rate no lower than \$6.50 US per hour. This policy helps alleviate the concern that participants may generally feel undercompensated and provide poorer quality data as a result. Prolific also employs a number of verification and monitoring procedures aimed at identifying bots and participants providing random answers. Prolific's data quality safeguards plus the breadth of their participant pool make the platform an appropriate choice for collecting the data for this study.

### 3.5.2 Attention Checks

This study employed attention checks in order to potentially identify participants who were not reading the items or task instructions carefully. Attention checks are typically intermixed with the experimental stimuli and resemble the experimental stimuli in length and format; however, instead of collecting a standard response, attention checks prompt participants to confirm that they have carefully read the experiment instructions and/or the item itself (Oppenheimer et al., 2009). This study contained two types of attention checks. Attention checks of the first type were presented after the instructions for each of the three tasks and the LEX Tale task. Participants read the task instructions and then answered two comprehension questions, each of which had two potential answers to choose from.

Attention checks of the second type were embedded within the experimental items in each of the three experimental tasks. In these attention checks, participants saw an item that was similar to all other items in length and format but indicated in some way how the participant should respond if they are reading carefully. For example, in an attention check from the acceptability judgement task, in place of a test sentence, participants saw the sentence “Please give this sentence a rating of 'five'.” Correct responses to this type of attention check indicate that the participant has actually read the sentences in the item and has not simply submitted a rating at random. Over the duration of the study, participants responded to a total of 14 attention checks (8 of the first type, 6 of the second type). Prolific’s guidelines state that a participant who misses more than one attention check may have their responses ‘rejected’ (i.e. the researcher may withhold compensation). In this study, only one participant’s data was rejected for containing three or more incorrectly answered attention checks.

### 3.5.3 Item Presentation

For each trial in the acceptability judgement task and the forced-choice task, the context sentence was displayed by itself for 3.5 seconds. The test sentence(s) (and the rating scale, in the case of the acceptability judgement task) then appeared. In other words, in each trial, participants were unable to submit a response until 3.5 seconds had elapsed. This presentation format was deemed necessary for two reasons: first, it may have encouraged participants to carefully read *both* the context sentence *and* the test sentence, which was key for valid completion of the task. Second, it prevented participants from being able to rapidly ‘click through’ the experiment by simply selecting random ratings/sentences in quick succession.

### 3.5.4 Operating Systems and Browsers

Unlike lab-based data collection, participants for online studies complete the experiment using their own computers. For the self-paced reading task, it is reasonable to ask whether differences in operating system (Mac vs. Windows, for example) or web browser (Google Chrome, Safari, Firefox, etc.) might have an effect on the recording of RTs. Internet browser appears to have a small effect on response time accuracy, and operating system appears to have a somewhat larger, though relatively benign, effect (Reimers & Stewart, 2015). As a result, all statistical models in the analysis of the self-paced reading data include operating system and web browser as fixed effects in order to account for variation from these sources.

## 3.6 Chapter Summary

In summary, Chapter 3 presented the hypotheses to be tested, which included a set of basic hypotheses about the effects of givenness on each of the three sentence types as well as a set of hypotheses regarding the effect of language background. In order to test these hypotheses, three



groups of participants (monolingual English speakers, German-English bilingual speakers, and Spanish-English bilingual speakers) were recruited via Prolific to complete three experimental tasks: an acceptability judgement task (AJT), a forced choice task (FCT) and a self-paced reading (SPR) task. All three tasks feature stimuli of a similar type, which were designed to cross the factors sentence type (PO, DO, HNPS) and givenness (given-new, new-given).

## **CHAPTER 4. RESULTS**

Data from the three tasks were each analyzed using three sets of statistical models. The first set of models analyzed the data from the three L1 groups individually in order to conduct within-group comparisons of the experimental conditions. In the second set of models, data from the three L1 groups was analyzed together. This allowed for the three L1 groups to be directly compared. In the third set, data from the two bilingual groups was analyzed together (without the monolingual English group). This allowed the bilingual groups to be compared while examining the effects of factors that are specific to these groups, such as English exposure, English use, and general English proficiency. The structure of this chapter is as follows: Section 4.1 briefly discusses the characteristics of the bilingual groups. Section 4.2 presents the results of the acceptability judgement task, section 4.3 presents the results of the forced-preference task, and section 4.4 presents the results of the self-paced reading task. Section 4.5 provides a summary of the major results.

### **4.1 Bilingual Group Characteristics**

Results from the screener survey and the language background questionnaire provide information about the bilingual groups' characteristics. In general, the results show that the two groups are fairly similar with regard to the variables of interest. The mean age at which the participants began learning English is similar in both groups (German-English bilingual group: age 9, Spanish-English bilingual group: age 8). Crucially, the mean age at which the participants in both groups began learning English is well below age 14, which was taken to be the cutoff point for 'bilingual' status in this study. The two groups are also similar in terms of their mean general English proficiency (German-English: 84.54, Spanish-English: 74.42), mean self-rated English

exposure (German-English: 4.033, Spanish-English: 4.312), and mean self-rated English use (German-English: 3, Spanish-English: 3.008). A detailed summary of the bilingual group characteristics can be found in Appendix A.

## **4.2 Acceptability Judgement Task**

To evaluate the results of the acceptability judgement task (AJT) for statistical significance, the raw (untransformed) ratings, consisting of responses on a scale from 1 to 7, were submitted to a series of cumulative link mixed models. The first three models were fitted to the three L1 groups individually and were used to evaluate within-groups differences in the experimental conditions for statistical significance. AJT model 1 (AJTm1) was fitted to the results from the monolingual English group, AJT model 2 (AJTm2) was fitted to the results from the German-English bilingual group, and AJT model 3 (AJTm3) was fitted to the results from the Spanish-English bilingual group. AJT model 4 (AJTm4) and AJT model 5 (AJTm5) were used to evaluate between-groups differences for statistical significance. AJTm4 was fitted to the combined results from all three language groups, and AJTm5 was fitted to the combined results of the two bilingual groups. An exploratory model, AJTm5', examined the effect English use across domains. In all models, random intercepts were included for participants and items. Including random effects accounts for variation in the fixed effects conditional on the random effects, effectively accounting for the natural variation between participants and items.

### **4.2.1 Within-group Results: Monolingual English Speakers (AJTm1)**

Figure 4-1 shows the mean acceptability ratings by sentence type and givenness from the monolingual English group. PO and DO sentences received similar ratings on average in the given-new condition, while HNPS sentences received lower mean ratings in the given-new condition

compared to the other two sentence types. PO sentences received similar mean ratings in the new-given condition compared to the given-new condition; in fact, mean ratings for PO sentences were slightly higher in the new-given condition. In contrast, DO and HNPS sentences received lower mean ratings in the new-given condition compared to the given-new condition.

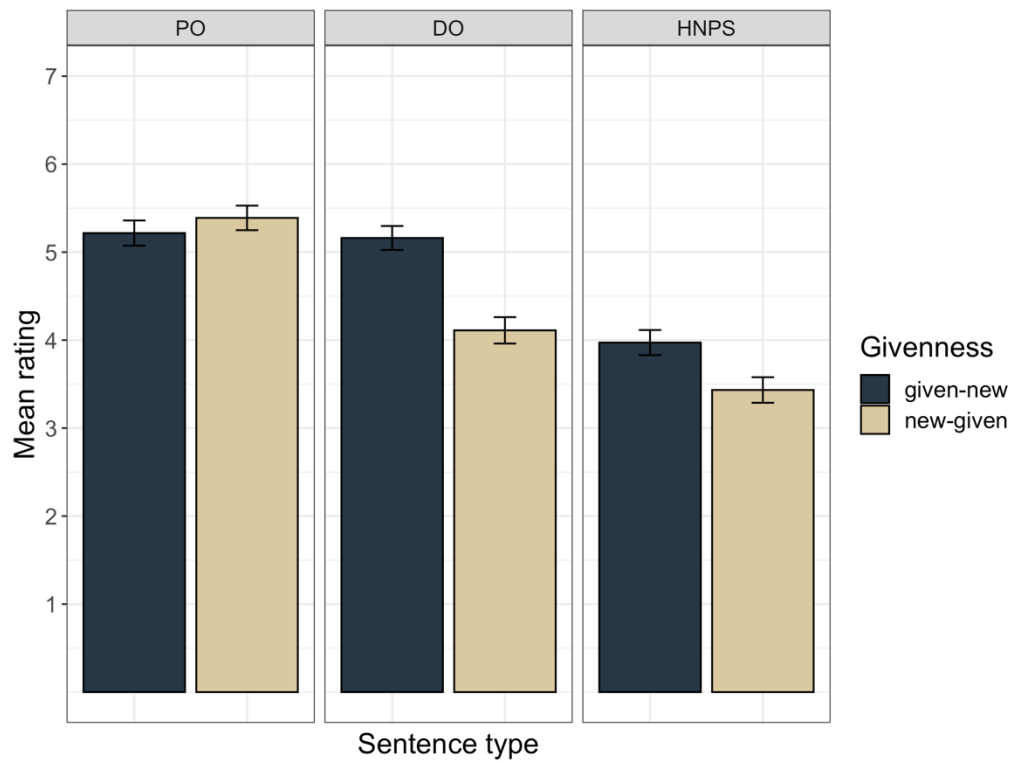


Figure 4-1. Monolingual English speaker mean ratings, sentence type X information structure.

To evaluate these patterns for statistical significance, AJTm1 was fitted to the results from the monolingual English group. AJTm1 included the independent variables ‘sentence type’ (PO, DO, HNPS), ‘givenness’ (given-new, new-given) and their interaction as fixed effects. Additional fixed effects were verb, animacy of the theme argument, sequential stimulus position, and task order. Random intercepts were included for participants and items. The model output from AJTm1 is shown in Table 7.

Table 7. AJT model 1 (monolingual English group).

<i>Predictors</i>	<b>as.factor(Rating)</b>			
	<i>Odds Ratios</i>	<i>CI</i>	<i>Statistic</i>	<i>p</i>
1 2	0.02	0.01 – 0.07	-7.13	<b>&lt;0.001</b>
2 3	0.09	0.03 – 0.24	-4.75	<b>&lt;0.001</b>
3 4	0.17	0.06 – 0.47	-3.43	<b>0.001</b>
4 5	0.41	0.15 – 1.11	-1.76	0.079
5 6	0.96	0.35 – 2.58	-0.09	0.931
6 7	2.68	0.99 – 7.24	1.94	0.052
SentenceType [DO]	0.91	0.61 – 1.34	-0.49	0.623
SentenceType [HNPS]	0.22	0.15 – 0.33	-7.45	<b>&lt;0.001</b>
Givenness [new-given]	1.31	0.88 – 1.96	1.34	0.181
Verb [bring]	0.50	0.27 – 0.92	-2.23	<b>0.026</b>
Verb [feed]	0.86	0.47 – 1.59	-0.48	0.633
Verb [hand]	0.27	0.12 – 0.62	-3.08	<b>0.002</b>
Verb [mail]	0.42	0.20 – 0.90	-2.23	<b>0.026</b>
Verb [offer]	0.55	0.31 – 0.99	-2.01	<b>0.044</b>
Verb [send]	0.37	0.19 – 0.71	-2.98	<b>0.003</b>
Verb [show]	0.35	0.19 – 0.63	-3.48	<b>0.001</b>
Verb [throw]	0.18	0.09 – 0.38	-4.51	<b>&lt;0.001</b>
animacy [aAI]	7.18	4.69 – 11.00	9.07	<b>&lt;0.001</b>
Taskorder	1.23	0.85 – 1.77	1.10	0.270
Listposition	1.00	0.99 – 1.00	-0.99	0.322
SentenceType [DO] * Givenness [new-given]	0.23	0.13 – 0.41	-5.09	<b>&lt;0.001</b>
SentenceType [HNPS] * Givenness [new-given]	0.42	0.24 – 0.73	-3.11	<b>0.002</b>

- Table 7 continued -

<b>Random Effects</b>	
$\sigma^2$	3.29
$\tau_{00}$ ProlificID	1.20
$\tau_{00}$ ItemsetOnly	0.01
ICC	0.27
$N$ ProlificID	60
$N$ ItemsetOnly	18
Observations	1080
Marginal $R^2$ / Conditional $R^2$	0.261 / 0.459

Model output from AJTm1 indicates the presence of a significant interaction between sentence type and givenness, such that DO and HNPS sentences with new-given constituent ordering were significantly more likely to receive lower ratings compared to PO sentences with new-given constituent order. Pairwise comparisons (Tukey) confirm that there was no significant difference in ratings between PO sentences in the given-new condition compared to the new-given condition ( $z = -1.337, p = 0.7645$ ). In contrast, participants were significantly more likely to assign higher ratings in the given-new condition compared to the new-given condition for DO sentences ( $z = 5.994, p < .0001$ ) and HNPS sentences ( $z = 3.148, p = 0.0204$ ). Additionally, PO and DO sentences were significantly more likely to receive higher ratings than HNPS in both the given-new condition (PO:  $z = 7.448, p < .0001$ ; DO:  $z = 7.115, p < .0001$ ) and the new-given condition (PO:  $z = 11.423, p < .0001$ ; DO:  $z = 4.267, p = 0.0003$ ).

Some experimental items featured ditransitive sentences with animate theme arguments (e.g. *the chair offered a statistician the programmer*). These sentences are generally considered to

be odd, since the theme argument in ditransitive predicates is typically inanimate. As a result, it is necessary to consider the effect of theme animacy on participants' acceptability judgements. Figure 4-2 shows the mean acceptability ratings by sentence type and theme animacy from the monolingual English group. Generally speaking, all three sentence types received higher mean ratings when the theme argument was inanimate compared to when the theme argument was animate.

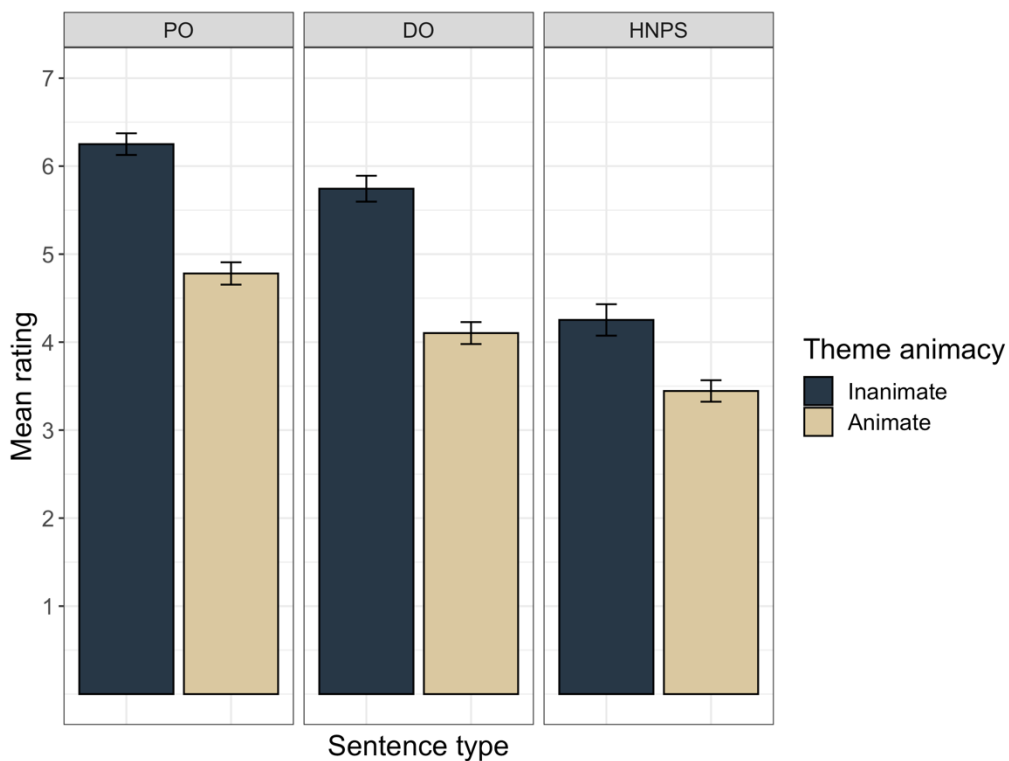


Figure 4-2. Monolingual English speaker mean ratings, sentence type X theme animacy.

Indeed, the model output from AJTm1 indicates a significant main effect of theme animacy such that sentences with inanimate theme arguments were significantly more likely to receive higher ratings compared to those with animate theme arguments. Importantly, the model output still indicates a significant interaction between sentence type and givenness even when theme

animacy is included as a main effect in the model. This result indicates that the effects of sentence type and givenness persist even after theme animacy has been accounted for. Since the main focus of this study is the interaction between sentence type and the givenness constraint, little more will be said about the effect of theme animacy; however, the factor theme animacy will be included in all subsequent statistical models in order to account for variation between those items that contain inanimate themes and those items that contain animate themes.

#### **4.2.2 Within-group Results: German-English Bilingual Speakers (AJTm2)**

Figure 4-3 shows the mean acceptability ratings by sentence type and givenness from the German-English bilingual group. In general, results from the German-English bilingual group were similar to those from the monolingual English group. PO and DO sentences received similar mean ratings in the given-new condition, while HNPS sentences received lower mean ratings in the given-new condition compared to the other two sentence types. PO sentences received similar mean ratings in the new-given condition compared to the given-new condition, while DO and HNPS sentences received lower mean ratings in the new-given condition compared to the given-new condition.



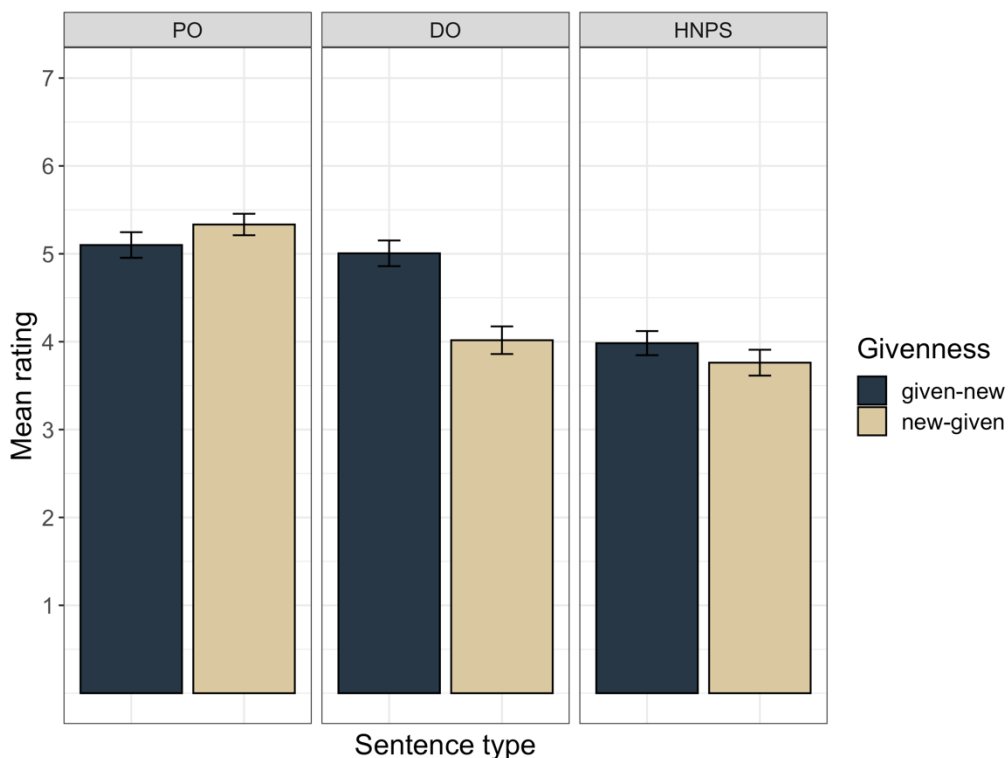


Figure 4-3. German-English bilingual mean ratings, sentence type X information structure.

To evaluate these patterns for statistical significance, AJTm2 was fitted to the results from the German-English bilingual group. Like AJTm1, AJTm2 included the independent variables ‘sentence type’ (PO, DO, HNPS), ‘givenness’ (given-new, new-given) and their interactions as fixed effects, in addition to fixed effects for verb, animacy of the theme argument, sequential stimulus position, and task order. Unlike AJTm1, AJTm2 also included a set of fixed effects that were specific to the bilingual groups. These fixed effects were general English proficiency (LEXTale score), self-ratings of English speaking proficiency, listening proficiency, and reading proficiency, composite English use score, composite English exposure score, self-identification of language dominance (‘German’ or ‘both English and German’), and age of onset of English acquisition. Random intercepts were included for participants and items. The model output from AJTm2 is shown in Table 8.

Table 8. AJT model 2 (bilingual German-English group).

<i>Predictors</i>	<b>as.factor(Rating)</b>			
	<i>Odds Ratios</i>	<i>CI</i>	<i>Statistic</i>	<i>p</i>
1 2	0.03	0.00 – 0.53	-2.37	<b>0.018</b>
2 3	0.08	0.00 – 1.68	-1.62	0.104
3 4	0.18	0.01 – 3.59	-1.13	0.258
4 5	0.31	0.02 – 6.30	-0.76	0.444
5 6	0.83	0.04 – 16.87	-0.12	0.901
6 7	2.24	0.11 – 45.89	0.52	0.600
Sentence_type [DO]	0.88	0.60 – 1.30	-0.65	0.517
Sentence_type [HNPS]	0.29	0.20 – 0.43	-6.34	<b>&lt;0.001</b>
Givenness [new-given]	1.15	0.78 – 1.69	0.71	0.480
Verb [bring]	1.01	0.43 – 2.40	0.03	0.975
Verb [feed]	0.77	0.33 – 1.83	-0.59	0.557
Verb [hand]	0.31	0.10 – 0.97	-2.02	<b>0.043</b>
Verb [mail]	0.79	0.28 – 2.25	-0.43	0.665
Verb [offer]	1.13	0.50 – 2.54	0.29	0.773
Verb [send]	0.51	0.21 – 1.26	-1.45	0.146
Verb [show]	0.45	0.19 – 1.03	-1.88	0.060
Verb [throw]	0.27	0.10 – 0.73	-2.57	<b>0.010</b>
animacy [aAI]	6.21	3.47 – 11.11	6.16	<b>&lt;0.001</b>
Taskorder	1.13	0.84 – 1.54	0.81	0.416
ListPosition	1.00	0.99 – 1.01	-0.48	0.632
speaking English	1.03	0.93 – 1.14	0.51	0.608
understanding English	1.03	0.79 – 1.33	0.19	0.849
reading English	1.07	0.75 – 1.52	0.36	0.717

- Table 8 continued -

LEX_score	1.00	0.98 – 1.03	0.12	0.901
composit_ENG_use	0.97	0.73 – 1.28	-0.24	0.807
composit_ENG_expose	0.65	0.38 – 1.10	-1.62	0.106
What language do you feel most comfortable with [German]	1.23	0.75 – 2.02	0.83	0.405
What age were you when you began learning English?	1.01	0.88 – 1.16	0.17	0.868
Sentence_type [DO] * Givenness [new-given]	0.29	0.17 – 0.50	-4.43	<b>&lt;0.001</b>
Sentence_type [HNPS] * Givenness [new-given]	0.66	0.39 – 1.12	-1.54	0.123
<hr/> <b>Random Effects</b> <hr/>				
$\sigma^2$	3.29			
$\tau_{00}$ ProlificID	0.54			
$\tau_{00}$ token_set	0.08			
ICC	0.16			
$N_{\text{ProlificID}}$	60			
$N_{\text{token\_set}}$	18			
Observations	1080			
Marginal $R^2$ / Conditional $R^2$	0.235 / 0.356			

Model output from AJTm2 indicates the presence of a significant interaction between sentence type and givenness, such that DO sentences with new-given constituent ordering were significantly more likely to receive lower ratings compared to PO sentences with new-given constituent order. Pairwise comparisons (Tukey) confirm that there was no significant difference

between ratings for PO sentences in the given-new condition compared to the new-given condition ( $z = -0.706, p = 0.9813$ ). There was also no significant difference between ratings for HNPS sentences in the given-new condition compared to the new-given condition ( $z = 1.505, p = 0.6609$ ). In contrast, DO sentences were significantly more likely to receive higher ratings in the given-new condition compared to the new-given condition ( $z = 5.591, p = <.0001$ ). Additionally, PO sentences were significantly more likely to receive higher ratings than HNPS in both the given-new condition ( $z = 6.340, p < .0001$ ) and the new-given condition ( $z = 8.408, p < .0001$ ). DO sentences were significantly more likely to receive higher ratings than HNPS in the given-new condition ( $z = 5.795, p < .0001$ ), but not in the new-given condition ( $z = 1.546, p = 0.6340$ ). There were no significant effects associated with any of the bilingual-specific predictors (general English proficiency, self-ratings of English speaking proficiency, listening proficiency, and reading proficiency, composite English use score, composite English exposure score, self-identification of language dominance, and age of onset of English acquisition).

#### **4.2.3 Within-group Results: Spanish-English Bilingual Speakers (AJTm3)**

Figure 4-4 shows the mean acceptability ratings by sentence type and givenness from the Spanish-English bilingual group. Unlike the other two groups, all three sentence types received similar mean ratings in the given-new condition. PO sentences received similar mean ratings in the new-given condition compared to the given-new condition. DO and HNPS sentences received lower mean ratings in the new-given condition compared to PO sentences but received similar mean ratings in the new-given condition compared to one another.

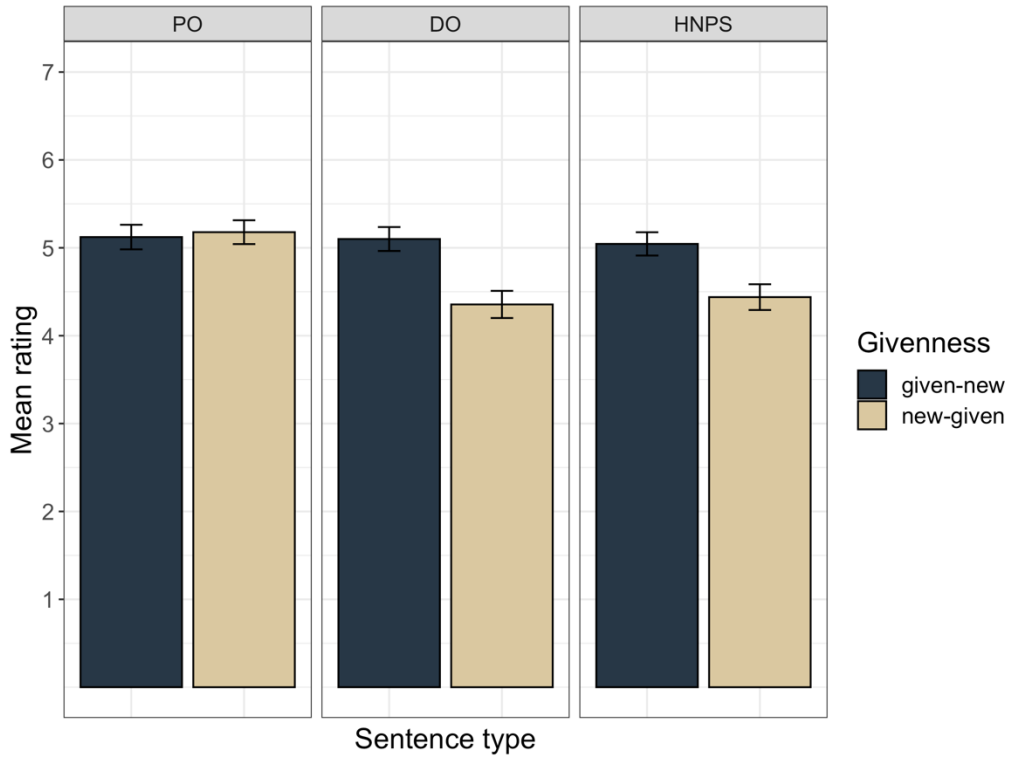


Figure 4-4. Spanish-English bilingual mean ratings, sentence type X information structure.

To evaluate these patterns for statistical significance, AJTm3 was fitted to the results from the Spanish-English bilingual group. Like AJTm2 for the German-English bilingual group, AJTm3 included the independent variables ‘sentence type’ (PO, DO, HNPS), ‘givenness’ (given-new, new-given) and their interactions as fixed effects, with additional fixed effects for verb, animacy of the theme argument, sequential stimulus position, task order, general English proficiency (LEXTale score), self-ratings of English speaking proficiency, listening proficiency, and reading proficiency, composite English use score, composite English exposure score, self-identification of language dominance (‘Spanish’ or ‘both English and Spanish’), and age of onset of English acquisition. Random intercepts were included for participants and items. The model output from AJTm2 is shown in Table 9.

Table 9. AJT model 3 (bilingual Spanish-English group).

<i>Predictors</i>	<b>as.factor(Rating)</b>			
	<i>Odds Ratios</i>	<i>CI</i>	<i>Statistic</i>	<i>p</i>
1 2	0.03	0.00 – 0.92	-2.01	<b>0.045</b>
2 3	0.07	0.00 – 2.35	-1.49	0.137
3 4	0.13	0.00 – 4.54	-1.12	0.263
4 5	0.29	0.01 – 9.81	-0.69	0.488
5 6	0.73	0.02 – 25.03	-0.17	0.863
6 7	2.16	0.06 – 73.91	0.43	0.669
Sentence_type [DO]	0.97	0.66 – 1.43	-0.13	0.894
Sentence_type [HNPS]	0.87	0.59 – 1.28	-0.72	0.470
Givenness [new-given]	0.95	0.64 – 1.39	-0.27	0.784
Verb [bring]	1.06	0.54 – 2.08	0.16	0.874
Verb [feed]	0.62	0.31 – 1.22	-1.39	0.163
Verb [hand]	0.49	0.19 – 1.22	-1.54	0.123
Verb [mail]	1.14	0.50 – 2.63	0.31	0.756
Verb [offer]	1.19	0.62 – 2.26	0.52	0.601
Verb [send]	0.71	0.35 – 1.46	-0.94	0.349
Verb [show]	0.64	0.33 – 1.25	-1.29	0.195
Verb [throw]	0.26	0.12 – 0.57	-3.35	<b>0.001</b>
animacy [aAI]	3.71	2.33 – 5.90	5.52	<b>&lt;0.001</b>
Taskorder	0.86	0.62 – 1.21	-0.85	0.396
ListPosition	1.00	0.99 – 1.01	0.55	0.581
speaking English	0.93	0.72 – 1.21	-0.55	0.581
understanding English	0.91	0.70 – 1.19	-0.67	0.504
reading English	1.13	0.86 – 1.49	0.88	0.380

- Table 9 continued -

LEX_score	1.00	0.98 – 1.03	0.23	0.816
composit_ENG_use	0.88	0.60 – 1.29	-0.64	0.523
composit_ENG_expose	1.13	0.61 – 2.11	0.39	0.694
What language do you feel most comfortable with [Spanish]	0.62	0.33 – 1.17	-1.48	0.139
What age were you when you began learning English?	0.97	0.90 – 1.05	-0.69	0.491
Sentence_type [DO] * Givenness [new-given]	0.47	0.27 – 0.81	-2.73	<b>0.006</b>
Sentence_type [HNPS] * Givenness [new-given]	0.54	0.32 – 0.93	-2.21	<b>0.027</b>
<hr/>				
<b>Random Effects</b>				
$\sigma^2$	3.29			
$\tau_{00}$ ProlificID	0.93			
$\tau_{00}$ token_set	0.03			
ICC	0.22			
$N_{\text{ProlificID}}$	60			
$N_{\text{token\_set}}$	18			
Observations	1080			
Marginal $R^2$ / Conditional $R^2$	0.151 / 0.342			

Model output from AJTm3 indicates the presence of a significant interaction between sentence type and givenness, such that DO and HNPS sentences with new-given constituent ordering were significantly more likely to receive lower ratings compared to PO sentences with new-given constituent order. Pairwise comparisons (Tukey) confirm that there was no significant

difference in ratings between PO sentences in the given-new condition compared to the new-given condition ( $z = 0.274, p = 0.9998$ ). In contrast, participants were significantly more likely to assign higher ratings in the given-new condition compared to the new-given condition for DO sentences ( $z = 4.161, p = 0.0005$ ) and HNPS sentences ( $z = 3.438, p = 0.0077$ ). Unlike the other two groups, there was no significant difference between ratings of HNPS sentences in the given-new condition compared to PO sentences in the given-new condition ( $z = 0.723, p = 0.9792$ ) and DO sentences in the given-new condition ( $z = 0.606, p = 0.9906$ ). PO sentences were significantly more likely to receive higher ratings than HNPS in the new-given condition ( $z = 3.923, p = 0.0012$ ), while there was no significant difference between DO and HNPS sentences in the new-given condition ( $z = -0.154, p = 1.0000$ ). There were no significant effects associated with any of the bilingual-specific predictors (general English proficiency, self-ratings of English speaking proficiency, listening proficiency, and reading proficiency, composite English use score, composite English exposure score, self-identification of language dominance, and age of onset of English acquisition).

#### **4.2.4 Within Group Comparison Summary**

In summary, all three groups of participants displayed similar yet distinct patterns of responses in the AJT. For the monolingual English-speaking group, DO and HNPS sentences were significantly more likely to receive higher ratings in the given-new condition compared to the new-given condition. For the German-English bilingual group, only DO sentences were more likely to receive higher ratings in the given-new condition; PO and HNPS sentences did not differ significantly across the givenness conditions. For the Spanish-English bilingual group, DO and HNPS sentences were significantly more likely to receive higher ratings in the given-new condition, but there was no significant difference in the ratings assigned to DO and HNPS



sentences in either givenness condition. The next section will consider whether the three groups' overall patterns of response are significantly different from one another when compared directly.

#### **4.2.5 Between-groups Comparison (AJTm4)**

To evaluate the key differences between the three groups for statistical significance, AJTm4 was constructed. AJTm4 included the independent variables 'sentence type' (PO, DO, HNPS), 'givenness' (given-new, new-given), 'language background' ('English', 'German,' and 'Spanish'), and their interactions, as fixed effects. Additional fixed effects were verb, animacy of the theme argument, sequential stimulus position, and task order. Random intercepts were included for participants and items.

Initial model output from AJTm4 did not indicate the presence of a significant interaction between sentence type, givenness and language background, so the three-way interaction term was removed. A nested model comparison using a likelihood ratio test indicated that removal of the three-way interaction did not result in a significant reduction in model fit ( $LR = 4.2068, p = .3787$ ). The resulting model did not indicate presence of a significant interaction between language background and givenness, so the two-way interaction term was removed without significant reduction in model fit ( $LR = 0.3913, p = .8223$ ). The resulting model was adopted as the final version of AJTm4. The model output for AJTm4 is shown in Table 10.

Table 10. AJTm4 (monolingual English group, German-English bilingual group, Spanish-English bilingual group).

<i>Predictors</i>	<b>as.factor(Rating)</b>			
	<i>Odds Ratios</i>	<i>CI</i>	<i>Statistic</i>	<i>P</i>
1 2	0.03	0.01 – 0.06	-9.13	<b>&lt;0.001</b>
2 3	0.09	0.04 – 0.19	-6.26	<b>&lt;0.001</b>
3 4	0.18	0.09 – 0.38	-4.45	<b>&lt;0.001</b>
4 5	0.37	0.18 – 0.79	-2.58	<b>0.010</b>
5 6	0.94	0.44 – 1.99	-0.16	0.872
6 7	2.65	1.25 – 5.60	2.54	<b>0.011</b>
Sentence_type [DO]	0.78	0.57 – 1.07	-1.55	0.122
Sentence_type [HNPS]	0.20	0.15 – 0.28	-9.96	<b>&lt;0.001</b>
Givenness [new-given]	1.11	0.89 – 1.39	0.94	0.345
language_ background [German]	0.80	0.51 – 1.24	-1.00	0.317
language_ background [Spanish]	0.73	0.47 – 1.14	-1.37	0.170
Verb [bring]	0.82	0.42 – 1.59	-0.59	0.552
Verb [feed]	0.73	0.38 – 1.42	-0.92	0.355
Verb [hand]	0.34	0.14 – 0.82	-2.40	<b>0.016</b>
Verb [mail]	0.73	0.33 – 1.62	-0.78	0.438
Verb [offer]	0.91	0.49 – 1.70	-0.31	0.760
Verb [send]	0.51	0.26 – 1.03	-1.86	0.062
Verb [show]	0.46	0.24 – 0.88	-2.36	<b>0.018</b>
Verb [throw]	0.24	0.11 – 0.51	-3.68	<b>&lt;0.001</b>
animacy [aAI]	5.49	3.52 – 8.59	7.48	<b>&lt;0.001</b>
Taskorder	1.09	0.90 – 1.32	0.92	0.360
ListPosition	1.00	0.99 – 1.00	-0.32	0.746

- Table 10 continued -

Sentence_type [DO] * Givenness [new-given]	0.33	0.24 – 0.45	-6.96	<b>&lt;0.001</b>
Sentence_type [HNPS] * Givenness [new-given]	0.55	0.40 – 0.74	-3.83	<b>&lt;0.001</b>
Sentence_type [DO] * language_background [German]	1.05	0.71 – 1.54	0.25	0.806
Sentence_type [HNPS] * language_background [German]	1.52	1.04 – 2.21	2.16	<b>0.031</b>
Sentence_type [DO] * language_background [Spanish]	1.52	1.03 – 2.23	2.12	<b>0.034</b>
Sentence_type [HNPS] * language_background [Spanish]	4.33	2.95 – 6.34	7.52	<b>&lt;0.001</b>
<b>Random Effects</b>				
$\sigma^2$	3.29			
$\tau_{00}$ ProlificID	0.92			
$\tau_{00}$ token_set	0.06			
ICC	0.23			
$N$ ProlificID	180			
$N$ token_set	18			
Observations	3240			
Marginal $R^2$ / Conditional $R^2$	0.206 / 0.388			

Model output from AJTm4 indicates the presence of a significant interaction between sentence type and givenness, as well as a significant interaction between language background and sentence type. For the sentence type by givenness interaction, pairwise comparisons (Tukey) confirm that there was no significant difference in ratings between PO sentences in the given-new condition compared to the new-given condition ( $z = -0.945$ ,  $p = 0.9348$ ). In contrast, participants

were significantly more likely to assign higher ratings in the given-new condition compared to the new-given condition for DO sentences ( $z = 8.983, p < .0001$ ) and HNPS sentences ( $z = 4.581, p = 0.0001$ ).

For the sentence type by language background interaction, there was no significant difference between ratings of PO sentences by the monolingual English group compared to the German-English bilingual group ( $z = 1.001, p = 0.9859$ ) and compared to the Spanish-English bilingual group ( $z = 1.374, p = 0.9079$ ). Similarly, there was no significant difference between ratings of DO sentences by the monolingual English group compared to the German-English bilingual group ( $z = 0.798, p = 0.9969$ ) or the Spanish-English bilingual group ( $z = -0.477, p = 0.9999$ ). Recall that, in the within groups comparison, the Spanish-English bilingual group appeared to assign higher ratings to HNPS sentences compared to the other two groups. The pairwise comparisons from model output from AJTm4 confirm this contrast: HNPS sentences were significantly more likely to be assigned lower ratings by the bilingual German-English group ( $z = -4.371, p = 0.0004$ ) and the monolingual English group ( $z = -5.227, p < .0001$ ) compared to the Spanish-English bilingual group. In other words, the Spanish-English bilingual group assigned HNPS sentences significantly higher ratings across the board compared to the other two groups.

The within-group comparison also appeared to show a difference in the ratings of HNPS sentences by the monolingual English group compared to the German-English bilingual group; however, there was no significant difference between the ratings of HNPS sentences by these two groups overall ( $z = -0.868, p = 0.9946$ ). Comparing HNPS sentences across givenness conditions, the within-group comparison confirmed that the monolingual English group was significantly more likely to give HNPS sentences in the given-new condition higher ratings compared to in the new-given condition, while ratings of HNPS sentences by the German-English bilingual group did

not differ across givenness conditions. This might suggest that the monolingual English group gave HNPS sentences higher ratings specifically in the given-new condition compared to the German-English bilingual group; however, pairwise comparisons of HNPS across givenness conditions show that there is no significant difference between ratings of HNPS in the given-new condition by the monolingual English group and those of HNPS in the given-new condition by the German-English bilingual group ( $z = -0.868, p = 1.0000$ ).

Interestingly, the contrast between ratings of HNPS sentences in the given-new and new-given conditions in the German-English bilingual group, which was not significant in the within-group comparison, is now significant in AJTm4 ( $z = 4.581, p = 0.0007$ ). This could simply be because AJTm4 has more statistical power compared to AJTm2 by virtue of having a greater number of observations (3240 for AJTm4 compared to 1080 for AJTm2). For the purposes of within-group comparison, it also seems reasonable to assume that the model which is homogenous when it comes to language background (AJTm2) is more reliable for determining which patterns in the German-English bilingual responses are significant, as this model assesses the German-English bilingual group ‘on its own terms’. As a result, I will discount the significance of the relatively small contrast between the ratings for HNPS in the given-new and new-given conditions by the German-English bilingual group in AJTm4.

#### **4.2.6 Between-Groups Comparison Summary**

In summary, comparisons between the three experimental groups revealed that the Spanish-English bilingual group was significantly more likely to assign high ratings to HNPS sentences compared to the monolingual English and the German-English bilingual groups. In contrast, there was no significant difference between ratings of HNPS by the monolingual-English group and the German-English bilingual group. In other words, the results show one pattern of

results for the Spanish-English bilingual group, and a different pattern of results for the German-English bilingual and monolingual English groups. On its face, this finding could be interpreted as a difference based on language background; however, it is possible that the difference in the treatment of HNPS sentences is caused by some other difference between the two bilingual groups, and it not attributable to language background per se. The next section will consider factors such as general English proficiency, amount of English exposure, and frequency of English use as potential explanations for this apparent difference between the bilingual groups.

#### **4.2.7 Bilingual Between-groups Comparison (AJTm5)**

To evaluate the differences between the two bilingual groups for statistical significance, model AJTm5 was constructed. AJTm5 included the independent variables ‘sentence type’ (PO, DO, HNPS), ‘givenness’ (given-new, new-given), ‘language background’ (‘English’, ‘German,’ and ‘Spanish’), and their interactions, as fixed effects. Additional fixed effects were included for verb, animacy of the theme argument, sequential stimulus position, task order, general English proficiency (LEXTale score), self-ratings of English speaking proficiency, listening proficiency, and reading proficiency, composite English use score, composite English exposure score, self-identification of language dominance (‘Spanish’ or ‘both English and Spanish), and age of onset of English acquisition. Random intercepts were included for participants and items.

Initial model output from AJTm4 did not indicate the presence of a significant interaction between sentence type, givenness and language background, so the three-way interaction term was removed. A nested model comparison using a likelihood ratio test indicated that removal of the three-way interaction did not result in a significant reduction in model fit ( $LR = 3.011, p = 0.2219$ ). The resulting model did not indicate presence of a significant interaction between language background and givenness, so the two-way interaction term was removed without significant

reduction in model fit ( $LR = 0.3198$ ,  $p = 0.5717$ ). The resulting model was adopted as the final version of AJTm5. The model output for AJTm5 is shown in Table 11.

Table 11. AJTm5 (German-English bilingual group, Spanish-English bilingual group).

<i>Predictors</i>	<b>as.factor(Rating)</b>			
	<i>Odds Ratios</i>	<i>CI</i>	<i>Statistic</i>	<i>p</i>
1 2	0.02	0.00 – 0.20	-3.33	<b>0.001</b>
2 3	0.06	0.01 – 0.59	-2.42	<b>0.016</b>
3 4	0.12	0.01 – 1.21	-1.80	0.072
4 5	0.24	0.03 – 2.35	-1.22	0.222
5 6	0.64	0.07 – 6.22	-0.38	0.702
6 7	1.83	0.19 – 17.73	0.52	0.603
Sentence_type [DO]	0.79	0.56 – 1.10	-1.41	0.158
Sentence_type [HNPS]	0.30	0.21 – 0.41	-7.23	<b>&lt;0.001</b>
language_background [Spanish]	1.19	0.65 – 2.20	0.57	0.572
Givenness [new-given]	1.07	0.81 – 1.40	0.46	0.648
Verb [bring]	1.06	0.49 – 2.28	0.15	0.883
Verb [feed]	0.69	0.32 – 1.50	-0.93	0.352
Verb [hand]	0.37	0.13 – 1.04	-1.88	0.060
Verb [mail]	0.95	0.38 – 2.40	-0.11	0.914
Verb [offer]	1.18	0.57 – 2.42	0.44	0.662
Verb [send]	0.60	0.27 – 1.35	-1.24	0.216
Verb [show]	0.54	0.26 – 1.14	-1.61	0.108
Verb [throw]	0.27	0.11 – 0.67	-2.84	<b>0.004</b>
animacy [aAI]	4.99	2.98 – 8.36	6.11	<b>&lt;0.001</b>
Taskorder	0.97	0.78 – 1.21	-0.25	0.806

- Table 11 continued -

ListPosition	1.00	0.99 – 1.01	0.03	0.980
speaking English	1.00	0.90 – 1.11	0.03	0.976
understanding English	0.95	0.80 – 1.12	-0.61	0.543
reading English	1.09	0.89 – 1.34	0.86	0.390
LEX_score	1.00	0.99 – 1.02	0.32	0.752
composit_ENG_use	0.91	0.72 – 1.14	-0.82	0.411
composit_ENG_expose	0.84	0.56 – 1.27	-0.83	0.408
What language do you feel most comfortable with [German]	1.16	0.69 – 1.96	0.56	0.574
What language do you feel most comfortable with [Spanish]	0.68	0.39 – 1.19	-1.35	0.178
What age were you when you began learning English?	0.98	0.92 – 1.04	-0.64	0.521
Sentence_type [DO] * language_background [Spanish]	1.42	0.97 – 2.09	1.81	0.071
Sentence_type [HNPS] * language_background [Spanish]	2.75	1.88 – 4.02	5.22	<b>&lt;0.001</b>
Sentence_type [DO] * Givenness [new-given]	0.36	0.25 – 0.53	-5.17	<b>&lt;0.001</b>
Sentence_type [HNPS] * Givenness [new-given]	0.59	0.41 – 0.87	-2.70	<b>0.007</b>

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**Random Effects**

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$\sigma^2$	3.29
$\tau_{00}$ ProlificID	0.78
$\tau_{00}$ token_set	0.08
ICC	0.21



- Table 11 continued -

N <sub>ProlificID</sub>	119
N <sub>token_set</sub>	18
Observations	2142
Marginal R <sup>2</sup> / Conditional R <sup>2</sup>	0.192 / 0.358

Model output from AJTm5 indicates the presence of a significant interaction between sentence type and givenness, as well as a significant interaction between language background and sentence type. For the sentence type by givenness interaction, pairwise comparisons (Tukey) confirm that there was no significant difference in ratings between PO sentences in the given-new condition compared to the new-given condition ( $z = -0.457, p = 0.9975$ ). In contrast, DO sentences ( $z = 6.888, p < .0001$ ) and HNPS sentences ( $z = 3.431, p = 0.0079$ ) were significantly more likely to receive higher ratings in the given-new condition compared to the new-given condition. For the sentence type by language background interaction, pairwise comparisons confirm that there was no significant difference in the ratings assigned by the two bilingual groups to PO sentences ( $z = -0.565, p = 0.9932$ ) or DO sentences ( $z = -1.707, p = 0.5273$ ); however, the two groups did differ significantly in their ratings of HNPS sentences ( $z = -3.835, p = 0.0017$ ), such that the Spanish-English bilingual group was significantly more likely to assign HNPS higher ratings compared to the German-English bilingual group.

Importantly, there were no significant effects of predictors related to English proficiency, use, or exposure (general English proficiency, self-ratings of English speaking proficiency, listening proficiency, and reading proficiency, composite English use score, composite English exposure score, self-identification of language dominance, and age of onset of English acquisition). The results of AJTm5 showed a significant effect of language background even when predictors

related to experience with English were included in the model, which suggests that the effect of language background cannot be reduced to these factors. In order to explore whether other aspects of the participants' linguistic background could be responsible for their differing results in the AJT, an additional version of AJTm5, which I will call AJTm5', was constructed. The use of the prime symbol in the model name is meant to indicate that this model is exploratory, since it includes predictors that were not among those linguistic background characteristics that were chosen for inclusion in the statistical analysis at the outset. I have adopted this convention in order to clearly indicate which analyses are exploratory, in keeping with best practices for statistical modeling in linguistics (see Winter, 2019).

AJTm5' included predictors related to participants' domains of English use (English use at school, at work, at home, with a partner, or in social situations). The results are shown in Table 12.

Table 12. AJTm5' (German-English bilingual group, Spanish-English bilingual group),  
Exploratory analysis of English use across domains.

<i>Predictors</i>	<b>as.factor(Rating)</b>			
	<i>Odds Ratios</i>	<i>CI</i>	<i>Statistic</i>	<i>p</i>
1 2	0.20	0.01 – 5.25	-0.96	0.337
2 3	0.59	0.02 – 15.27	-0.32	0.752
3 4	1.22	0.05 – 31.34	0.12	0.906
4 5	2.38	0.09 – 61.29	0.52	0.601
5 6	6.29	0.24 – 162.17	1.11	0.267
6 7	17.95	0.69 – 463.55	1.74	0.082
Sentence_type [DO]	0.78	0.56 – 1.10	-1.42	0.156
Sentence_type [HNPS]	0.30	0.21 – 0.41	-7.25	<b>&lt;0.001</b>
language_ background [Spanish]	1.09	0.59 – 2.01	0.27	0.790
Givenness [new-given]	1.07	0.81 – 1.40	0.46	0.646

- Table 12 continued -

Verb [bring]	1.06	0.49 – 2.27	0.15	0.884
Verb [feed]	0.69	0.32 – 1.49	-0.94	0.346
Verb [hand]	0.38	0.14 – 1.04	-1.88	0.060
Verb [mail]	0.95	0.38 – 2.40	-0.10	0.917
Verb [offer]	1.17	0.57 – 2.41	0.43	0.666
Verb [send]	0.60	0.27 – 1.35	-1.24	0.217
Verb [show]	0.54	0.26 – 1.14	-1.61	0.108
Verb [throw]	0.27	0.11 – 0.67	-2.86	<b>0.004</b>
animacy [aAI]	4.97	2.97 – 8.32	6.10	<b>&lt;0.001</b>
Taskorder	1.01	0.82 – 1.26	0.11	0.913
ListPosition	1.00	0.99 – 1.01	0.03	0.980
speaking English	0.98	0.88 – 1.10	-0.29	0.770
understanding English	0.94	0.80 – 1.10	-0.76	0.448
reading English	1.12	0.92 – 1.36	1.11	0.268
LEX_score	1.00	0.99 – 1.02	0.57	0.569
composit_ENG_use	0.88	0.68 – 1.15	-0.92	0.355
composit_ENG_expose	0.90	0.60 – 1.34	-0.51	0.612
What language do you feel most comfortable with [German]	1.02	0.60 – 1.73	0.08	0.935
What language do you feel most comfortable with [Spanish]	0.59	0.34 – 1.02	-1.89	0.059
What age were you when you began learning English?	0.97	0.91 – 1.03	-1.06	0.288
English at school	1.02	0.93 – 1.11	0.39	0.700

- Table 12 continued -

English at home	1.20	0.96 – 1.50	1.59	0.112
English at work	1.05	0.97 – 1.13	1.13	0.257
English in social situations	1.09	0.89 – 1.34	0.85	0.397
Does partner speak English? [?Prefer not to say]	6.76	1.55 – 29.59	2.54	<b>0.011</b>
Does partner speak English? [?Yes]	1.47	0.93 – 2.32	1.67	0.096
Sentence_type [DO] * language_background [Spanish]	1.42	0.97 – 2.08	1.80	0.072
Sentence_type [HNPS] * language_background [Spanish]	2.76	1.88 – 4.03	5.23	<b>&lt;0.001</b>
Sentence_type [DO] * Givenness [new-given]	0.36	0.25 – 0.53	-5.17	<b>&lt;0.001</b>
Sentence_type [HNPS] * Givenness [new-given]	0.60	0.41 – 0.87	-2.69	<b>0.007</b>
<hr/> <b>Random Effects</b> <hr/>				
$\sigma^2$	3.29			
$\tau_{00}$ ProlificID	0.69			
$\tau_{00}$ token_set	0.07			
ICC	0.19			
$N$ ProlificID	119			
$N$ token_set	18			
Observations	2142			
Marginal $R^2$ / Conditional $R^2$	0.210 / 0.359			

Among the new predictors, only whether the participant's partner speaks English is significant ( $z = 2.54, p = .011$ ). Importantly, the output from AJTm5' still indicates a significant interaction between sentence type and language background such that the Spanish-English bilingual group was significantly more likely to give HNPS sentences higher ratings compared to the German-English bilingual group ( $z = -3.528, p = 0.0056$ ). This result shows that the effects of language background remain significant even when these additional factors are included in the model, which suggests that the effect associated with language background is not reducible to effects of these factors.

#### **4.2.8 Bilingual Between-Groups Comparison Summary**

In summary, the between-groups comparison of the two bilingual groups revealed that the Spanish-English bilingual group and the German-English bilingual group performed differently overall on the AJT. Specifically, participants from the Spanish-English bilingual group were significantly more likely to assign higher ratings to HNPS sentences across the board compared to the German-English bilingual groups. The goal of this analysis was to determine whether this apparent difference between the groups could be attributed to factors related to English proficiency, exposure, or use (AJTm5). An exploratory analysis of the effects of English use across social domains (at home, at work, at school, in social situations, and with a partner) was also conducted (AJTm5'). The output from AJTm5 and AJTm5' revealed that the effect of language background persisted even when these factors were added to the model. This result suggests that the difference between the two groups observed in the AJT is cannot be reduced to the effects of variables related to their experience with English.

### 4.3 Forced-choice Task

In the forced choice task, participants were asked to choose the sentence that they preferred after considering two possible options: either (a) a PO sentence and a DO sentence or (b) a PO sentence and a HNPS sentence. Further, sentence type and givenness were crossed, resulting in four possible types of choices (conditions): ‘PO<sub>given-new</sub> or DO<sub>new-given</sub>’; ‘PO<sub>new-given</sub> or DO<sub>given-new</sub>’; ‘PO<sub>given-new</sub> or HNPS<sub>new-given</sub>’; and ‘PO<sub>new-given</sub> or HNPS<sub>given-new</sub>’. Crossing sentence type and givenness in this way allows the effect of givenness on sentence choice to be examined.

To evaluate the results of the forced-choice task (FCT) for statistical significance, the participants’ sentence choices in each condition were submitted to a series of mixed effects binary logistic regression models. The first three models were fitted to the three L1 groups individually and were used to evaluate within-groups differences for statistical significance. FCT model 1 (FCTm1) was fitted to the results from the monolingual English group, FCT model 2 (FCTm2) was fitted to the results from the German-English bilingual group, and FCT model 3 (FCTm3) was fitted to the results from the Spanish-English bilingual group. FCT model 4 (FCTm4) and FCT model 5 (FCTm5) were used to evaluate between-groups differences in the experimental conditions for statistical significance. FCTm4 was fitted to the combined results from all three language groups, and FCTm5 was fitted to the combined results of the two bilingual groups. An exploratory model, FCTm5’, considered the effects of English use across domains. Random intercepts were included for participants and items. In each analysis, choice (a) (PO sentence vs. DO sentence) and choice (b) (PO sentence vs. HNPS sentence) were analyzed separately.

#### 4.3.1 Monolingual English Speakers (FCTm1)

Figure 4-5 shows the number of trials in which monolingual English speakers chose PO and DO sentences across the givenness conditions. The left-hand panel represents sentence choice

in the  $PO_{\text{given-new}}$  or  $DO_{\text{new-given}}$  condition, while the right-hand panel represents sentence choice in the  $PO_{\text{new-given}}$  or  $DO_{\text{given-new}}$  condition. Bars represent the number of tokens of each sentence chosen in each information structure condition. Using the raw counts (as opposed to proportions, for example) is possible because each condition was presented an equal number of times. The left-hand panel shows that monolingual English speakers overwhelmingly prefer PO sentences when the alternative is a DO sentence with new-given information order. The right-hand panel shows that the number of DO tokens increases when the DO sentence has given-new information order.

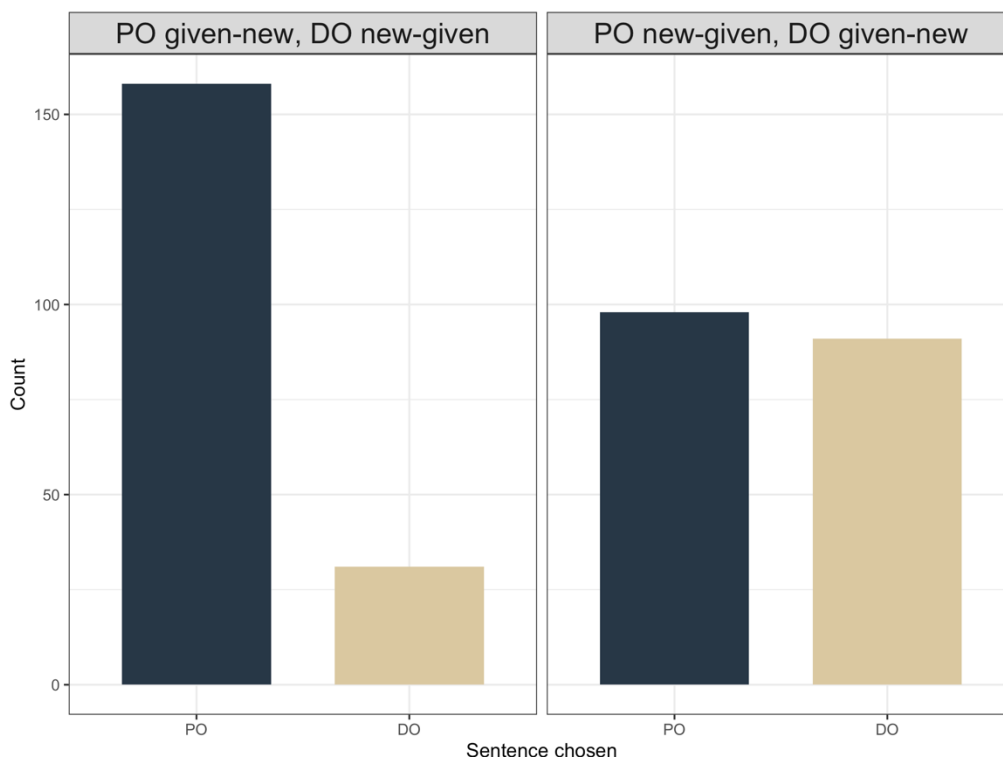


Figure 4-5. Monolingual English speakers' choice of PO or DO by givenness.

To evaluate these patterns for statistical significance, FCTm1a was fitted to the results from the monolingual English group in the 'PO vs. DO' conditions. FCTm1a included the independent variable 'condition' ( $PO_{\text{new-given}}$  or  $DO_{\text{given-new}}$ ,  $PO_{\text{given-new}}$  or  $DO_{\text{new-given}}$ ) as a fixed effect.

Additional fixed effects were verb, sequential stimulus position, task order, and animacy of the post-verbal arguments. Random slopes effects were included for participants and items. The model output from FCTm1a is shown in Table 13.

Table 13. Monolingual English speaker PO-DO model output.

<b>factor(sentence_type_chosen)</b>				
<i>Predictors</i>	<i>Odds Ratios</i>	<i>CI</i>	<i>Statistic</i>	<i>p</i>
(Intercept)	0.29	0.08 – 1.02	-1.93	0.053
ListPosition	0.99	0.96 – 1.01	-1.01	0.314
Taskorder	1.04	0.74 – 1.46	0.21	0.837
Condition [b]	5.57	3.27 – 9.46	6.34	<b>&lt;0.001</b>
Verb [give]	1.62	0.38 – 6.92	0.65	0.517
Verb [mail]	0.31	0.06 – 1.59	-1.41	0.158
Verb [offer]	1.36	0.44 – 4.19	0.54	0.590
Verb [sell]	0.74	0.17 – 3.24	-0.40	0.686
Verb [send]	0.67	0.15 – 2.99	-0.52	0.604
Verb [serve]	0.62	0.14 – 2.75	-0.63	0.530
Verb [show]	0.77	0.27 – 2.23	-0.48	0.634
Verb [throw]	0.32	0.09 – 1.21	-1.68	0.092
animacy [aAI]	0.76	0.35 – 1.68	-0.67	0.502



- Table 13 continued -

<b>Random Effects</b>	
$\sigma^2$	3.29
$\tau_{00}$ ProlificID	0.32
$\tau_{00}$ token_set	0.00
$N$ ProlificID	63
$N$ token_set	12
Observations	378
Marginal $R^2$ / Conditional $R^2$	0.235 / NA

Model output from FCTm1a shows a significant effect of condition ( $p < .001$ ). The parameter estimate for ‘Condition [b]’ is positive, meaning that participants were significantly more likely to choose a DO sentence in the ‘PO<sub>new-given</sub> or DO<sub>given-new</sub>’ condition compared to the ‘PO<sub>given-new</sub> or DO<sub>new-given</sub>’ condition.

Figure 4-6 shows the number of trials in which monolingual English speakers chose PO and HNPS sentences across the givenness conditions. Monolingual English speakers preferred PO sentences in both conditions, but tokens of HNPS increased in the ‘PO<sub>new-given</sub> or HNPS<sub>given-new</sub>’ condition.

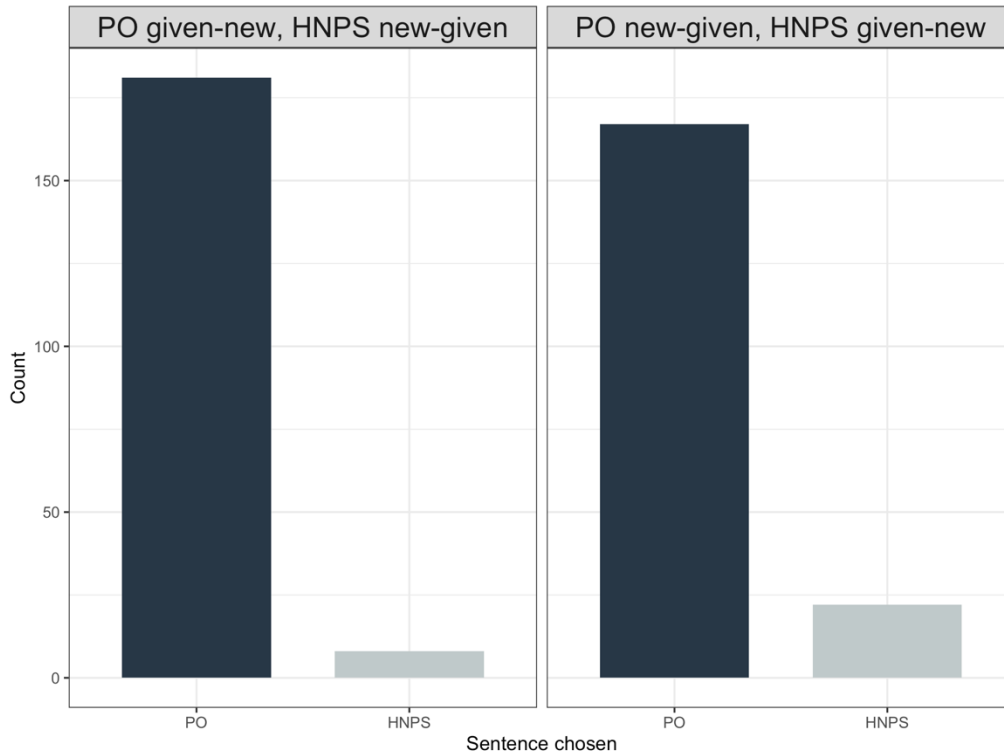


Figure 4-6. Monolingual English speakers' choice of PO or HNPS by givenness.

To evaluate these patterns for statistical significance, FCTm1b was fitted to the results from the monolingual English group in the 'PO vs. HNPS' conditions. FCTm1b included the independent variable 'condition' ( $PO_{\text{new-given}}$  or  $HNPS_{\text{given-new}}$ ,  $PO_{\text{given-new}}$  or  $HNPS_{\text{new-given}}$ ) as a fixed effect. Additional fixed effects were verb, sequential stimulus position, task order, and animacy of the post-verbal arguments. Random slopes effects were included for participants and items. The model output from FCTm1a is shown in Table 14.

Table 14. Monolingual English speaker PO-HNPS model output.

<b>factor(sentence_type_chosen)</b>				
<i>Predictors</i>	<i>Odds Ratios</i>	<i>CI</i>	<i>Statistic</i>	<i>p</i>
(Intercept)	0.07	0.01 – 0.61	-2.39	<b>0.017</b>
ListPosition	1.01	0.97 – 1.05	0.41	0.684
Taskorder	0.47	0.24 – 0.90	-2.26	<b>0.024</b>
Condition [d]	4.05	1.56 – 10.55	2.87	<b>0.004</b>
Verb [give]	7.39	0.64 – 85.10	1.60	0.109
Verb [mail]	1.21	0.07 – 20.40	0.13	0.896
Verb [offer]	1.90	0.29 – 12.59	0.66	0.507
Verb [sell]	0.00	0.00 – Inf	-0.04	0.970
Verb [send]	2.52	0.18 – 34.79	0.69	0.489
Verb [serve]	0.83	0.05 – 14.64	-0.12	0.902
Verb [show]	3.67	0.63 – 21.22	1.45	0.147
Verb [throw]	0.70	0.08 – 6.33	-0.32	0.749
animacy [aAI]	0.39	0.11 – 1.42	-1.43	0.153
<b>Random Effects</b>				
$\sigma^2$	3.29			
$\tau_{00}$ ProlificID	0.97			
$\tau_{00}$ token_set	0.00			
N ProlificID	63			
N token_set	12			
Observations	378			
Marginal R <sup>2</sup> / Conditional R <sup>2</sup>	0.873 / NA			

Model output from FCTm1b shows a significant effect of condition ( $p = 0.00417$ ). The parameter estimate for ‘Condition [d]’ is positive, meaning that participants were significantly more likely to choose a HNPS sentence in the ‘PO<sub>new-given</sub> or HNPS<sub>given-new</sub>’ condition compared to the ‘PO<sub>given-new</sub> or HNPS<sub>new-given</sub>’ condition. There was also a significant effect of task order ( $p = 0.024$ ). Each participant completed the tasks in one of three possible orders: Task order 1 (AJT, FCT, SPR), task order 2 (SPR, AJT, FCT), or task order 3 (FCT, SPR, AJT). In order to examine potential differences between the task orders, the model was re-run with task order 1 set as the reference level. The results indicated that HNPS sentences were significantly less likely to be chosen in task order 3 compared to task order 1 ( $p = 0.0338$ ), while there was no significant difference between task order 1 and task order 2. In other words, those speakers who completed the FCT first were significantly less likely to choose HNPS sentences compared to speakers who completed the FCT after completing the AJT.

#### 4.3.2 German-English Bilingual Speakers (FCTm2)

Figure 4-7 shows the number of trials in which German-English bilingual speakers chose PO and DO sentences across the information structure conditions. The left-hand panel shows that the German-English bilingual speakers preferred PO sentences in the ‘PO<sub>given-new</sub> or DO<sub>new-given</sub>’ condition, but DO tokens increased in the ‘PO<sub>new-given</sub> or DO<sub>given-new</sub>’ condition.

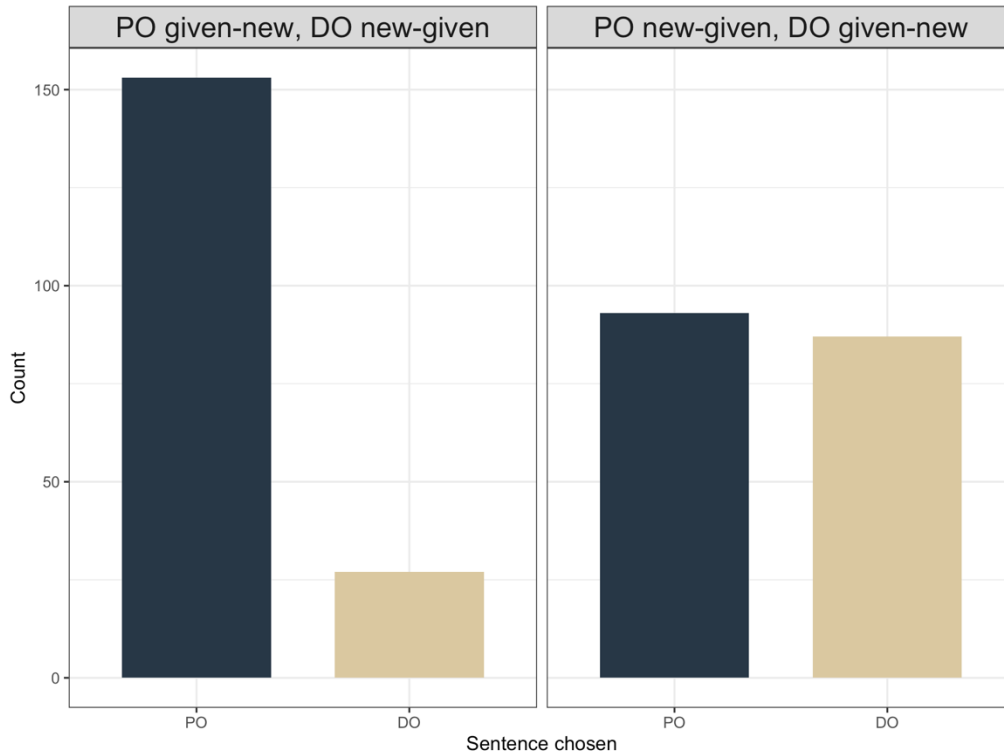


Figure 4-7. German-English bilingual speakers' choice of PO or DO by information order.

To evaluate these patterns for statistical significance, FCTm2a was fitted to the results from the German-English bilingual group in the 'PO vs. DO' conditions. FCTm2a included the independent variable 'condition' ( $PO_{\text{new-given}}$  or  $DO_{\text{given-new}}$ ,  $PO_{\text{given-new}}$  or  $DO_{\text{new-given}}$ ) as a fixed effect, in addition to fixed effects for verb, animacy of the theme argument, sequential stimulus position, and task order. FCTm2a also included a set of fixed effects that were specific to the bilingual groups. These fixed effects were general English proficiency (LEXTale score), self-ratings of English speaking proficiency, listening proficiency, and reading proficiency, composite English use score, composite English exposure score, self-identification of language dominance ('German' or 'both English and German'), and age of onset of English acquisition. The model output from FCTm2a is shown in Table 15.

Table 15. German-English bilingual PO-DO model output (FCTm2a).

<i>Predictors</i>	<b>factor(sentence_type_chosen)</b>			
	<i>Odds Ratios</i>	<i>CI</i>	<i>Statistic</i>	<i>p</i>
(Intercept)	1.57	0.04 – 56.98	0.25	0.806
ListPosition	1.01	0.98 – 1.03	0.57	0.571
Taskorder	1.01	0.70 – 1.45	0.05	0.960
Condition [b]	6.42	3.72 – 11.10	6.67	<b>&lt;0.001</b>
Verb [give]	5.63	1.22 – 25.87	2.22	<b>0.026</b>
Verb [mail]	1.51	0.29 – 7.85	0.49	0.626
Verb [offer]	3.38	0.99 – 11.55	1.94	0.052
Verb [sell]	4.65	0.99 – 21.92	1.94	0.052
Verb [send]	2.15	0.44 – 10.48	0.95	0.342
Verb [serve]	6.39	1.39 – 29.37	2.39	<b>0.017</b>
Verb [show]	2.42	0.78 – 7.48	1.54	0.125
Verb [throw]	0.33	0.07 – 1.61	-1.37	0.170
animacy [aAI]	0.51	0.23 – 1.15	-1.63	0.104
speaking English	1.07	0.94 – 1.22	1.05	0.294
understanding English	0.94	0.70 – 1.27	-0.39	0.695
reading English	1.12	0.75 – 1.68	0.56	0.577
LEX_score	0.96	0.94 – 0.99	-2.83	<b>0.005</b>
composit_ENG_use	0.72	0.51 – 1.02	-1.87	0.062
composit_ENG_expose	1.10	0.61 – 2.00	0.31	0.753
What language do you feel most comfortable with [German]	0.98	0.55 – 1.76	-0.06	0.955
What age were you when you began learning English?	0.99	0.84 – 1.16	-0.16	0.874

- Table 15 continued -

<b>Random Effects</b>	
$\sigma^2$	3.29
$\tau_{00}$ ProlificID	0.00
$\tau_{00}$ token_set	0.00
N ProlificID	60
N token_set	12
Observations	360
Marginal $R^2$ / Conditional $R^2$	0.345 / NA

Model output from FCTm2a shows a significant effect of condition ( $p < .001$ ). The parameter estimate for ‘Condition [b]’ is positive, indicating that participants were significantly more likely to choose a DO sentence in the ‘PO<sub>new-given</sub> or DO<sub>given-new</sub>’ condition. Additionally, there was a significant main effect of general English proficiency ( $z = -2.833$ ,  $p = .00461$ ), such that participants were less likely to choose DO sentences as LEXTale score increased. Data visualizations suggest that this effect was driven mainly by a decrease in DO selections in the PO<sub>given-new</sub> or DO<sub>new-given</sub> condition by participants with higher LEXTale scores. There was also a marginally significant main effect of composite English use score ( $z = -1.865$ ,  $p = .06211$ ), such that DO selections decreased as composite use score increased.

Figure 4-8 shows the number of trials in which German-English bilingual speakers chose PO and HNPS sentences across the information structure conditions. German-English bilingual speakers preferred PO sentences over HNPS sentences in both information structure conditions, though the number of HNPS tokens increases in the ‘PO<sub>new-given</sub> or HNPS<sub>given-new</sub>’ condition.

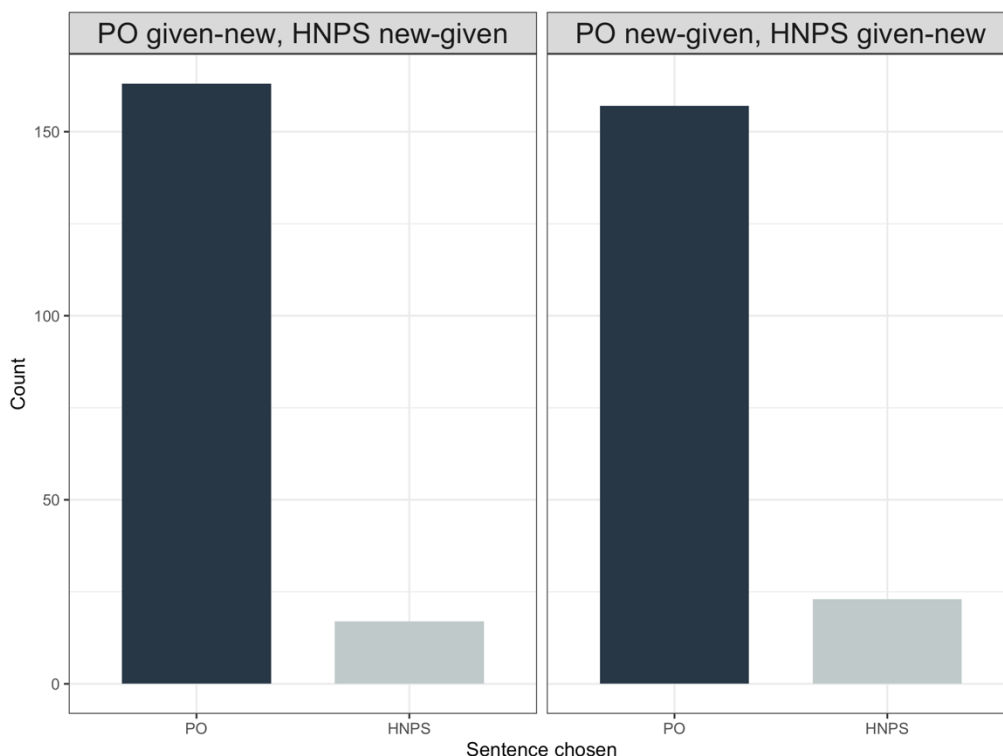


Figure 4-8. German-English bilingual speakers' choice of PO or HNPS by information order.

To evaluate these patterns for statistical significance, FCTm2b was fitted to the results from the German-English bilingual group in the 'PO vs. HNPS' conditions. FCTm2b included the independent variable 'condition' ( $PO_{\text{new-given}}$  or  $HNPS_{\text{given-new}}$ ,  $PO_{\text{given-new}}$  or  $HNPS_{\text{new-given}}$ ) as a fixed effect, in addition to fixed effects for verb, animacy of the theme argument, sequential stimulus position, and task order. FCTm2b also included a set of fixed effects that were specific to the bilingual groups. These fixed effects were general English proficiency (LEXTale score), self-ratings of English speaking proficiency, listening proficiency, and reading proficiency, composite English use score, composite English exposure score, self-identification of language dominance ('German' or 'both English and German'), and age of onset of English acquisition. The model output from FCTm2b is shown in Table 16.



Table 16. German-English bilingual PO-HNPS model output (FCTm2b).

<i>Predictors</i>	<b>factor(sentence_type_chosen)</b>			
	<i>Odds Ratios</i>	<i>CI</i>	<i>Statistic</i>	<i>p</i>
(Intercept)	31.54	0.02 – 60685.16	0.89	0.371
ListPosition	1.00	0.96 – 1.04	-0.02	0.985
Taskorder	1.18	0.49 – 2.83	0.37	0.709
Condition [d]	1.62	0.73 – 3.58	1.20	0.232
Verb [give]	3.08	0.25 – 37.95	0.88	0.379
Verb [mail]	0.33	0.02 – 6.36	-0.73	0.464
Verb [offer]	2.03	0.33 – 12.45	0.76	0.446
Verb [sell]	1.19	0.09 – 15.95	0.13	0.894
Verb [send]	3.55	0.31 – 41.29	1.01	0.312
Verb [serve]	2.52	0.23 – 27.86	0.76	0.450
Verb [show]	0.58	0.09 – 3.84	-0.57	0.571
Verb [throw]	1.85	0.26 – 12.98	0.62	0.538
animacy [aAI]	0.73	0.17 – 3.09	-0.42	0.673
speaking English	0.98	0.75 – 1.28	-0.14	0.885
understanding English	1.18	0.60 – 2.29	0.47	0.636
reading English	0.81	0.33 – 1.98	-0.46	0.644
LEX_score	0.92	0.87 – 0.98	-2.60	<b>0.009</b>
composit_ENG_use	0.92	0.43 – 1.96	-0.22	0.824
composit_ENG_expose	0.97	0.27 – 3.53	-0.05	0.962
What language do you feel most comfortable with [German]	0.43	0.12 – 1.58	-1.27	0.204
What age were you when you began learning English?	1.13	0.78 – 1.63	0.65	0.518

- Table 16 continued -

<b>Random Effects</b>	
$\sigma^2$	3.29
$\tau_{00}$ ProlificID	1.79
$\tau_{00}$ token_set	0.00
N ProlificID	60
N token_set	12
Observations	360
Marginal R <sup>2</sup> / Conditional R <sup>2</sup>	0.364 / NA

Results do not indicate a significant effect of condition ( $z = 1.20, p = 0.232$ ). Participants were not significantly more likely to choose a HNPS sentence in the ‘PO<sub>new-given</sub> or HNPS<sub>given-new</sub>’ condition. There was a significant main effect of general English proficiency ( $z = -2.83, p = 0.005$ ) such that participants were less likely to choose HNPS sentences as LEXTale score increased. There was also a marginally significant main effect of composite English use score ( $z = -1.87, p = 0.062$ ) such that HNPS selections decreased as composite English use score increased.

### 4.3.3 Spanish-English Bilingual Group (FCTm3)

Figure 4-9 shows the number of trials in which Spanish-English bilingual speakers chose PO and DO sentences across the givenness conditions. The left-hand panel shows that Spanish-English bilingual speakers preferred PO sentences in the ‘PO<sub>given-new</sub> or DO<sub>new-given</sub>’ condition, though the number of DO tokens increased in the ‘PO<sub>new-given</sub> or DO<sub>given-new</sub>’ condition. Interestingly, compared to the other two groups, the Spanish-English bilingual group appears to choose DO sentences more often in the new-given condition.

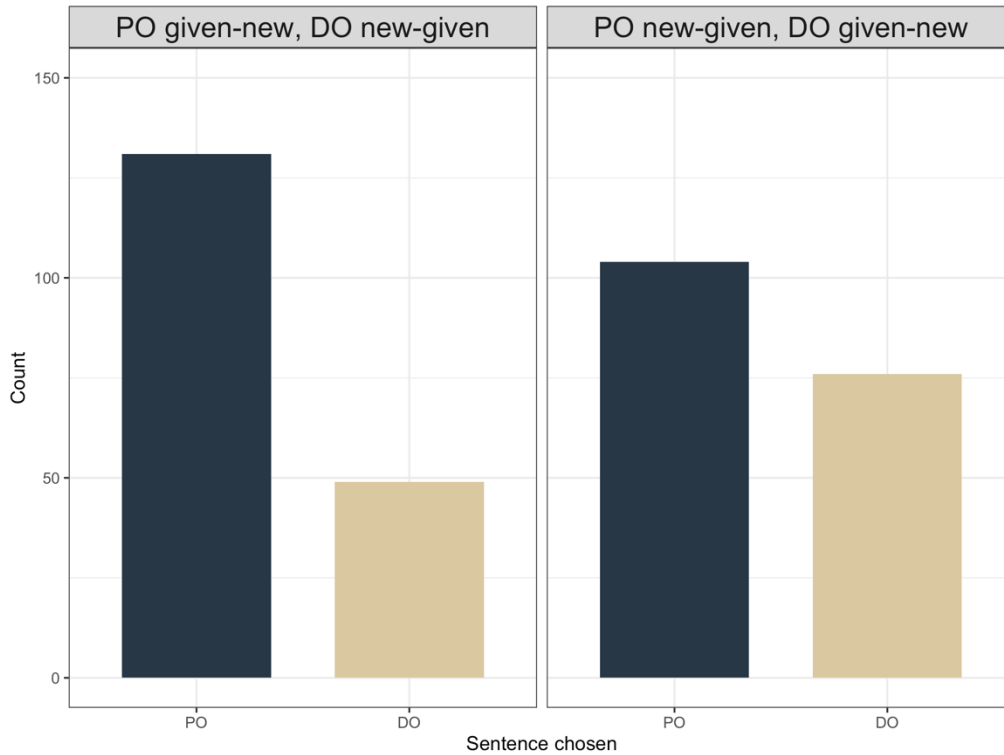


Figure 4-9. Spanish-English bilingual speakers' choice of PO or DO by givenness.

To evaluate these patterns for statistical significance, FCTm3a was fitted to the results from the Spanish-English bilingual group in the 'PO vs. DO' conditions. FCTm3a included the independent variable 'condition' ( $PO_{\text{new-given}}$  or  $DO_{\text{given-new}}$ ,  $PO_{\text{given-new}}$  or  $DO_{\text{new-given}}$ ) as a fixed effect, in addition to fixed effects for verb, animacy of the theme argument, sequential stimulus position, and task order. FCTm3a also included a set of fixed effects that were specific to the bilingual groups. These fixed effects were general English proficiency (LEXTale score), self-ratings of English speaking proficiency, listening proficiency, and reading proficiency, composite English use score, composite English exposure score, self-identification of language dominance ('Spanish' or 'both English and Spanish'), and age of onset of English acquisition. The model output from FCTm3a is shown in Table 17.

Table 17. Spanish-English bilingual PO-DO model output.

<i>Predictors</i>	<b>factor(sentence_type_chosen)</b>			
	<i>Odds Ratios</i>	<i>CI</i>	<i>Statistic</i>	<i>p</i>
(Intercept)	11.42	0.42 – 311.14	1.44	0.149
ListPosition	1.01	0.98 – 1.03	0.44	0.663
Taskorder	1.25	0.92 – 1.69	1.42	0.156
Condition [b]	2.07	1.28 – 3.33	2.97	<b>0.003</b>
Verb [give]	0.67	0.17 – 2.55	-0.59	0.552
Verb [mail]	0.38	0.09 – 1.50	-1.39	0.166
Verb [offer]	0.49	0.17 – 1.43	-1.30	0.194
Verb [sell]	0.21	0.05 – 0.94	-2.04	<b>0.042</b>
Verb [send]	0.21	0.05 – 0.93	-2.06	<b>0.039</b>
Verb [serve]	0.56	0.15 – 2.10	-0.85	0.393
Verb [show]	0.60	0.23 – 1.57	-1.04	0.297
Verb [throw]	0.17	0.05 – 0.57	-2.85	<b>0.004</b>
animacy [aAI]	0.94	0.46 – 1.94	-0.16	0.873
speaking English	0.92	0.73 – 1.16	-0.69	0.487
understanding English	1.15	0.91 – 1.46	1.15	0.252
reading English	0.95	0.74 – 1.21	-0.42	0.676
composit_ENG_use	0.97	0.69 – 1.36	-0.20	0.839
composit_ENG_expose	0.92	0.53 – 1.62	-0.28	0.777
LEX_score	0.97	0.94 – 0.99	-2.71	<b>0.007</b>
What language do you feel most comfortable with [Spanish]	0.63	0.35 – 1.11	-1.59	0.112
What age were you when you began learning English?	0.98	0.91 – 1.04	-0.72	0.470

- Table 17 continued -

<b>Random Effects</b>	
$\sigma^2$	3.29
$\tau_{00}$ ProlificID	0.05
$\tau_{00}$ token_set	0.00
ICC	0.02
$N$ ProlificID	60
$N$ token_set	12
Observations	360
Marginal $R^2$ / Conditional $R^2$	0.165 / 0.179

The model output from FCTm3a indicates a significant effect of condition ( $z = -2.71, p = 0.003$ ). The parameter estimate for ‘Condition [b]’ is positive, indicating that participants were significantly more likely to choose a DO sentence in the ‘PO<sub>new-given</sub> or DO<sub>given-new</sub>’ condition. Additionally, there is a significant effect of general English proficiency ( $z = -2.71, p = 0.007$ ), such that participants were less likely to choose DO sentences as LEXTale score increased. Data visualizations suggest that this effect was driven primarily by a decrease in DO selections in the PO<sub>given-new</sub> or DO<sub>new-given</sub> condition by participants with higher LEXTale scores.

Figure 4-10 shows the number of trials in which Spanish-English bilingual speakers chose PO and HNPS sentences across the information structure conditions. Spanish-English bilingual speakers preferred PO sentences in both information structure conditions, though tokens of HNPS increased in the ‘PO<sub>new-given</sub> or HNPS<sub>given-new</sub>’ condition.

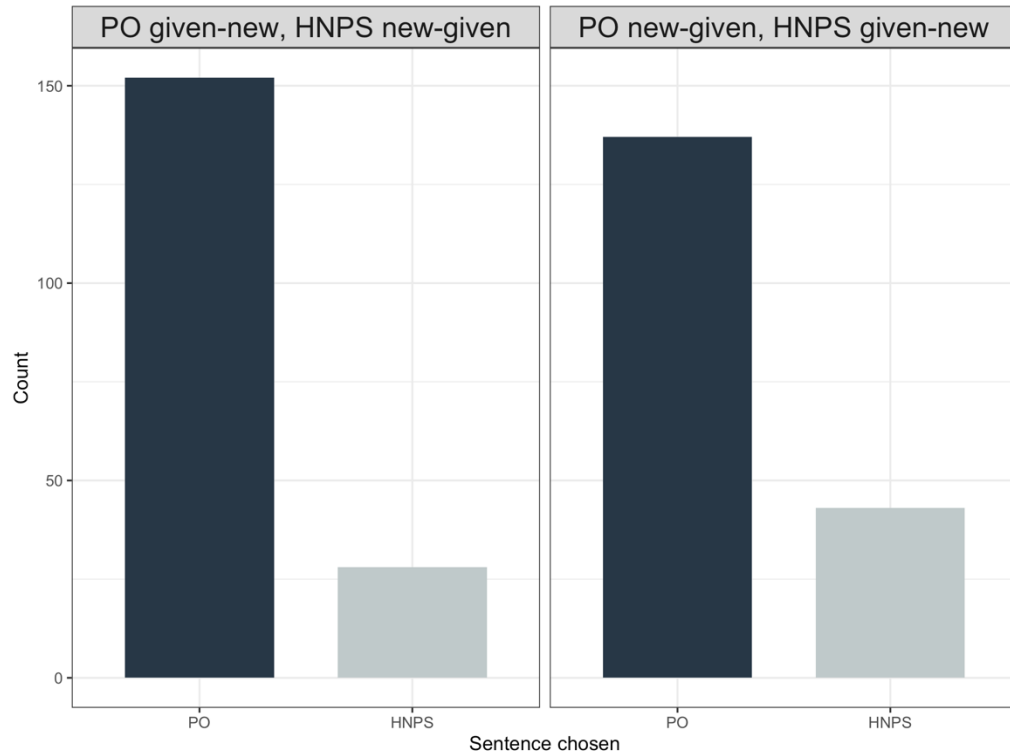


Figure 4-10. Spanish-English bilingual speakers' choice of PO or HNPS by information order.

To evaluate these patterns for statistical significance, FCTm3b was fitted to the results from the Spanish-English bilingual group in the 'PO vs. HNPS' conditions. FCTm3b included the independent variable 'condition' ( $PO_{\text{new-given}}$  or  $HNPS_{\text{given-new}}$ ,  $PO_{\text{given-new}}$  or  $HNPS_{\text{new-given}}$ ) as a fixed effect, in addition to fixed effects for verb, animacy of the theme argument, sequential stimulus position, and task order. FCTm3b also included a set of fixed effects that were specific to the bilingual groups. These fixed effects were general English proficiency (LEXTale score), self-ratings of English speaking proficiency, listening proficiency, and reading proficiency, composite English use score, composite English exposure score, self-identification of language dominance ('Spanish' or 'both English and Spanish'), and age of onset of English acquisition. The model output from FCTm3b is shown in Table 18.

Table 18. Spanish-English bilingual PO-HNPS model output.

<i>Predictors</i>	<b>factor(sentence_type_chosen)</b>			
	<i>Odds Ratios</i>	<i>CI</i>	<i>Statistic</i>	<i>p</i>
(Intercept)	0.39	0.00 – 54.12	-0.37	0.709
ListPosition	0.98	0.95 – 1.01	-1.51	0.132
Taskorder	1.26	0.79 – 2.03	0.96	0.336
Condition [d]	1.98	1.08 – 3.63	2.20	<b>0.028</b>
Verb [give]	4.55	0.65 – 31.76	1.53	0.126
Verb [mail]	5.45	0.94 – 31.75	1.89	0.059
Verb [offer]	4.13	1.02 – 16.70	1.99	<b>0.046</b>
Verb [sell]	4.19	0.66 – 26.54	1.52	0.128
Verb [send]	1.61	0.22 – 11.67	0.47	0.637
Verb [serve]	2.51	0.36 – 17.45	0.93	0.352
Verb [show]	2.05	0.50 – 8.36	1.00	0.317
Verb [throw]	0.54	0.08 – 3.82	-0.61	0.539
animacy [aAI]	0.49	0.18 – 1.33	-1.39	0.164
speaking English	1.35	0.94 – 1.93	1.64	0.100
understanding English	0.82	0.57 – 1.17	-1.11	0.265
reading English	0.84	0.56 – 1.25	-0.87	0.383
LEX_score	0.93	0.90 – 0.97	-3.64	<b>&lt;0.001</b>
composit_ENG_use	0.92	0.56 – 1.52	-0.32	0.745
composit_ENG_expose	2.60	1.14 – 5.95	2.26	<b>0.024</b>
What language do you feel most comfortable with [Spanish]	2.40	1.01 – 5.70	1.98	<b>0.047</b>
What age were you when you began learning English?	1.04	0.94 – 1.14	0.70	0.481

- Table 18 continued -

<b>Random Effects</b>	
$\sigma^2$	3.29
$\tau_{00}$ ProlificID	0.55
$\tau_{00}$ token_set	0.00
N ProlificID	60
N token_set	12
Observations	360
Marginal R <sup>2</sup> / Conditional R <sup>2</sup>	0.326 / NA

The results indicate a significant effect of condition ( $z = 2.20, p = 0.028$ ). The parameter estimate for ‘Condition [d]’ is positive, indicating that participants were significantly more likely to choose a HNPS sentence in the ‘PO<sub>new-given</sub> or HNPS<sub>given-new</sub>’ condition. Additionally, there were significant effects of general English proficiency ( $z = -3.64, p < 0.001$ ), composite English exposure ( $z = 2.26, p = 0.024$ ) and language dominance ( $z = 1.98, p = 0.047$ ). The significant effect of general English proficiency was such that participants were less likely to choose HNPS sentences as LEX Tale score increased. Data visualizations suggest that this effect was driven mainly by a decrease in HNPS selections in the PO<sub>given-new</sub> or HNPS<sub>new-given</sub> condition by participants with higher LEX Tale scores. The significant effect of composite English exposure score was such that participants were more likely to choose HNPS sentences as composite English exposure score increased. Data visualizations suggest that this effect was driven mainly by an increase in HNPS selections in the PO<sub>new-given</sub> or HNPS<sub>given-new</sub> condition by participants with higher composite English exposure scores. Finally, the significant effect of language dominance was such that participants who identified as being primarily Spanish dominant were more likely to choose



HNPS sentences compared to those who identified as being equally dominant in both Spanish and English. Data visualization shows that participants who identified as Spanish dominant choose more HNPS sentences in both givenness conditions when compared to those speakers who identified as being equally dominant in both Spanish and English.

#### **4.3.4 Within-Group Comparison Summary**

In summary, all three groups were significantly more likely to choose a DO sentence in the ‘PO<sub>new-given</sub> or DO<sub>given-new</sub>’ condition compared to the ‘PO<sub>given-new</sub> or DO<sub>new-given</sub>’ condition. In addition, for both bilingual groups, participants were less likely to choose DO sentences as LEX Tale score increased. Data visualizations suggest that this effect was driven mainly by a decrease in DO selections in the PO<sub>given-new</sub> or DO<sub>new-given</sub> condition by participants with higher LEX Tale scores in both groups. The monolingual English speaker group and the Spanish-English bilingual groups were significantly more likely to choose HNPS sentences in the ‘PO<sub>new-given</sub> or HNPS<sub>given-new</sub>’ condition compared to the ‘PO<sub>given-new</sub> or HNPS<sub>new-given</sub>’ condition, while the German-English bilingual group was not. For both bilingual groups, there was a significant effect of general English proficiency such that participants were less likely to choose HNPS sentences as LEX Tale score increased. For the Spanish-English bilingual group, data visualizations suggest that this effect was driven mainly by a decrease in HNPS selections in the PO<sub>given-new</sub> or HNPS<sub>new-given</sub> condition by participants with higher LEX Tale scores. Additionally, there were significant effects of composite English exposure score and language dominance, both of which were associated with an increased likelihood of participants choosing HNPS sentences. Data visualizations suggest that this effect was driven mainly by an increase in HNPS selections in the PO<sub>new-given</sub> or HNPS<sub>given-new</sub> condition by participants with higher composite English exposure scores. The significant effect of language dominance was such that participants who identified as Spanish dominant were more

likely to choose HNPS sentences compared to participants who identified as being equally dominant in both Spanish and English.

The within-groups comparisons suggest different overall patterns of results across the three language groups. Three of these differences are particularly notable: First, there was no significant effect of givenness on German-English bilingual speakers' choice of HNPS, while there was a significant effect of givenness on the selection of HNPS by the monolingual English and the Spanish-English bilingual group. Second, the Spanish-English bilingual group seemed to show a weaker preference for DO sentences based on givenness: Compared to the other two groups, Spanish-English bilingual group appeared to choose more DO tokens in the  $PO_{\text{given-new}}$  or  $DO_{\text{new-given}}$  condition. Third, there was a significant effect of language dominance on HNPS selection by the Spanish-English bilingual group, but this was not the case for the German-English bilingual group. The next section will present a between-groups analysis where some of these differences will be evaluated for statistical significance.

#### **4.3.5 Between-groups Comparison (FCTm4)**

In order to examine potential differences in the response patterns of the three groups, models FCTm4a and FCTm4b were constructed. FCTm4a was fitted to the results from all three groups in the 'PO vs. DO' conditions, and FCTm4b was fitted to the results from all three groups in the 'PO vs. HNPS' conditions. Both models included the independent variable 'condition' ( $PO_{\text{new-given}}$  or  $DO_{\text{given-new}}$ ,  $PO_{\text{given-new}}$  or  $DO_{\text{new-given}}$ ) as a fixed effect, in addition to fixed effects for verb, sequential stimulus position, and task order. The fixed effect for animacy of the post-verbal arguments was removed due to model fit issues. Additionally, these models contained the predictor 'language background', with the levels 'English', 'German', and 'Spanish', as well as an

interaction between language background and condition. The model output from FCTm4a is shown in Table 19.

Table 19. All groups, PO-DO model output.

<i>Predictors</i>	<b>factor(sentence_type_chosen)</b>				
	<i>Odds Ratios</i>	<i>CI</i>	<i>Statistic</i>	<i>p</i>	
(Intercept)	0.20	0.09 – 0.44	-4.06	<b>&lt;0.001</b>	
language_background [German]	0.92	0.51 – 1.66	-0.29	0.775	
language_background [Spanish]	2.05	1.19 – 3.54	2.59	<b>0.010</b>	
Condition [b]	5.48	3.31 – 9.07	6.62	<b>&lt;0.001</b>	
ListPosition	1.00	0.99 – 1.01	-0.12	0.907	
Taskorder	1.07	0.89 – 1.29	0.75	0.451	
Verb [give]	1.19	0.62 – 2.31	0.52	0.602	
Verb [mail]	0.41	0.19 – 0.85	-2.37	<b>0.018</b>	
Verb [offer]	1.04	0.57 – 1.87	0.12	0.903	
Verb [sell]	0.64	0.32 – 1.28	-1.26	0.208	
Verb [send]	0.47	0.23 – 0.96	-2.08	<b>0.038</b>	
Verb [serve]	0.90	0.46 – 1.75	-0.32	0.747	
Verb [show]	0.88	0.50 – 1.54	-0.46	0.649	
Verb [throw]	0.27	0.12 – 0.57	-3.41	<b>0.001</b>	
language_background [German] * Condition [b]	1.09	0.53 – 2.23	0.23	0.817	
language_background [Spanish] * Condition [b]	0.37	0.19 – 0.72	-2.90	<b>0.004</b>	

- Table 19 continued -

<b>Random Effects</b>	
$\sigma^2$	3.29
$\tau_{00}$ ProlificID	0.20
$\tau_{00}$ token_set	0.00
N ProlificID	183
N token_set	12
Observations	1098
Marginal R <sup>2</sup> / Conditional R <sup>2</sup>	0.186 / NA

The model output indicates a significant effect of condition ( $z = 6.62, p < .001$ ). The parameter estimate for ‘Condition [b]’ is positive, indicating that, overall, DO sentences were more likely to be chosen in the ‘PO<sub>new-given</sub> or DO<sub>given-new</sub>’ condition compared to the PO<sub>given-new</sub> or DO<sub>new-given</sub>’ condition. There was a significant main effect of language background ( $z = 2.59, p = 0.010$ ) as well as a significant interaction between language background and condition. The significant main effect of language background was such that the Spanish-English bilingual group was significantly more likely to choose DO sentences overall compared to the monolingual English group (the reference level); however, interestingly, the significant interaction between language background and condition ( $z = -2.90, p = 0.004$ ) was such that the Spanish-English bilingual group was significantly *less* likely to choose DO sentences in the ‘PO<sub>new-given</sub> or DO<sub>given-new</sub>’ condition.

On the other hand, the German-English bilingual group did not differ significantly from the monolingual English speaker group in their likelihood of choosing a DO, either overall ( $p = 0.775$ ) or in the ‘PO<sub>new-given</sub> or DO<sub>given-new</sub>’ condition ( $p = 0.817$ ). In order to confirm that the Spanish-English bilingual group was significantly different from both the monolingual English

speaker group and the German-English bilingual group, the language background factor was re-leveled with Spanish as the reference level and the model was re-run. The results confirm that the Spanish-English bilingual group was significantly less likely to choose a DO sentence in the ‘PO<sub>new-given</sub> or DO<sub>given-new</sub>’ condition compared to the monolingual English speaker group ( $p = 0.003690$ ) and the German-English bilingual group ( $p = 0.002059$ ).

The model output from FCTm4b is shown in Table 20.

Table 20. All groups, PO-HNPS model output.

<i>Predictors</i>	<b>factor(sentence_type_chosen)</b>			
	<i>Odds Ratios</i>	<i>CI</i>	<i>Statistic</i>	<i>p</i>
(Intercept)	0.03	0.01 – 0.12	-5.02	<b>&lt;0.001</b>
language_background [German]	2.45	0.85 – 7.04	1.66	0.096
language_background [Spanish]	5.17	1.88 – 14.21	3.19	<b>0.001</b>
Condition [d]	3.47	1.43 – 8.40	2.75	<b>0.006</b>
ListPosition	0.99	0.97 – 1.01	-0.74	0.458
Taskorder	0.75	0.52 – 1.07	-1.58	0.115
Verb [give]	2.47	0.88 – 6.96	1.71	0.087
Verb [mail]	1.15	0.41 – 3.28	0.27	0.787
Verb [offer]	2.14	0.89 – 5.14	1.70	0.089
Verb [sell]	1.16	0.40 – 3.33	0.27	0.785
Verb [send]	1.31	0.46 – 3.71	0.51	0.612
Verb [serve]	1.10	0.37 – 3.28	0.17	0.864
Verb [show]	1.49	0.60 – 3.67	0.86	0.389
Verb [throw]	0.97	0.32 – 2.97	-0.05	0.962
language_background [German] * Condition [d]	0.44	0.14 – 1.39	-1.40	0.161

- Table 20 continued -

language_ background [Spanish]	0.58	0.20 – 1.67	-1.01	0.310
* Condition [d]				
<hr/>				
<b>Random Effects</b>				
<hr/>				
$\sigma^2$	3.29			
$\tau_{00}$ ProlificID	1.60			
$\tau_{00}$ token_set	0.00			
$N$ ProlificID	183			
$N$ token_set	12			
Observations	1098			
Marginal $R^2$ / Conditional $R^2$	0.167 / NA			

The results do not indicate the presence of a significant interaction between language background and condition. There was a significant effect of condition ( $z = 2.75, p < 0.001$ ), such that that HNPS sentences were significantly more likely to be chosen in the ‘PO<sub>new-given</sub> or HNPS<sub>given-new</sub>’ condition compared to the ‘PO<sub>given-new</sub> or HNPS<sub>new-given</sub>’ condition. There was also a significant main effect of language background such that the Spanish-English bilingual group was significantly more likely to choose a HNPS sentence compared to the monolingual English speaker group ( $z = 3.19, p < 0.001$ ). On the other hand, the German-English bilingual group did not differ significantly from the monolingual English speaker group ( $z = 1.66, p = 0.096$ ). In order to see whether the Spanish-English bilingual group differed significantly from both the German-English bilingual group and the monolingual English speaker group, the model was re-leveled with ‘Spanish’ as the reference level for language background and the model was re-run. The results confirm that the Spanish-English bilingual group differed significantly compared to the monolingual English speaker group ( $p = 0.000424$ ) and the German-English bilingual group ( $p =$

0.010149). Together with the non-significant interaction between language background and condition, these results indicate that the Spanish-English bilingual group was more likely to choose HNPS sentences overall compared to the other two groups.

#### **4.3.6 Between-Groups Comparison Summary**

In summary, the between-groups analysis revealed several significant differences in the patterns of results across the three participant groups. These differences were primarily between the Spanish-English bilingual group, on the one hand, and the German-English bilingual and monolingual English speaker groups, on the other hand. The Spanish-English bilingual group was significantly more likely to choose DO sentences overall compared to the other two groups. The Spanish-English bilingual group was also significantly *less* likely to choose DO sentences in the ‘PO<sub>new-given</sub> or DO<sub>given-new</sub>’ condition compared to the other two groups. Additionally, the Spanish-English bilingual group was significantly more likely to choose HNPS sentences overall compared to the other two groups. The next section will attempt to identify the source of those differences by comparing the two bilingual groups and considering variables related to English proficiency, exposure, and use.

#### **4.3.7 Bilingual Groups Comparison (FCTm5)**

In order to identify the factor(s) driving the differences between the experimental groups, models FCTm5a and FCTm5b were constructed. Recall that in FCTm4a, there was a significant main effect of language background such that the Spanish-English bilingual group was more likely to choose DOs compared to the other two groups. Additionally, the Spanish-English bilingual group was *less* likely to choose DO sentences in the PO<sub>new-given</sub> or DO<sub>given-new</sub> condition. FCTm4a showed that the Spanish-English bilingual group was significantly more likely to choose HNPS

sentences overall compared to the other two groups. The aim of the models FCTm5a and FCTm5b is to compare the two bilingual groups directly to determine if these apparent differences might be accounted for by variables related to English proficiency, exposure, and use.

The models FCTm5a and FCTm5b included the independent variables ‘condition’ (PO<sub>new-given</sub> or DO<sub>given-new</sub>, PO<sub>given-new</sub> or DO<sub>new-given</sub>) and language background (‘Spanish’, ‘German’) and their interaction as fixed effects. Additional fixed effects were included for verb, animacy of the theme argument, sequential stimulus position, task order, general English proficiency (LEXTale score), self-ratings of English speaking proficiency, listening proficiency, and reading proficiency, composite English use score, composite English exposure score, self-identification of language dominance (‘Spanish/German’ or ‘both English and Spanish/German’), and age of onset of English acquisition. Random intercepts were included for participants and items. The model output from FCTm5a is shown in Table 21.

Table 21. Bilingual groups, PO-DO model output.

<i>Predictors</i>	<b>factor(sentence_type_chosen)</b>			
	<i>Odds Ratios</i>	<i>CI</i>	<i>Statistic</i>	<i>p</i>
(Intercept)	2.62	0.29 – 23.79	0.86	0.392
ListPosition	1.01	0.99 – 1.02	0.67	0.502
Taskorder	1.16	0.94 – 1.45	1.38	0.168
language_ background [Spanish]	1.94	0.97 – 3.86	1.87	0.061
Condition [b]	6.10	3.60 – 10.33	6.73	<b>&lt;0.001</b>
Verb [give]	1.73	0.65 – 4.59	1.10	0.272
Verb [mail]	0.71	0.25 – 1.99	-0.65	0.513
Verb [offer]	1.17	0.54 – 2.53	0.39	0.698
Verb [sell]	1.03	0.37 – 2.84	0.06	0.955



- Table 21 continued -

Verb [send]	0.67	0.24 – 1.92	-0.74	0.460
Verb [serve]	1.70	0.65 – 4.46	1.08	0.281
Verb [show]	1.17	0.58 – 2.36	0.45	0.655
Verb [throw]	0.24	0.09 – 0.61	-2.98	<b>0.003</b>
animacy [aAI]	0.70	0.41 – 1.19	-1.33	0.183
speaking English	1.03	0.93 – 1.15	0.59	0.558
understanding English	1.04	0.89 – 1.22	0.50	0.619
reading English	0.99	0.81 – 1.20	-0.12	0.903
composit_ENG_use	0.82	0.66 – 1.03	-1.68	0.092
composit_ENG_expose	1.08	0.74 – 1.60	0.41	0.682
LEX_score	0.96	0.95 – 0.98	-4.50	<b>&lt;0.001</b>
What language do you feel most comfortable with [German]	1.03	0.61 – 1.73	0.11	0.916
What language do you feel most comfortable with [Spanish]	0.64	0.38 – 1.07	-1.69	0.092
What age were you when you began learning English?	0.99	0.93 – 1.05	-0.33	0.742
language_background [Spanish] * Condition [b]	0.32	0.16 – 0.65	-3.15	<b>0.002</b>

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**Random Effects**

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$\sigma^2$	3.29
$\tau_{00}$ ProlificID	0.00
$\tau_{00}$ token_set	0.00
N ProlificID	119

- Table 21 continued -

N <sub>token_set</sub>	12
Observations	714
Marginal R <sup>2</sup> / Conditional R <sup>2</sup>	0.231 / NA

The results indicate a significant effect of condition ( $z = 6.73, p < 0.001$ ) such that participants were significantly more likely to choose DO sentences in the ‘PO<sub>new-given</sub> or DO<sub>given-new</sub>’ condition, and a significant effect of general English proficiency such that DO sentences were significantly less likely to be chosen as LEXTale score increased. There was also a significant interaction between language background and condition ( $z = -3.15, p = 0.002$ ), such that the Spanish-English bilingual group was less likely to choose DO sentences in the ‘PO<sub>new-given</sub> or DO<sub>given-new</sub>’ condition compared to the German-English bilingual group, the reference level.

Compared to FCTm4a, the main effect of language background in FCTm5a is no longer significant, which indicates that the effect associated with language background is now accounted for by the variables that have been added in FCTm5a. Out of all the bilingual-specific predictors added to FCTm5a, only general English proficiency (LEXTale score) is significant, meaning that it is the most likely candidate to account for the main effect that was associated with language background in FCTm4a. This result suggests that the higher probability of the Spanish-English bilingual group choosing DO sentences overall compared to the German-English bilingual group may be better explained by differences in general English proficiency between the two groups.

Importantly, compared to FCTm4a, there is still a significant interaction between language background and condition in FCTm5a, such that the Spanish-English bilingual group was significantly less likely to choose DO sentences in the ‘PO<sub>new-given</sub> or DO<sub>given-new</sub>’ condition compared to the German-English bilingual group ( $z = -3.15, p = 0.002$ ). This result indicates that

the tendency for the Spanish-English bilingual group to choose DO sentences less often in the ‘PO<sub>new-given</sub> or DO<sub>given-new</sub>’ condition is still significant even after factors related to the participants’ experience with English are taken into account. Of the predictors related to speakers’ experience with English, only general English proficiency (LEXTale score) had a significant effect on speakers’ sentence preferences. It might be reasonable to wonder whether the interaction between language background and condition would still be significant if the model also contained an interaction between LEXTale score and condition. In fact, when the model was re-run with this interaction included, the language background by condition interaction term ( $z = -2.30, p = .021$ ) was still significant, while the LEXTale by condition interaction term ( $z = 1.75, p = .080$ ) was marginally significant. This result is perhaps the best evidence that the significant effect associated with language background cannot be straightforwardly attributed to factors related to participants’ experience with English, even those factors (such as LEXTale score) that nonetheless significantly influence participants’ sentence preferences.

In order to explore whether other aspects of the participants’ linguistic background could be responsible for their differing results in the FCT, an exploratory model, FCTm5a’, was constructed. FCTm5a’ included predictors related to participants’ domains of English use (English use at school, at work, at home, with a partner, or in social situations). The results are shown in Table 22 (the predictor for language dominance was removed due to convergence issues).

Table 22. Bilingual groups' PO-DO model output, English use across domains added.

<i>Predictors</i>	<b>factor(sentence_type_chosen)</b>			
	<i>Odds Ratios</i>	<i>CI</i>	<i>Statistic</i>	<i>p</i>
(Intercept)	2.00	0.08 – 53.24	0.41	0.678
ListPosition	1.01	0.99 – 1.02	0.74	0.462
Taskorder	1.18	0.95 – 1.46	1.45	0.146
language_ background [Spanish]	1.48	0.80 – 2.75	1.26	0.208
Condition [b]	6.09	3.60 – 10.31	6.73	<b>&lt;0.001</b>
Verb [give]	1.73	0.65 – 4.62	1.09	0.276
Verb [mail]	0.71	0.25 – 2.00	-0.65	0.514
Verb [offer]	1.17	0.54 – 2.54	0.39	0.699
Verb [sell]	1.02	0.37 – 2.86	0.04	0.965
Verb [send]	0.67	0.23 – 1.92	-0.75	0.453
Verb [serve]	1.70	0.64 – 4.48	1.07	0.285
Verb [show]	1.17	0.58 – 2.36	0.43	0.667
Verb [throw]	0.23	0.09 – 0.60	-3.02	<b>0.003</b>
animacy [aAI]	0.70	0.41 – 1.19	-1.33	0.184
speaking English	1.05	0.93 – 1.17	0.75	0.452
understanding English	1.04	0.89 – 1.22	0.53	0.598
reading English	1.01	0.83 – 1.23	0.07	0.943
composit_ENG_use	0.81	0.62 – 1.05	-1.57	0.116
composit_ENG_expose	1.15	0.78 – 1.70	0.71	0.480
LEX_score	0.96	0.95 – 0.98	-4.39	<b>&lt;0.001</b>
What age were you when you began learning English?	0.99	0.93 – 1.05	-0.25	0.801
English at school	0.99	0.91 – 1.09	-0.13	0.895

- Table 22 continued

English at home	0.91	0.73 – 1.15	-0.77	0.441
English at work	0.98	0.91 – 1.05	-0.63	0.527
English in social situations	1.07	0.88 – 1.32	0.69	0.491
Does partner speak English? [?Prefer not to say]	3.59	0.89 – 14.48	1.80	0.072
Does partner speak English? [?Yes]	1.14	0.73 – 1.79	0.58	0.560
language_ background [Spanish] * Condition [b]	0.33	0.16 – 0.66	-3.12	<b>0.002</b>
<b>Random Effects</b>				
$\sigma^2$	3.29			
$\tau_{00}$ ProlificID	0.00			
$\tau_{00}$ token_set	0.00			
$N$ ProlificID	119			
$N$ token_set	12			
Observations	714			
Marginal $R^2$ / Conditional $R^2$	0.235 / NA			

Importantly, the output from FCTm5a' still indicates the presence of a significant interaction between language background and condition, such that the Spanish-English bilingual group was significantly less likely to select DO sentences in the 'PO<sub>new-given</sub> or DO<sub>given-new</sub>' condition compared to the German-English bilingual group. There were no significant effects associated with the additional predictors related to domain of English use.

The model output from FCTm5b is shown in Table 23.

Table 23. Bilingual groups, PO-HNPS model output.

<i>Predictors</i>	<b>factor(sentence_type_chosen)</b>			
	<i>Odds Ratios</i>	<i>CI</i>	<i>Statistic</i>	<i>p</i>
(Intercept)	5.83	0.13 – 258.62	0.91	0.362
- Table 23 continued -				
ListPosition	0.99	0.97 – 1.01	-0.97	0.330
Taskorder	1.23	0.81 – 1.87	0.99	0.320
language_ background [Spanish]	0.54	0.20 – 1.47	-1.21	0.225
Condition [d]	1.83	1.14 – 2.95	2.51	<b>0.012</b>
Verb [give]	4.53	1.00 – 20.60	1.95	0.051
Verb [mail]	2.59	0.61 – 10.90	1.30	0.195
Verb [offer]	3.31	1.11 – 9.88	2.15	<b>0.032</b>
Verb [sell]	3.01	0.69 – 13.21	1.46	0.144
Verb [send]	2.64	0.59 – 11.71	1.27	0.203
Verb [serve]	2.81	0.64 – 12.42	1.37	0.172
Verb [show]	1.38	0.46 – 4.15	0.57	0.570
Verb [throw]	1.09	0.29 – 4.02	0.13	0.900
animacy [aAI]	0.55	0.24 – 1.23	-1.46	0.145
speaking English	1.05	0.86 – 1.29	0.50	0.617
understanding English	1.00	0.74 – 1.36	0.02	0.983
reading English	0.87	0.61 – 1.24	-0.76	0.444
composit_ENG_use	0.91	0.60 – 1.38	-0.44	0.663
composit_ENG_expose	1.67	0.83 – 3.35	1.43	0.151
LEX_score	0.93	0.90 – 0.96	-4.72	<b>&lt;0.001</b>
What age were you when you began learning English?	1.03	0.94 – 1.14	0.63	0.526

- Table 23 continued -

What language do you feel most comfortable with [German]	0.44	0.16 – 1.22	-1.58	0.114
What language do you feel most comfortable with [Spanish]	1.86	0.75 – 4.57	1.35	0.178
<hr/>				
<b>Random Effects</b>				
<hr/>				
$\sigma^2$	3.29			
$\tau_{00}$ ProlificID	1.00			
$\tau_{00}$ token_set	0.00			
$N_{\text{ProlificID}}$	119			
$N_{\text{token\_set}}$	12			
Observations	714			
Marginal $R^2$ / Conditional $R^2$	0.308 / NA			

The initial model output did not indicate the presence of a significant interaction between language background and condition, and so the interaction term was removed without significant reduction in model fit ( $LR = 0.3827$ ,  $p = 0.5361$ ). The resulting model output again showed a significant effect of condition ( $z = 2.51$ ,  $p = 0.012$ ) such that speakers were significantly more likely to choose HNPS sentences in the ‘PO<sub>new-given</sub> or HNPS<sub>given-new</sub>’ condition. Importantly, compared to model FCTm4b, the main effect of language background is no longer significant ( $z = -1.21$ ,  $p = 0.225$ ), indicating that the Spanish-English bilingual group did not differ significantly from the German-English bilingual group in their selection of HNPS. This result indicates that the effect associated with language background in FCTm4b is now accounted for by the variables that

have been added in FCTm5b, which suggests that language background per se does not account for different rates of HNPS selection between the two groups.

In order to explore whether other aspects of the participants' linguistic background could be responsible for their differing results in the FCT, another exploratory model, FCTm5b', was constructed. FCTm5b' included predictors related to participants' domains of English use (English use at school, at work, at home, with a partner, or in social situations). The results are shown in Table 24 (the predictor for language dominance was removed due to convergence issues).

Table 24. Bilingual groups' PO-HNPS model output, English use across domains added.

<i>Predictors</i>	<b>factor(sentence_type_chosen)</b>				
	<i>Odds Ratios</i>	<i>CI</i>	<i>Statistic</i>	<i>p</i>	
(Intercept)	17.52	0.05 – 6006.12	0.96	0.336	
ListPosition	0.99	0.97 – 1.01	-1.02	0.307	
Taskorder	1.23	0.83 – 1.82	1.03	0.302	
language_ background [Spanish]	1.69	0.77 – 3.70	1.30	0.192	
Condition [d]	1.81	1.13 – 2.91	2.47	<b>0.013</b>	
Verb [give]	4.28	0.96 – 19.14	1.90	0.057	
Verb [mail]	2.54	0.61 – 10.57	1.28	0.200	
Verb [offer]	3.20	1.08 – 9.46	2.10	<b>0.035</b>	
Verb [sell]	2.92	0.68 – 12.63	1.43	0.151	
Verb [send]	2.58	0.59 – 11.33	1.26	0.208	
Verb [serve]	2.78	0.64 – 12.08	1.36	0.173	
Verb [show]	1.36	0.46 – 4.05	0.55	0.580	
Verb [throw]	1.10	0.30 – 4.03	0.15	0.882	
animacy [aAI]	0.56	0.25 – 1.25	-1.41	0.159	



- Table 24 continued -

speaking English	0.99	0.80 – 1.22	-0.11	0.914
understanding English	1.04	0.79 – 1.37	0.29	0.771
reading English	0.88	0.64 – 1.22	-0.75	0.452
composit_ENG_use	0.95	0.59 – 1.52	-0.21	0.836
composit_ENG_expose	1.22	0.63 – 2.37	0.58	0.561
LEX_score	0.92	0.90 – 0.95	-5.19	<b>&lt;0.001</b>
What age were you when you began learning English?	1.05	0.95 – 1.16	0.91	0.362
English at school	0.89	0.76 – 1.05	-1.34	0.180
English at home	1.33	0.84 – 2.10	1.21	0.225
English at work	1.13	0.99 – 1.29	1.88	0.060
English in social situations	0.69	0.48 – 0.98	-2.10	<b>0.036</b>
Does partner speak English? [?Prefer not to say]	1.80	0.19 – 17.42	0.51	0.611
Does partner speak English? [?Yes]	0.57	0.26 – 1.27	-1.36	0.173

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**Random Effects**

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$\sigma^2$	3.29
$\tau_{00}$ ProlificID	0.71
$\tau_{00}$ token_set	0.00
N ProlificID	119
N token_set	12
Observations	714
Marginal R <sup>2</sup> / Conditional R <sup>2</sup>	0.331 / NA

Output from FCTm5b' does not indicate a significant main effect of language background, which again indicates that any differences in HNPS selection between the two bilingual groups are adequately accounted for by other predictors. Interestingly, there was a significant effect of the predictor corresponding to use of English (vs. dominant language, German or Spanish) in social situations, such that increased use of English in social situations was associated more selections of HNPS. Data visualization suggests that this effect is not specific to one of the givenness conditions but is rather a main effect on selection of HNPS.

#### **4.3.8 Bilingual Between-Groups Comparison Summary**

In summary, this section compared the Spanish-English and German-English bilingual groups with the aim to further investigate three apparent differences between them: First, the Spanish-English bilingual group was more likely to choose DO sentences compared to the German-English bilingual group (and the monolingual English speaker group); second, the Spanish-English bilingual group was less likely to choose DO sentences in the 'PO<sub>new-given</sub> or DO<sub>given-new</sub>' condition compared to the German-English bilingual group (and the monolingual English speaker group); Third, the Spanish-English bilingual group was more likely to choose HNPS sentences compared to the German-English bilingual group (and the monolingual English speaker group). To determine the source of these differences, a series of models were constructed which included a number of factors corresponding to general English proficiency, English use, and English exposure. The results suggest that only one of these findings cannot be accounted for by these additional predictors: the lower likelihood of the Spanish-English bilingual group choosing DO sentences in the 'PO<sub>new-given</sub> or DO<sub>given-new</sub>' condition.

#### 4.4 Self-paced Reading Task

To evaluate the results of the self-paced reading task for statistical significance, the raw (untransformed) RTs were trimmed by removing observations greater than three standard deviations above the group mean for each of the three experimental groups. The resulting datasets were then divided by sentence region for analysis. The first region (R1) contained RTs corresponding to the subject and the verb, which were the same across all givenness conditions. The second region (R2) contained the RTs corresponding to the first post-verbal argument (determiner and noun). The third region (R3) contained the RTs corresponding to the second post-verbal argument (determiner and noun). The fourth region (R4) contained the RTs corresponding to the two words following R3. The fifth region (R5) contained RTs corresponding to all remaining words in the sentence. The critical region in this analysis is Region 3, the region containing the RTs corresponding to the second post-verbal argument. This is the critical region because it is the region in which the sentence type and the constituent order become clear to the reader, and it is the region where Brown et al. (2012) found a significant interaction between sentence type and givenness. The content of each region for the three sentence types is shown in Table 25, repeated from Chapter 3.

Table 25. The five regions of analysis for the three sentence types.

<i>The retailer sold</i>	<i>the/a physicist</i>	<i>the/a laptop</i>	<i>because hers</i>	<i>was broken.</i>
<i>The retailer sold</i>	<i>the/a laptop</i>	<i>[to]the/a physicist</i>	<i>because hers</i>	<i>was broken.</i>
<i>The retailer sold</i>	<i>[to]the/a physicist</i>	<i>the/a laptop</i>	<i>because hers</i>	<i>was broken.</i>
Region 1	Region 2	Region 3	Region 4	Region 5
Subject and verb	NP1	NP2	Spillover 1	Spillover 2

The dataset for each region was submitted to a mixed effect linear regression model. Each model contained the fixed effects ‘sentence type’ (PO, DO, HNPS) and ‘givenness’ (given-new, new-given) as well as their interaction. Additional fixed effects were lemma frequency of individual lexical items (estimated using the CELEX database), orthographic length of individual lexical items, verb subcategorization frequencies (estimated using sentence completion data from Brown et al 2012), semantic plausibility of each lexicalization (estimated using results of the semantic plausibility study), sequential stimulus position, task order, animacy of the theme argument, and accuracy of responses to comprehension questions. Random effects were included for participants and items. Models for the bilingual groups additionally contained the predictors general English proficiency (LEXTale score), self-ratings of English speaking proficiency, listening proficiency, and reading proficiency, composite English use score, composite English exposure score, self-identification of language dominance, and age of onset of English acquisition.

#### **4.4.1 Monolingual English Speakers**

Figure 4-11 shows the monolingual English groups’ mean RT for each sentence type as a function of sentence region in the given-new and new-given conditions. Generally speaking, mean RTs for all three sentence types were higher in the new-given condition compared to the given-new condition. In the given-new condition, where givenness is hypothesized to have a facilitative effect on processing, PO sentences appear to generally have the lowest mean RT, followed by DO sentences, and then HNPS sentences.

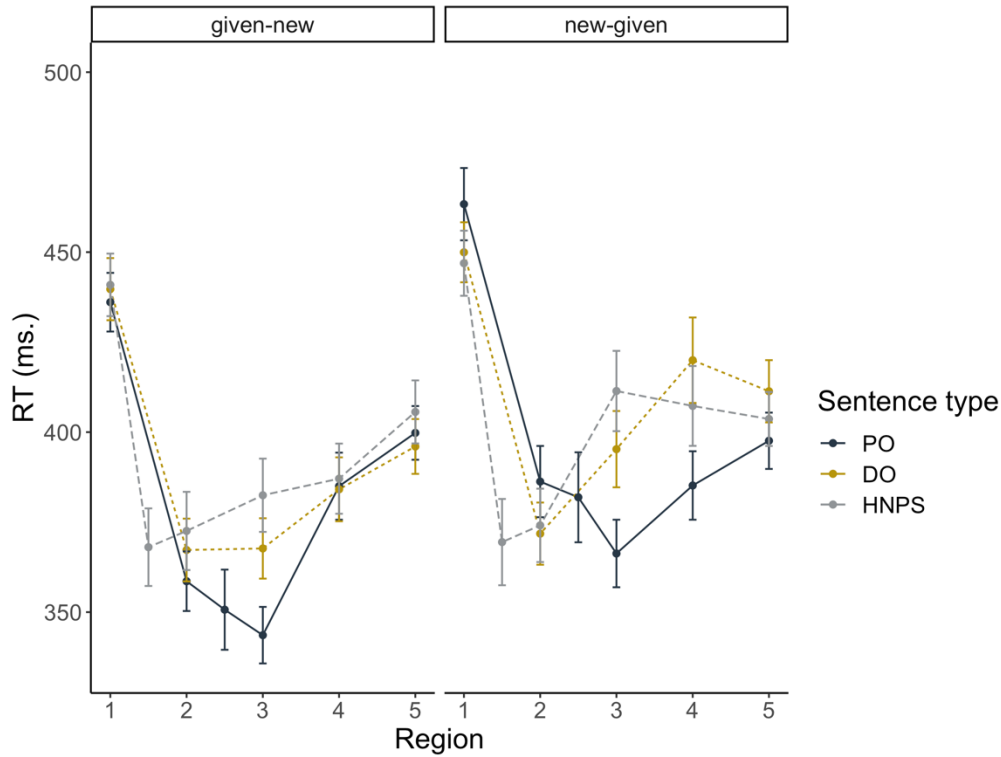


Figure 4-11. Mean RT by sentence region, monolingual English group.

Model output for R1 did not indicate a significant main effect of sentence type ( $F = 1.0823$ ,  $p = 0.33894$ ) nor did it indicate a significant sentence type by givenness interaction ( $F = 0.7249$ ,  $p = 0.48447$ ). There was a significant effect givenness ( $F = 5.4848$ ,  $p = 0.01925$ ), potentially as a result of uneven presentation of items between the given-new and new-given conditions. Model output for R2 did not indicate a significant main effect of sentence type ( $F = 0.4455$ ,  $p = 0.64061$ ), nor did it indicate a significant interaction between sentence type and givenness ( $F = 1.0040$ ,  $p = 0.36661$ ). There was a significant main effect of givenness ( $F = 3.68$ ,  $p < 0.001$ ) such that RTs were slower for sentences in the new-given condition.

Model output for R3 indicated significant main effects of both sentence type ( $F = 17.4822$ ,  $p < .001$ ) and givenness ( $F = 10.5340$ ,  $p = 0.0012008$ ). Pairwise comparisons (Tukey) revealed that RTs for PO sentences in the new-given condition were significantly faster than those for DO

sentences ( $t = -2.987, p = 0.0339$ ) and HNPS sentences ( $t = -4.653, p = 0.0001$ ) in the same condition. No significant difference was found between PO and DO RTs in the given-new condition ( $t = -2.399, p = 0.1572$ ), while RTs for PO sentences were significantly lower in the given-new condition compared to those for HNPS sentences ( $t = -3.646, p = 0.0037$ ). There was no significant sentence type by givenness interaction ( $F = 0.2306, p = 0.7941053$ ).

Model output for R4 indicated a marginally significant interaction between sentence type and givenness ( $F = 2.6153, p = 0.073423$ ), such that RTs for PO sentences in the new-given condition were marginally lower than those for DO sentences ( $t = -2.640, p = 0.0884$ ), though there was no significant differences between RTs for PO and HNPS sentences in this condition ( $t = -1.710, p = 0.5255$ ). There were no significant differences in RTs for any of the sentence types in the given-new condition. Model output for R5 did not indicate the presence of a significant main effect of sentence type ( $F = 0.2459, p = 0.78202$ ) nor did it indicate a significant interaction between sentence type and givenness ( $F = 2.2320, p = 0.10749$ ). There was a marginally significant main effect of givenness ( $F = 3.5983, p = 0.05793$ ).

#### **4.4.2 German-English Bilingual Speakers**

Figure 4-12 shows the German-English bilingual groups' mean RT for each sentence type as a function of sentence region in the given-new and new-given conditions. Generally, RTs for all three sentence types were higher in the given-new condition compared to the new-given condition. In the given-new condition, PO sentences generally had the lowest mean RT; however, unlike the monolingual English group, DO sentences appear to have a highest mean RT, followed by HNPS and then PO sentences.

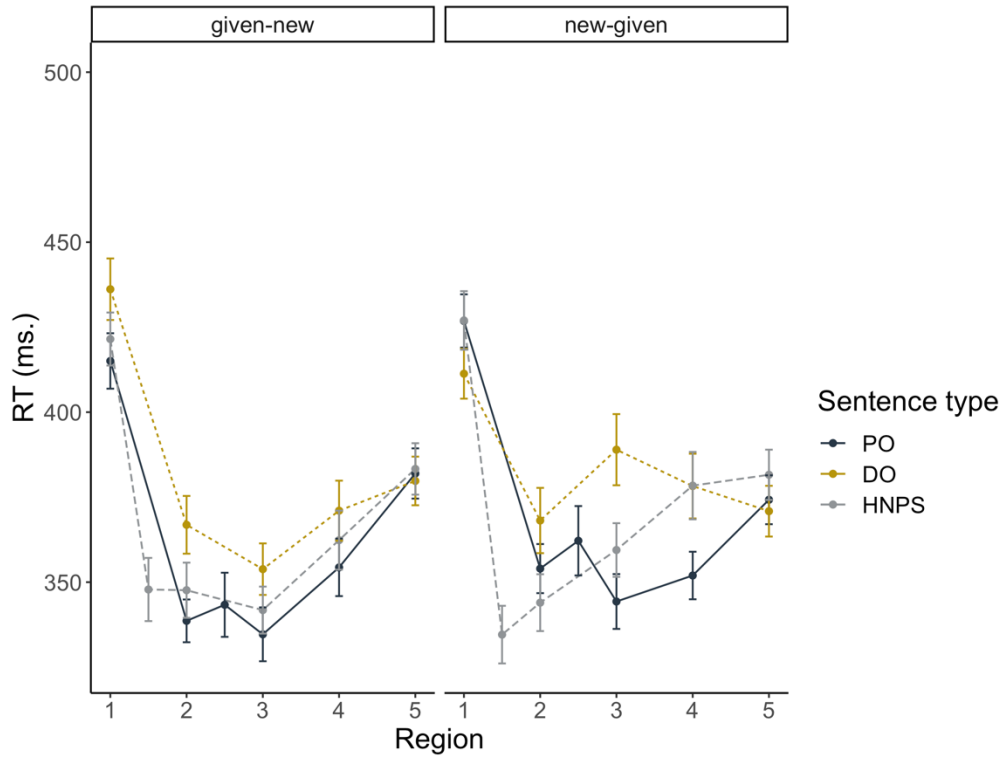


Figure 4-12. Mean RT by sentence region, German-English bilingual group.

Model output for R1 indicated a significant interaction between sentence type and givenness ( $F = 3.8857, p = 0.02063$ ) such that RTs for DO sentences were marginally higher in the given-new condition compared to the new-given condition ( $t = 2.774, p = 0.0619$ ). Again, this is likely the result of uneven presentation of items across sentence type and givenness conditions. Model output for R2 did not indicate the presence of a significant interaction between sentence type and givenness ( $F = 2.2212, p = 0.1087451$ ), but did indicate significant main effects of sentence type ( $F = 5.3723, p = 0.0047092$ ) and givenness ( $F = 4.9416, p = 0.0263268$ ).

Model output for R3 indicated the presence of a marginally significant interaction between sentence type and givenness ( $F = 2.8377, p = 0.05879$ ) such that RTs for DO sentences in the given-new condition were significantly lower ( $t = -3.184, p = 0.0184$ ) compared to those in the

new-given condition. No difference between givenness conditions was found in RTs for PO ( $t = -0.254, p = 0.9999$ ) or HNPS ( $t = -0.633, p = 0.9886$ ) sentences.

Model output for R4 did not indicate the presence of a significant interaction between sentence type and givenness ( $F = 0.8736, p = 0.41759$ ); however, RTs for PO sentences in the new-given condition were marginally lower than those for DO sentences ( $t = -2.798, p = 0.0581$ ). There was a significant main effect of sentence type ( $F = 4.9125, p = 0.00744$ ) and givenness ( $F = 3.3219, p = 0.06852$ ). Model output for R5 did not indicate a significant interaction between sentence type and givenness, nor did it indicate significant main effects of sentence type or givenness.

#### **4.4.3 Spanish-English Bilingual Speakers**

Figure 4-13 shows the Spanish-English bilingual groups' mean RT for each sentence type as a function of sentence region in the given-new and new-given conditions. Generally speaking, all three sentence types had higher mean RTs in the new-given condition compared to the given-new condition.



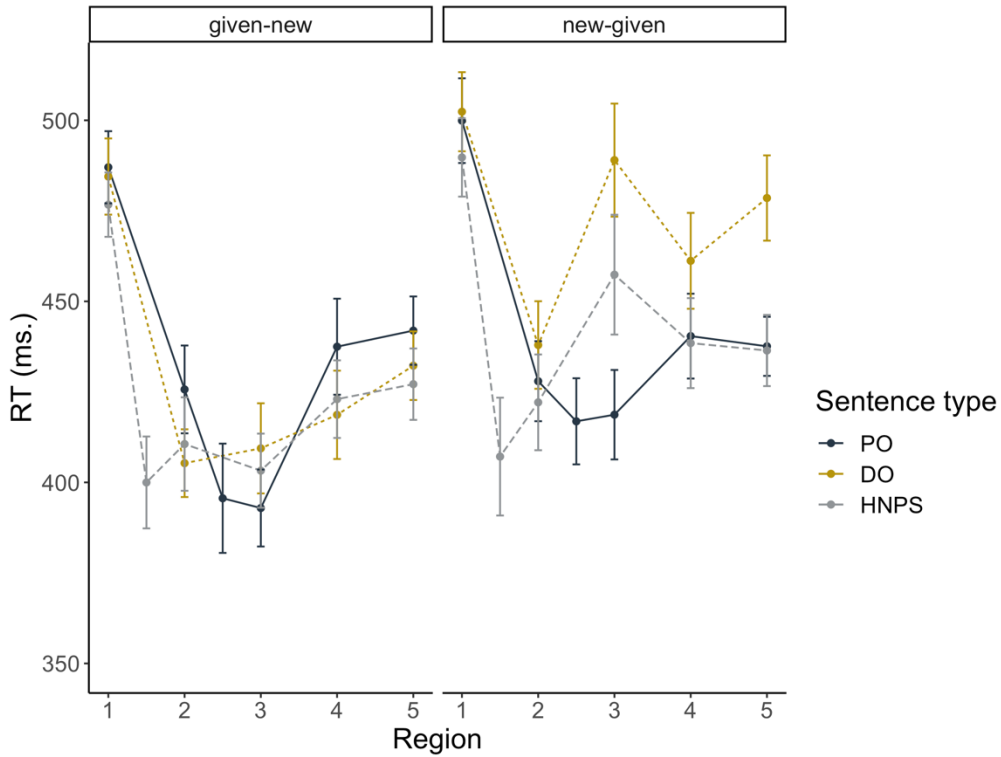


Figure 4-13. Mean RT by sentence region, Spanish-English bilingual group.

Model output for R1 did not indicate a significant interaction between sentence type and givenness ( $F = 0.1591, p = 0.85289$ ), nor did it indicate a significant main effect of sentence type ( $F = 0.9357, p = 0.39244$ ). There was a marginally significant main effect of givenness ( $F = 3.3126, p = 0.06885$ ). Model output for R2 did not indicate the presence of a significant interaction between sentence type and givenness, nor did it indicate the presence of significant main effects of sentence type or givenness.

Model output for R3 indicated the presence of a marginally significant interaction between sentence type and givenness ( $F = 2.8609, p = 0.0574547$ ). Pairwise comparisons show that RTs for DO sentences in the given-new condition were significantly lower than RTs for DO sentences in the new-given condition ( $t = -5.033, p < .0001$ ). Similarly, RTs for HNPS sentences in the given-new condition were significantly lower compared to those in the new-given condition ( $t = -3.284,$

$p = 0.0133$ ). RTs for PO sentences did not differ significantly between the given-new and the new-given conditions ( $t = -1.847, p = 0.4358$ ).

Model output for R4 did not indicate the presence of a significant interaction between sentence type and givenness ( $F = 1.7948, p = 0.16643$ ), nor did it indicate the presence of a significant main effect of sentence type ( $F = 0.2130, p = 0.80820$ ). There was a significant main effect of givenness ( $F = 3.9055, p = 0.04827$ ), and RTs for DO sentences in the given-new condition were marginally lower compared to the new-given condition ( $t = -2.640, p = 0.0884$ ). Model output for R5 indicated the presence of a significant interaction between sentence type and givenness ( $F = 4.2861, p = 0.0138355$ ) such that RTs for DO sentences in the given-new condition were significantly lower than those in the new-given condition ( $t = -3.163, p = 0.0195$ ), while there was no difference in RTs for PO and HNPS sentences across the givenness conditions.

#### **4.4.4 Summary**

In summary, givenness appears to play a facilitative role in sentence processing for all three experimental groups. For all three groups, strong effects of givenness and sentence type were observed in R3, the second-post verbal argument, as expected; however, the nature of the effect in all three groups was slightly different. In the monolingual group, contrary to prediction, there was no significant interaction between sentence type and givenness at the critical region (R3), as evidenced by longer RTs for all three sentence types in the new-given condition compared to the given-new condition; however, PO sentences in the new-given condition had significantly lower RTs compared to DO sentences in the new-given condition, despite the lack of a significant difference in RT between the two sentence types in the given-new condition.

There was evidence of a marginally significant interaction between sentence type and givenness in both of the bilingual groups, as predicted. For the German-English bilingual group,

there was evidence of a marginally significant interaction between sentence type and givenness at the critical region, such that RTs for DO sentences in the new-given condition were significantly higher compared to the given-new condition, while there was no significant difference in RTs between givenness conditions for PO and HNPS sentences. The Spanish-English bilingual group also showed evidence of a significant interaction between givenness and sentence type in R3, such that RTs for both DO and HNPS sentences were significantly longer in the new-given condition compared to the given-new condition, while there was no significant difference between givenness conditions for PO sentences. Additionally, for the Spanish-English bilingual group, RTs for DO sentences in the new-given condition showed a slowdown that began in R3 and persisted through R4 and R5. The other two groups did not exhibit this type of significant spillover effect in R4 and R5 for DO sentences in the new-given condition; instead, RTs for DOs in R4 and R5 dropped, potentially demonstrating faster ‘recovery’ after encountering new-given order.

#### **4.5 Chapter Summary**

This chapter presented the results of three experimental tasks: an acceptability judgement task a forced-choice task, and a self-paced reading task. Each of these tasks examined the effects of the givenness constraint on the three ditransitive sentence types. The results of the AJT showed that all three groups assign DO sentences significantly higher ratings in the given-new condition compared to the new-given condition. Additionally, the monolingual English group and the Spanish-English bilingual group assigned significantly higher ratings to HNPS sentences in the given-new condition compared to the new-given condition, though there was no difference in ratings for HNPS between conditions in the German-English bilingual group. The between-groups comparison revealed that the Spanish-English bilingual group assigns HNPS sentences higher ratings across the board compared to the other two groups. Further, this finding does not appear to

be reducible to differences in general English proficiency, English use, English exposure etc. between the two bilingual groups.

The FCT revealed that all three groups were significantly more likely to choose DO sentences in the given-new condition compared to the new-given condition. The monolingual English group and the Spanish-English bilingual group were also significantly more likely to choose HNPS sentences in the given-new condition, though there was no change in likelihood of choosing HNPS between givenness conditions in the German-English bilingual group. The between-groups comparison revealed that the Spanish-English bilingual group was *less* likely to choose DO sentences in the new-given condition compared to the other two groups, and this difference did not disappear once factors such as general English proficiency, English use, English exposure etc. were accounted for.

Finally, the SPR task revealed that givenness plays a facilitatory role in sentence processing for all three groups. For the monolingual English group, there was no significant interaction between sentence type and givenness at the critical region, contrary to prediction; however, when RTs for DO and PO sentences were compared across givenness conditions, the RTs for PO sentences in the new-given condition were significantly lower compared to those for DO sentences, despite there being no significant difference between PO and DO RTs in the given-new condition. For the two bilingual groups, there was evidence of a marginally significant interaction between sentence type and givenness at the critical region. For the German-English bilingual group, RTs for DO sentences were significantly higher in the new-given condition compared to the given-new condition. For the Spanish-English bilingual group, RTs for both DO and HNPS sentences were significantly higher in the new-given condition compared to the given-new condition. The slow-

down in RTs for DO sentences in the new-given condition began in R3 and also persisted into R4 and R5 for the Spanish-English bilingual group.

## CHAPTER 5. DISCUSSION

Chapter 5 will discuss the results that were presented in Chapter 4. Chapter 5 will be structured as follows: Section 5.1 will discuss the results in terms of the hypotheses put forth in Chapter 3. Section 5.2 will discuss the implications of the results for ongoing debates in the theoretical literature as well as potential directions for future research. Section 5.3 will discuss the methodological limitations of this study, and section 5.4 will summarize the main themes of the chapter.

### 5.1 Experimental Hypotheses

#### 5.1.1 Hypotheses for Monolingual English Speakers

The hypotheses for the monolingual English speaker group were as follows (repeated from Chapter 3):

MLH1. *PO sentences will be easier to process/more acceptable/preferred in all conditions*

*(that is, regardless of givenness) compared to DO sentences and HNPS sentences.*

*DO sentences will be easier to process/more acceptable/preferred in all conditions*

*compared to HNPS sentences (Brown et al., 2012; Clifton & Frazier, 2004).*

MLH2. *PO sentences with new-given order and PO sentences with given-new order will be*

*similarly easy to process/acceptable/preferred (Brown et al., 2012; Clifton & Frazier,*

*2004).*

MLH3. *DO sentences with new-given order will be more difficult to process/less*

*acceptable/dispreferred compared to DO sentences with given-new order (Brown et*

*al., 2012; Clifton & Frazier, 2004).*

MLH4. *HNPS sentences with new-given order will be more difficult to process/less acceptable/dispreferred compared to HNPS sentences with given-new order (Arnold et al., 2000, inter alia; Clifton & Frazier, 2004).*

Since sentence type was hypothesized to interact with givenness, tests for main effects of sentence type are difficult to interpret, as they require averaging over levels of givenness. As a result, MLH1 was not evaluated statistically; however, numerically, MLH1 was supported. In the AJT, PO sentences received the highest average ratings, followed by DO sentences, followed by HNPS sentences. In the FCT, PO sentences were chosen most across conditions, followed by DO sentences, followed by HNPS sentences. Finally, in the SPR task, PO sentences had the lowest reading times on average, followed by DO sentences, followed by HNPS sentences.

MLH2 was partially supported. In the AJT, PO sentences were equally likely to receive high ratings in both givenness conditions. In the FCT, PO sentences were less likely to be chosen in the new-given condition compared to the given-new condition; however, PO sentences were chosen more often than DO and HNPS sentences, even in the new-given condition. These results complement previous studies that found weak/non-existent givenness effects for PO sentences compared to DO sentences (Brown et al., 2012; Clifton & Frazier, 2004). Interestingly, the results of the FCT differ from the results of the FCT conducted by Park (2011, 2014), despite the similarities between the tasks. Recall that, in Park's study, the 'native' English speaker group chose new-given PO sentences in only 25% of trials, preferring given-new DO sentences 75% of the time. Unlike the current study, where PO sentences were still chosen in over 50% of trials in the new-given condition, Park's study shows more of a 'full reversal' of sentence preferences based on givenness. That is, speakers tended to choose the sentence type that allowed them to maintain given-new ordering.

How might these contrasting results be reconciled? It is not the case that PO sentences are completely unaffected by the givenness constraint; generally speaking, there is evidence for a preference for given-before-new constituent ordering in language processing and language production, and PO sentences are no exception. The difference between PO and DO sentences with regard to the givenness constraint is rather a matter of degree: the effects of the givenness constraint are weaker for PO sentences compared to DO (and HNPS) sentences because the first post-verbal argument slot in PO sentences is not specified for a secondary topic (Goldberg, 2006). PO sentences are not exempt from the givenness constraint, even though the givenness constraint plays a relatively weaker role in determining the appropriateness of the PO sentence in a particular context.

Returning to Park's study, Park's FCT differed from the current FCT in the salience of the givenness manipulation used in the experimental items. For instance, in example (15) shown in Chapter 2, the given referent was first introduced as a lexical NP (*his English teacher*), and was subsequently referred to seven additional times using a pronoun: *He liked **her** voice... the way **she** explained everything... **She** helped him... in **her** class... **She** was always kind... So when **she** left... He missed **her** very much*. This differs from the current study, where the given referent was only mentioned once, and only as a lexical NP. Given the use of both lexical and pronominal referring expressions and repeated reference, it seems reasonable to suggest that the given referent in Park's FCT was comparatively 'more given' than the given referent in the current FCT, which was only mentioned once. The increased givenness of the given referent in Park's FCT might explain why the results from her 'native' English-speaking group showed a 'full reversal' in their sentence preferences: the referent in Park's FCT was given enough to cause participants to favor



the given-new DO sentence over the new-given (but still felicitous) PO sentence, while this was not the case in the current FCT.

These contrasting results raise interesting questions regarding the effect that degree of givenness has on speakers' acceptance of PO sentences. If new-given PO sentences are less acceptable when the recipient argument is highly given, as Park's results suggest, is this givenness effect gradient or categorical? That is, do new-given PO sentences become increasingly less acceptable as givenness of the recipient argument increases incrementally, or is there a threshold at which the recipient argument becomes 'too given', resulting in a sharp decline in acceptability for new-given PO sentences? This question could be investigated by systematically manipulating the form of the recipient argument in new-given PO sentences, perhaps by using the six types of referring expressions in Gundel et al.'s (1993) Givenness Hierarchy. Such a study would shed additional light on the way that the general preference for given-before-new constituent ordering is instantiated in different constructions by way of nuanced, construction-specific information structure-to-syntax mappings. This is a potentially interesting question for future research.

In the SPR task, PO sentences were read significantly more slowly at the critical region in the new-given condition compared to the given-new condition. This result contradicts the findings of Brown et al. (2012), who found a no significant difference in RT at the critical region in PO sentences with given-new and new-given constituent ordering. This study attempted to replicate the findings of Brown et al. (2012) by using the same stimuli in the SPR task, so the differing results call for explanation. While the results of the present study showed a main effect of givenness for all three sentence types, PO sentences in the new-given condition were read significantly faster than DO sentences in the new-given condition, despite there being no significant difference in RT between the two sentence types in the given-new condition. This result

is in line with the hypothesis that the givenness constraint has a greater influence on processing ease for DO sentences compared to PO sentences.

Accepting that previous findings regarding givenness effects on PO sentences are reliable, the remaining question then is why PO sentences in this study were read significantly more slowly in the new-given condition when previous studies found no difference in RTs for PO sentences between givenness conditions. One possibility is that the monolingual English speaker group changed their reading strategies over the course of the task in order to adapt to the presence of sentences with new-given order. If participants were using this strategy, they might consciously slow down when they encounter a new post-verbal argument after reading a ditransitive verb, in anticipation of an upcoming given argument. Such an adaptation is likely when participants begin to anticipate the presence of odd sentence types in the experiment, or when they begin to focus their attention on sentence form rather than sentence comprehension. To combat the first problem, a high filler-to-test sentence ratio, for example, at least 3 fillers for each test sentence (Keating & Jegerski, 2015) is desirable in SPR tasks. The SPR task in the current study had a filler-to-test sentence ratio of 2.5:1, raising the possibility that participants may have begun to anticipate upcoming ditransitive sentences. Some participants also completed the AJT and FCT before the SPR task, and the completion of such metalinguistic tasks may have prompted them to adopt reading strategies focused specifically on sentence form, rather than the strategies used for ‘normal reading.’

Indirect evidence that such an adaptation might have taken place can be found by comparing the mean RTs from the monolingual English group to the mean RTs from the German-English bilingual group. Mean RTs on both givenness conditions for the monolingual English group were longer than those for the German-English bilingual group, which is odd considering

the evidence that processing a non-dominant language is more taxing on the language processing system compared to processing in a dominant language.

MLH3 was supported. In the AJT, DO sentences were more likely to receive low ratings in the new-given condition compared to the given-new condition. In the FCT, DO sentences were less likely to be chosen in the new-given condition compared to the given-new condition. Finally, in the SPR task, DO sentences were read more slowly at the critical region in the new-given condition compared to the given-new condition. These results are in line with the predictions of Goldberg's (2006) theoretical account of the information structure-syntax mappings for DO sentences, and they are also consistent with previous findings from corpus studies of ditransitive sentences (e.g. Thompson, 1990) and studies of ditransitive sentence processing (Brown et al., 2012; Clifton & Frazier, 2004).

Finally, MLH4 was supported. In the AJT, HNPS sentences were more likely to receive low ratings in the new-given condition compared to the given-new condition. In the FCT, HNPS sentences were less likely to be chosen in the new-given condition compared to the given-new condition. In the SPR task, HNPS sentences were read more slowly at the critical region in the new-given condition compared to the given-new condition. These results are consistent with the findings of previous studies that examined the effects of givenness on HNPS production and processing (e.g. Arnold et al., 2000 *inter alia*; Clifton & Frazier, 2004). Further, the results of the SPR task supplement previous findings regarding the effects of givenness on the processing of HNPS by establishing the locus of the processing difficulty. While Clifton and Frazier (2004) found that whole sentence reading times for HNPS sentences were longer with new-given constituent order compared to given-new constituent order, they did not conduct an incremental RT analysis, which left open the question of where exactly in new-given HNPS sentences the slow-

down occurs. The results of the SPR task establish that the second post-verbal argument is the locus of processing difficulty in new-given HNPS sentences, similar to new-given DO sentences. Establishing this similarity between DO and HNPS sentences provides additional support for the claim that DO and HNPS sentences share a set of overlapping contextual constraints, as in the statistical preemption account of HNPS proposed by Goldberg (2011). The results of the SPR task lend additional credence to this claim by showing that the second-post verbal argument is the target of givenness effects in both DO and HNPS, creating the conditions for statistical preemption.

### 5.1.2 Hypotheses for Bilingual English Speakers

The null hypotheses about the bilingual groups' preferences regarding the three sentence types are the same as those for the monolingual English group (repeated from chapter 3).

BLH1. *PO sentences will be easier to process/more acceptable/preferred in all conditions (that is, regardless of givenness) compared to DO sentences and HNPS sentences.*

*DO sentences will be easier to process/more acceptable/preferred in all conditions compared to HNPS sentences (Brown et al., 2012; Clifton & Frazier, 2004).*

BLH2. *PO sentences with new-given constituent order and PO sentences with given-new constituent order will be similarly easy to process/acceptable/preferred (Brown et al., 2012; Clifton & Frazier, 2004).*

BLH3. *DO sentences with new-given constituent order will be more difficult to process/less acceptable/dispreferred compared to DO sentences with given-new constituent order (Brown et al., 2012; Clifton & Frazier, 2004).*

BLH4. *HNPS sentences with new-given constituent order will be more difficult to process/less acceptable/dispreferred compared to HNPS sentences with given-new constituent order (Arnold et al., 2000, inter alia; Clifton & Frazier, 2004).*

BLH1 was partially supported. Numerically speaking, both bilingual groups gave PO sentences the highest ratings in the AJT. For the German-English bilingual group, DO sentences received a lower mean rating than PO sentences, and a higher mean rating than HNPS sentences. This result is consistent with the ratings assigned by the monolingual English group.

Unlike the other two groups, the Spanish-English bilingual group rated DO and HNPS sentences similarly on average. How might this difference be explained? It is not possible to simply say that HNPS is highly acceptable because a similar construction is allowed in Spanish, because this explanation would incorrectly predict that HNPS would also be assigned high ratings by the German-English bilingual group. Instead, the ratings of HNPS sentences by the Spanish-English bilingual group might be explained by appealing to the relative acceptability of the PO and HNPS equivalents in Spanish, specifically by assuming that the Spanish HNPS equivalent is similarly acceptable to the Spanish PO equivalent, at least with given-new constituent ordering.

This assumption seems plausible considering that the Spanish HNPS equivalent is the only ditransitive option that allows a more-given recipient to be ordered before a less-given theme post-verbally. While the Spanish clitic-doubling construction also allows recipient-theme ordering, there is evidence that clitic-doubling is associated with a more specialized discourse function, which Belloro (2007) describes as follows: “If [recipient] arguments are normally definite, topical, and cognitively *active* in the mind of the interlocutors, then doubling emerges as a marked construction that codifies a marked meaning: it occurs when the referent in question is *less accessible* than normally expected for a [recipient] argument” (p. 145, emphasis original). It seems that clitic doubling is not simply a device that allows for given recipients to be ordered before new themes; instead, it appears to function as a means of referring to recipient arguments that are less given than expected.

Returning to the ecology metaphor mentioned in Chapter 2, it seems that the Spanish HNPS construction and the Spanish clitic-doubling construction occupy separate ‘grammatical niches’, allowing both constructions to survive. As a result, it is possible to predict that, in contexts where it is favored, the Spanish HNPS equivalent should be at least as acceptable as the Spanish PO equivalent. If this is the case, the high mean ratings of HNPS in English by the Spanish-English bilingual group may be attributed specifically to the presence of a similarly acceptable construction with similar contextual constraints that occurs in Spanish.

Returning to the evaluation of BLH1, in the FCT, both bilingual groups were more likely to choose PO sentences over DO and HNPS sentences in both givenness conditions. In the SPR task, PO sentences had the lowest mean RT at the critical region for both bilingual groups.

BLH2 was supported. In the AJT, both bilingual groups gave PO sentences similar ratings across the givenness conditions. In the FCT, both bilingual groups were more likely to choose a PO sentence over a DO or a HNPS sentence in both the given-new condition and the new-given condition. Finally, in the SPR task, PO sentences had similar RTs in the given-new and new-given conditions at the critical region for both groups.

BLH3 was supported. In the AJT, both groups were significantly more likely to assign low ratings to DO sentences in the new-given condition compared to the given-new condition. In the FCT, both bilingual groups were significantly more likely to choose DO sentences in the given-new condition compared to the new-given condition; however this effect was significantly weaker for the Spanish-English bilingual group compared to the German-English bilingual group and the monolingual English group. Finally, in the SPR task, RTs for DO sentences in the given-new condition were significantly faster compared to those in the new-given condition for both bilingual groups.

BLH4 was partially supported. In the AJT, the Spanish-English bilingual group was significantly more likely to give higher ratings to HNPS sentences in the given-new condition compared to the new-given condition; however, the German-English bilingual group was not significantly more likely to give HNPS sentences higher ratings in the given-new condition compared to the new-given condition, though the numerical difference between the givenness conditions was in the expected direction. In the FCT, the Spanish-English bilingual group was significantly more likely to choose HNPS sentences in the given-new condition compared to the new-given condition; however, again, the German-English bilingual group was not significantly more likely to choose HNPS sentences in the given-new condition compared to the new-given condition, though again, the numerical difference between the number of HNPS tokens chosen in the two givenness conditions was in the expected direction. In the SPR task, the Spanish-English bilingual group had significantly longer RTs at the critical region for HNPS sentences in the new-given condition compared to the given-new condition; however, in the German-English bilingual group, there was no significant difference between RTs at the critical region for HNPS sentences in the given-new and new given conditions.

The results of the German-English bilingual group regarding HNPS are notable and deserve explanation. In all three tasks, there was no significant effect of givenness on the HNPS sentence preferences of the German-English bilingual group. This result is unexpected, because the occurrence of the HNPS equivalent in German was assumed to be constrained by many of the same factors that constrain HNPS in English, including givenness. One way to explain this result is to hypothesize that some other factor plays a more significant role than givenness in the occurrence of the HNPS equivalent in German. If this were the case, assuming an account where structural similarity results in transferring characteristics of a dominant language construction to a

similar construction in the non-dominant language, it would make sense that the German-English bilingual group would show little evidence of givenness effects for HNPS sentences.

One possibility is that the occurrence of the HNPS equivalent in German involves an interaction between sentence type and verb type. In other words, the HNPS equivalent may only occur with a certain subset of German ditransitive verbs. This type of interaction is not unprecedented: According to Adler (2011), German allows scrambling such that any ditransitive verb that may occur in the German PO equivalent may also occur in the HNPS equivalent (much like English); however, unlike English, these ditransitive verbs may also occur in the German DO equivalent, and the German DO equivalent *also* allows scrambling. That is, the German DO equivalent allows theme-recipient ordering in certain contexts. For these verbs, four ditransitive constructions are possible: DO (recipient-theme), DO (theme-recipient), PO, and HNPS.

Regarding the acceptability of the scrambled (theme-recipient) DO in German, Adler (2011) makes an interesting observation:

If verbs do have a [PO] variant because their semantics licenses this PP, such as the *verkaufen* (sell)-type and *schicken* (send)-type classes, the discourse behavior of sell-type class verbs... shows that the *an*-variant may behave like the English [PO], as a possible, and for yet unclear reasons preferred [compared to DO (theme-recipient)], variant in which the theme and recipient are reversed. (p. 25).

Adler observes that the German PO-equivalent may be preferred over the (theme-recipient) DO in contexts that favor theme-recipient ordering, though the reasons for this are somewhat unclear. While this observation is not exactly relevant to the occurrence of the HNPS equivalent in German, it illustrates one example of complex interaction between information structure, verb type, and sentence type. It is possible that a similar complexity constrains the occurrence of HNPS in German. Future work might examine the information structure constraints on HNPS in German, with an eye for identifying the factors that may be more influential than givenness, or identifying



the lexical/contextual conditions that must be met in order for the German HNPS construction to be licensed.

Taken together, the overall patterns of results for the three experimental groups can be summarized as follows. The Spanish-English bilingual group differs from the other two groups in two important ways: First, in the FCT, the Spanish-English bilingual group was significantly less likely to choose DO sentences in the given-new condition compared to the other two groups, and by extension tended to choose DO sentences more often in the new-given condition compared to the other two groups. Second, in the AJT, the Spanish-English bilingual group was significantly more likely to assign HNPS sentences high ratings across the board. On the other hand, the overall patterns of results for the German-English bilingual group and the monolingual English group were quite similar. PO and DO sentences are treated similarly in the both the AJT and the FCT: both groups assign PO sentences similar overall ratings and show no significant effect of givenness in the AJT. Both groups exhibit givenness effects for DO sentences and assign similar mean ratings to DO sentences in both givenness conditions in the AJT. Both groups were also significantly more likely to choose DO sentences in the given-new condition compared to the new-given condition in the FCT.

The monolingual English group and the German-English bilingual group differ only with respect to HNPS sentences, where the German-English bilingual group demonstrated no significant effect of givenness; however, they did assign HNPS sentences higher mean ratings in the given-new condition compared to the new-give condition (though this difference was not significant), and more HNPS tokens were chosen in the given-new condition compared to the new-given condition (though not significantly more). The monolingual English group and the German-

English bilingual group also assign given-new HNPS sentences similar mean ratings in the AJT and select given-new HNPS sentences at similar rates in the FCT.

Taking a holistic view of the three groups' overall patterns of results, I argue that the results of the monolingual English group and the German-English bilingual group pattern more similarly to one another than they do to the Spanish-English bilingual group. The relationship between the three groups can be represented as in Figure 5-1.

<b>Similar</b>	<b>Different</b>
English	Spanish
German	

Figure 5-1. Characterization of the relationship between the three groups' overall results.

In Chapter 3, the relationship shown in Figure 17 was the one that was predicted if MLH7 was correct; that is, it is the relationship that was predicted if language background, operationalized as similarity between the ditransitive options available in the dominant and non-dominant languages (the Surface Overlap Hypothesis), was a significant factor governing the realization of the givenness constraint in bilingual speakers' ditransitive sentence preferences. The results provide evidence that this is indeed the case. The results from the Spanish-English bilingual group on the FCT and AJT are consistent with the hypothesis that Spanish-English bilingual speakers map Spanish ditransitive constructions more closely to the English PO and HNPS constructions than to the English DO, presumably due to the lack of a 'true' DO construction in Spanish. A predicted result of this mapping was weaker givenness effects for DO sentences in the Spanish-English bilingual group, and the Spanish-English bilingual group's treatment of DO sentences in the FCT is consistent with this interpretation.

Considered together, the three groups overall patterns of results, in conjunction with the nature of the differences present in the Spanish-English bilingual group, support the conclusion that language background, specifically similarity between L1 and L2 constructions, plays a significant role in bilingual speakers' realization of the givenness constraint in their ditransitive sentence preferences, consistent with the claims of previous work (Marefat, 2005; K.-S. Park, 2014, 2011).

An alternative explanation is that the apparent differences between the two bilingual groups might be attributable to factors related to their experiences with English. In the AJT, the factors general English proficiency (LEXTale score), self-rated English speaking proficiency, listening proficiency, and reading proficiency, composite English use score, composite English exposure score, self-identification of language dominance ('Spanish/German' or 'both English and Spanish/German'), and age of onset of English acquisition did not have a significant main effect on participants' ratings, and the key contrasts between the groups remained significant. In the FCT, there was a significant effect of general English proficiency (LEXTale score); however, the significant differences between the two bilingual groups remained even after proficiency was accounted for. In fact, when general English proficiency by condition and language background by condition interactions were included in the same model, the language background by condition interaction was significant, while the general English proficiency by condition interaction was not. Taken together, these findings suggest that the differences between the two bilingual groups cannot be reduced to these factors, failing to disprove the hypothesis that language background is driving differences between the two bilingual groups.

In short, there are still significant differences between the two bilingual groups, even when factors related to English proficiency and experience with English are taken into account.

Exploratory analyses of the AJT and FCT data investigated potential effects of English use in different domains (at work, at school, at home, in social situations, and with a partner). The results again showed that predictors related to English use across domains do not account for differences between the two bilingual groups in either task. In terms of this study, there are two possible explanations for this. The first possibility is that cross-linguistic influence does indeed play a small but significant role in the realization of the givenness constraint in bilingual speakers' sentence preferences, as previous studies have claimed. The second possibility is that the two bilingual groups in this study, or the English input that they are exposed to, differ in some other way that has not been adequately accounted for.

In summary, when the results of all three experimental groups are considered holistically, the monolingual English group and the German-English bilingual group pattern similarly to one another, and, crucially, pattern differently from the Spanish-English bilingual group. Statistical analyses suggest that this pattern of results cannot be attributed to factors relating to participants' experience with English. As a result, the data support an interpretation where cross-linguistic influence plays a significant role in the realization of the givenness constraint in bilingual speakers' ditransitive sentence preferences.

## **5.2 Implications and Future Directions**

The previous section evaluated each of the experimental hypotheses in light of the study results and concluded that cross-linguistic influence does play a small but significant role in the realization of the givenness constraint on bilingual speakers' sentence preferences in this study. This section will consider the implications of these results and propose potential directions for further research.

### 5.2.1 Theoretical Implications

In Chapter 2, the effect of the givenness constraint on bilingual speakers' sentence preferences was discussed in terms of two explanations: the L1 similarity explanation and the input salience explanation. These two types of explanations were traced back to two broad theoretical perspectives: those frameworks that predict influence of the L1/dominant language on L2/non-dominant production/comprehension, even at the highest levels of proficiency, and those frameworks that view language input characteristics as the main driver of L2 development, such as Usage-Based Approaches. As previously discussed, both types of approaches acknowledge the importance of the L1/dominant language on language processing/production in the L2/non-dominant language. As a result, it is not possible to broadly argue for one type of approach or the other based on the current results.

Nevertheless, there are some notable theoretical implications at other levels of granularity. Two such implications pertain to (1) the status of the givenness constraint vis à vis grammatical knowledge and (2) the structural similarity between English and Spanish ditransitive sentences. First, the results of this study support accounts that consider the givenness constraint to be a 'soft' constraint in the grammar. The results from the monolingual English group demonstrated that the givenness constraint is realized differently for PO sentences compared to DO and HNPS sentences: while there was generally a strong dispreference for DO and HNPS sentences with new-given constituent order, PO sentences were generally not subject to this same dispreference. This result is consistent with the interpretation that the realization of the givenness constraint is construction specific; that is, while there may be a general preference for given-before-new ordering in language processing/production, the degree to which that preference is expressed differs between grammatical constructions.

Further, the results from the Spanish-English bilingual group show that the givenness constraint on DO sentences was weaker for this group compared to the German-English bilingual group. This difference was hypothesized to be the result of Spanish lacking an equivalent to the English DO construction, leading to differences between the bilingual groups: while the German-English bilingual group could simply transfer the information structure properties of the German DO to the English DO, the Spanish-English bilingual group could not similarly take advantage of the similarities between their dominant and non-dominant languages. If this hypothesis is correct, the weaker givenness effects on DO sentences in the Spanish-English bilingual group suggest that these speakers must learn the construction-specific realization of the givenness constraint for English DO sentences. This might be unexpected if we were to assume that the givenness constraint is simply a general ordering preference that applies to all constructions equally across languages.

Taken together, these results support accounts that conceive of the givenness constraint as a soft constraint in the grammar of English. While there is certainly a general preference to order given information before new information in language processing and production, the way that this preference is realized is construction specific. Such an account is in line with, for example, constructional approaches to representing English ditransitive sentences (Goldberg, 2006), in which the interaction between syntax and information structure is captured as part of speakers' grammatical knowledge of the construction. However the relationship between information structure and syntax is represented, the results of this study support an account where speakers' grammatical knowledge includes construction-specific information about how givenness influences individual ditransitive sentence types.

Of course, alternative explanations are also possible. MacDonald (personal communication) suggests an explanation based on constructional ‘neighborhoods’, where constructions that ‘live’ close to one another in the grammatical representation share similar properties. Under this account, the PO construction and the English transitive construction live in the same neighborhood. The object position in the transitive construction is a position where new information is commonly introduced; the PO construction then ‘inherits’ this property due to its proximity to the transitive construction in the grammatical representation, which explains why a discourse new argument may felicitously occur in the first post-verbal argument position in PO sentences. Under this account, the given-before-new principle is thought of as a general tendency shaping language production, not a grammatical constraint. The exceptional behavior of the PO construction in language processing results from the properties it inherits from the transitive construction, and not from grammatically specified mappings between syntax and information structure. Future work investigating the effects of givenness on related constructions, such as the transitive construction and the PO construction, would be valuable for expanding on this type of account.

Turning to the second theoretical implication, this study assumed that the Spanish clitic doubling construction is structurally dissimilar to the English DO construction. This assumption was justified based on formal differences between the two constructions, namely differences in the ordering of the post-verbal arguments (theme-recipient vs. recipient-theme) and the form of the constituent containing the recipient argument (PP vs. NP). Following the Surface Overlap Hypothesis, it was hypothesized that Spanish speakers would show weaker givenness effects on English DO sentences due to the lack of a structurally similar construction in Spanish. The results of the FCT support this interpretation: the Spanish-English bilingual group was less likely to choose DOs in the given-new condition (where it was more favorable) and were more likely to

choose DOs in the new-given condition (where it was less favorable) compared to the other two groups.

If the predictions of the Surface Overlap Hypothesis are taken seriously, the results of the current study have implications for the debate regarding the presence or absence of a true DO construction in Spanish. Recall that it has been argued that the Spanish clitic doubled ditransitive is structurally similar to the English DO at some level of representation (Bleam, 2003; Demonte, 1995). In an approach that claims structural similarity between the English DO and the Spanish clitic doubled ditransitive, structural overlap predicts that Spanish-English bilingual speakers would behave similarly to monolingual English speakers and German/English bilingual speakers in their sensitivity to givenness in DO sentences, via positive transfer from Spanish. However, the results of this study suggest that this is not the case: while the German-English bilingual group showed similar sensitivity to givenness compared to the monolingual English group on DO trials in the FCT, the Spanish-English bilingual group showed significantly weaker effects of givenness. This result is unexpected under an account where the Spanish clitic doubled ditransitive and the English DO are structurally the same, but it is expected under an account where the two constructions are structurally different.

However, another interpretation is also possible, which is that the crucial difference between the Spanish clitic doubled ditransitive and the English DO is not the form and ordering of the arguments, but rather different information structure-syntax mappings. Under such an account, the two constructions are structurally similar enough to be identified across the two languages, but the distinct information structure-syntax mappings of the Spanish clitic-doubled ditransitive are transferred to the English DO, resulting in weaker effects of givenness. There is reason to find such an explanation plausible: recall that, according to Belloro (2007), clitic



doubling occurs when the ditransitive recipient argument is less given than might be expected. If this is the case, we might predict that Spanish-English bilingual speakers would show a weaker preference for DOs with given recipients vs. DOs with new recipients, and might even favor DOs with new recipients, since this is precisely the mismatch between argument structure and information structure that the Spanish clitic doubled ditransitive is used to mark. This possibility could be further investigated by conducting a forced-choice experiment that tests Spanish-English bilingual speakers' ditransitive preferences in both English and Spanish. Such a study could attempt to replicate the FCT results from this study and could provide a clearer picture of the information structure constraints associated with the Spanish clitic doubled ditransitive.

### **5.2.2 Methodological Implications**

In addition to the theoretical implications, the results of this study have several methodological implications. First, one of the main goals of this study was to replicate the results of the self-paced reading study conducted by Brown et al. (2012). This study aimed to extend Brown et al. (2012) in three main ways: first, it attempted to replicate the results using internet-based data collection methods. Second, it extended their study to include additional task types. Third, it extended their study to include bilingual English speakers.

Regarding the first point, results from the monolingual English group did not show evidence of an interaction between givenness and sentence type at the critical region, contrary to prediction; however, there was evidence that ease of processing for DO sentences was affected by givenness to a greater degree compared to PO sentences. It is possible that the lack of a significant interaction could be attributed to differences in the sample size and task design: the monolingual English group in this study consisted of 60 participants, while Brown et al.'s (2012) dataset consisted of 120 participants. Additionally, participants in Brown et al.'s (2012) study were

exposed to each experimental condition six times, while participants in the current study were exposed to each experimental condition in the SPR task only three times. Due to both of these factors, the current SPR analysis may be statistically underpowered compared to the analysis in Brown et al. (2012), which may explain the lack of a significant interaction between givenness and sentence type in the monolingual English group.

Regarding the second point, the results strengthen the conclusions of Brown et al. (2012) by finding similar patterns of results in two additional task types. Further, the results show a surprising level of consistency between self-paced reading and acceptability judgements. The results of the AJT from this study are almost identical to the results of the SPR study conducted by Brown et al. (2012), down to the slight (non-significant) advantage for PO sentences in the new-given order. This result lends support to the claim that scalar acceptability judgements are a means of assessing the level of processing difficulty associated with certain constructions and are not only a metalinguistic judgement of well-formedness.

Regarding the third point, the SPR results of both bilingual groups did show evidence of a marginally significant interaction between givenness and sentence type, as expected. This result is encouraging in two respects. First, together with the results of the monolingual English group, it suggests that internet-based data collection is a viable data collection strategy for SPR tasks focusing on sentence anomaly detection, even those tasks which are investigating subtle contrasts, such as contrasts in felicity. Second, these results suggest that internet-based data collection strategies are viable for studies of bilingual populations, even studies investigating real-time processing. This is an important point, as internet-based data collection strategies generally make experimental research more accessible and also allow bilingualism researchers to recruit populations that might not otherwise be available to them.

Additionally, the results have implications for the use of independent language proficiency measurements compared to self-ratings of proficiency in bilingualism research. Between the AJT and the FCT, there was only a significant effect of English proficiency in the FCT. Recall that the statistical analysis for the FCT included two types of predictors for English proficiency: LEX Tale score, which was used as an independent measure of English proficiency, and self-ratings of English proficiency along three axes: speaking English, reading English, and understanding English. Of those four predictors, only LEX Tale score was a significant predictor of participants' likelihood of choosing DO and HNPS sentences. There was no significant effect associated with participants' self-ratings of their English speaking, reading, and understanding proficiency.

This result is consistent with the results of Lemhöfer and Broersma (2012), which showed that LEX Tale was generally a better representation of proficiency compared to participants' self-ratings. It also suggests that independent measures generally capture information about proficiency that is missing from self-ratings, in support of the trend toward using independent measures of proficiency in bilingualism research. Measuring proficiency more consistently by adopting standard independent measures, such as the LEX Tale, will allow the results of similar studies to be more easily compared.

Finally, the results have several implications for better understanding how the same phenomena may be realized differently across different types of experimental tasks. First, when the two offline tasks (the AJT and the FCT) are compared, the two task types show slightly different patterns of results. For the monolingual English group, PO and DO sentences received similar mean ratings in the given-new condition; however, when participants were required to compare the two sentence types head-to-head, they still showed a preference for PO sentences, choosing new-given POs over given-new DOs in more than 50% of trials. This result might not

necessarily be expected based on the results of the AJT alone. In my view, both the AJT and the FCT together provide a more complete picture than either one of the tasks individually.

Regarding the results of the two bilingual groups, only the FCT revealed a difference between the Spanish-English bilingual group's treatment of DO sentences: in the AJT, the Spanish-English bilingual group assigned DO sentences similar ratings compared to the other two groups in both givenness conditions; however, when required to compare DO sentences with PO sentences head-to-head in the FCT, the Spanish-English bilingual group was significantly less likely to choose DO sentences in the given-new condition compared to the other two groups. Additionally, only the FCT revealed significant effects of general English proficiency: the FCT revealed that selections of DO and HNPS sentences in the new-given condition declined as general English proficiency increased, while there was no significant effect of general English proficiency in the analysis of the AJT.

These findings have two general implications: first, they lend support the observation that some phenomena in sentence comprehension are not detectable unless participants are given the opportunity to explicitly compare alternative sentence types (e.g. Ackerman et al., 2018). The process of making a scalar acceptability judgement of an anomalous sentence may well involve implicit comparison of that sentence "to a correct or predicted version" (Schütze, 1996, p. 174), but the qualitative difference between implicit and explicit comparisons of one sentence to another sentence seem to have real consequences for detecting certain kinds of contrasts. Second, bilingualism studies seeking to examine the effects of variables such as general language proficiency and experience with the language may find more fruitful results employing a FCT, though there is still value in being able to observe a particular contrast using multiple task types.

### 5.3 Limitations

While this study surely has several limitations, there are two significant limitations that must be discussed. These limitations involve (1) the design of the SPR task, and (2) the lack of data on givenness effects for ditransitive constructions in German and Spanish. First, several of the design features in the SPR task are methodologically sub-optimal, and it is important to make these deficiencies explicit. First, repeated-measures SPR tasks typically require many exposures to each experimental condition. According to Keating and Jegerski (2015), participants in an SPR task should ideally be exposed to each experimental condition 8-12 times, with the hope of ending up with 6-10 observations per condition after trimming. In this study, participants in the SPR task were exposed to each condition only 3 times. The analysis employed minimal trimming procedures in order to reduce data loss, but having only 3 observations per condition introduces the concern that the between-condition means may not be reliable. While the overall consistency between the results of the SPR task and the results of the other two tasks reduce concerns about reliability somewhat, an ideal design would have included more than three observations per condition.

The second significant flaw in the SPR task is related to the task sequence. Ideally, participants in an SPR task would not take part in any metalinguistic tasks, such as an acceptability judgement task, beforehand (Keating & Jegerski, 2015). This rule is based on the assumption that calling participants' attention to linguistic form may cause them to employ "explicit knowledge" during the SPR task in ways that do not resemble 'normal reading' (Keating & Jegerski, 2015, p. 11). In this study, some participants completed the SPR task after completing the AJT, introducing the concern that their performance on the SPR task may have been influenced by their prior completion of the AJT. The SPR analysis always included the variable 'task order' in order to address this concern; nevertheless, there is some evidence that the monolingual English group may have adopted 'unnatural' reading strategies in the SPR task.

The design of the SPR task attempted to balance the need for keeping the task sequence at a reasonable length with the need to include an adequate number of trials per condition. It additionally attempted to leverage the advantage of including a real-time processing task in the task sequence while acknowledging the potential danger of including such a task alongside a metalinguistic judgement task. In acknowledgement of these shortcomings, the analysis and interpretation of the SPR results in this study has been kept relatively conservative.

The second significant methodological limitation relates to the lack of data on givenness effects for ditransitive constructions in German and Spanish. Earlier in this chapter, it was said that the results tentatively support an interpretation where cross-linguistic influence plays a significant role in the realization of the givenness constraint on bilingual speakers' ditransitive sentence preferences. This interpretation makes the assumption that bilingual speakers transfer the information structure mappings associated with ditransitive constructions in German and Spanish to the equivalent constructions in English. For example, it was assumed that the HNPS equivalent in Spanish and HNPS in English have similar information structure properties, which are transferred when bilingual speakers' create associations between similar constructions in Spanish and English. This explained the why the Spanish-English bilingual group and the monolingual English group showed similar sensitivity to givenness for HNPS sentences. Crucially, this assumption was also employed to explain why the Spanish-English bilingual group differed from the German-English bilingual group in their treatment of DO sentences in the FCT. These kinds of assumptions were considered justified based on the effects of information structure on German and Spanish ditransitive constructions that were described in the literature.

In order for this kind of similarity-based explanation to be taken seriously, the givenness effects that are assumed to be associated with ditransitive sentences in German and Spanish must

be confirmed to exist. While acceptability judgements reported in the theoretical literature on are generally consistent with the results of formal acceptability judgement experiments (Sprouse et al., 2013), this is not always the case (see Hitz & Francis, 2016). A similarity-based interpretation would be strengthened by confirming that the patterns observed in the results of the bilingual groups correspond to similar patterns in German and Spanish.

In this respect, the results of this study make several predictions: first, for the translation-equivalent ditransitive verbs in German and Spanish, the PO equivalent should show weak/insignificant effects of givenness on all three tasks, in accordance with the performance of the two bilingual groups regarding PO sentences. Second, for the translation-equivalent ditransitive verbs in German, DO sentences should show significant effects of givenness, and HNPS sentences should show weak/insignificant effects of givenness, in accordance with the performance of the German-English bilingual group on all three experimental tasks. German-HNPS sentences for these verbs should additionally be rated as significantly less acceptable overall than the German DO and PO equivalents. Third, for the translation equivalent verbs in Spanish, HNPS sentences should show significant effects of givenness on all three experimental tasks, in accordance with the performance of the Spanish-English bilingual group. If we assume that the Spanish clitic doubled ditransitive is in fact structurally similar to the English DO, Spanish-English bilingual speakers should show a weaker preference for given recipients in clitic doubled ditransitive sentences, in line with the results for English DOs on the FCT. Only by knowing how the results of the current study compare to the results of similar studies of similar constructions in German and Spanish is it possible to determine the relative importance of linguistic similarity in the realization of the givenness constraint for English bilingual speakers.

## 5.4 Chapter Summary

In summary, the results of this study support an interpretation where cross-linguistic influence plays a significant role in the realization of the givenness constraint in bilingual speakers' ditransitive sentence preferences. The overall patterns of results from the three experimental groups provide evidence for an interpretation where the German-bilingual group and the monolingual English group perform more similarly to each other compared to the Spanish-English bilingual group, precisely the grouping that was predicted if cross-linguistic influence was of great importance. Further, the treatment of DO sentences by the Spanish-English bilingual group in the FCT are expected under an account where these speakers are unable to transfer the information structure properties of a similar ditransitive sentence type in Spanish.

These results have several implications: first, the differential effects of givenness on the three sentence types is in line with an account where the construction-specific realization of the givenness constraint forms part of English speakers' grammatical knowledge (as a soft constraint). Second, the results are consistent with an interpretation where Spanish lacks a true DO construction; however, an alternative interpretation is that the English DO and Spanish clitic doubled ditransitive are structurally similar but have different information structure constraints. Assuming the second interpretation, the results of this study motivate specific predictions about the givenness effects on Spanish clitic-doubled ditransitive sentences, which are predicted to align with the findings of Belloro (2007).

This study has two notable limitations. First, the design of the SPR task contains several methodological flaws. Proceeding with the task despite these flaws was viewed as a necessary sacrifice in order to make the overall study design feasible. While certain measures were taken to monitor the reliability of the SPR results, they were analyzed and interpreted with some caution. Second, this study does not include data regarding the effects of givenness on the relevant



ditransitive sentence types in German and Spanish. Without such data, it is impossible to get a clear picture of the magnitude of cross-linguistic influence on the realization of the givenness constraint; however, the results of this study provide support for the claim that cross-linguistic influence does play a role in the realization of the givenness constraint, even after other factors are taken into account.

## CHAPTER 6. CONCLUSION

In conclusion, this study was guided by two research questions related to the role that the givenness constraint plays in bilingual English speakers' ditransitive sentence preferences. Those research questions are repeated below.

- R1. Do bilingual English speakers demonstrate sensitivity to the givenness constraint in their ditransitive sentence preferences and/or during real-time sentence processing?
- R2. What is the relative importance of language background and speakers' experience with English (English proficiency, frequency of English use, amount of English exposure, etc.) in the realization of the givenness constraint in bilingual speakers' ditransitive sentence preferences?

The answer to R1 appears to be a fairly definitive 'yes'. For German-English bilingual speakers and Spanish-English bilingual speakers, all three experimental tasks provided evidence that the givenness constraint plays a role in their ditransitive sentence preferences. DO sentences were read more quickly, were more likely to receive high ratings, and were more likely to be selected over a new-given PO alternative in the given-new condition compared to the new-given condition. Additionally, for the Spanish-English bilingual group, HNPS sentences were also preferred in the given-new condition compared to the new-given condition. These results are consistent with the results of previous studies showing an effect of givenness on the sentence preferences of adult L2 English speakers, and they are also consistent with the findings from studies of L1 English speakers.

Regarding R2, the goal of this study was to consider whether the results could plausibly support an interpretation where cross-linguistic influence plays a significant role in shaping the realization of the givenness constraint in bilingual speakers' sentence preferences. In order to achieve this goal, this study included two groups of bilingual speakers whose dominant languages featured different enough ditransitive constructions as to allow the effects of cross-linguistic

influence to be detected. The study featured three different experimental tasks in order to test for potential effects of offline vs. online comprehension and for potential effects of participants having differing levels of metalinguistic competence. Finally, this study incorporated measures of general English proficiency, frequency of English use, amount of English exposure, and language dominance into the statistical analysis, in order to determine whether apparent effects of language background might be reducible to these factors. The results show that significant effects of language background persisted, even after these factors were accounted for. Specifically, the Spanish-English bilingual group was significantly more likely to give HNPS sentences higher ratings in the AJT and showed weaker effects of givenness on DO sentence choice in the FCT. I have argued that both of these results can be explained by appealing to cross-linguistic influence from Spanish, in line with approaches that predict cross-linguistic influence in cases of structural similarity, such as the Surface Overlap Hypothesis (Azaz, 2019; Döpke, 1998; Hulk & Müller, 2000; Müller, 1998; Yip & Matthews, 2000)

These results have several implications. First, the finding that the givenness constraint appears to play a larger role in speakers' preferences for DO and HNPS sentences compared to PO sentences indicates that the realization of the givenness constraint is construction specific. Construction specific givenness effects seem to provide evidence against a conception of givenness effects as resulting from the language-general preference for given-before-new order. Additionally, the finding that the realization of the givenness constraint is subject to cross-linguistic influence in the sentence preferences of bilingual English speakers shows that construction-specific weightings of the givenness constraint do not come for free, but in fact must be learned. I argue that these results support an analysis of the givenness constraint as a 'soft'

grammatical constraint, operationalized either as a true violable constraint or as the result of construction-specific information structure-syntax mappings.

Second, the results have implications for the claim that Spanish clitic-doubling constructions are structurally similar to the English DO construction. In a framework that posits structural similarity between clitic doubled ditransitive sentences and the English DO (e.g. Bleam, 2003), Spanish-English bilingual speakers might show sensitivity to givenness in their DO preferences in a similar manner to German-English bilingual speakers, because the relevant information structure-syntax mappings should be straightforwardly transferred from the Spanish clitic-doubled ditransitive to the English DO. In this study, the Spanish-English bilingual group demonstrated significantly weaker givenness effects for DO sentences compared to the German-English bilingual group and the monolingual English group on the FCT. This result is consistent with the interpretation that the weaker DO effects observed in the Spanish-English bilingual group result from the lack of a true DO construction in Spanish, though they are also consistent with an interpretation where the English DO and the Spanish clitic doubled ditransitive are structurally identical but have different information structure constraints.

While these results provide new insights into the realization of the givenness constraint in bilingual speakers' ditransitive sentence preferences, this study has several limitations. Most significantly, this study did not examine the effects of givenness on the Spanish and German constructions that were assumed to be the structural equivalents of the English PO, DO, and HNPS sentences. In order for a transfer explanation of bilingual speakers' responses to be seriously considered, the effect of givenness on the relevant Spanish and German constructions must be examined. Only after the effects of givenness in Spanish and German have been examined will it be possible to construct a complete picture of the potential effects of cross-linguistic influence.

To this end, several predictions about the effects of givenness in Spanish and German can be made based on the current results, assuming that language background does in fact influence bilingual speakers' responses. For example, the German-English bilingual group did not demonstrate a significant sensitivity to givenness on HNPS sentences in any of the three experimental tasks. This result was unexpected, because the occurrence of the German HNPS equivalent was assumed to be constrained by many of the same factors that constrain HNPS. Under a transfer account, the insignificant effect of givenness on German bilingual speakers' HNPS responses implies that some other factor may play a more important role in the occurrence of HNPS in German. One such explanation is that certain German verbs prefer the HNPS equivalent over the DO construction for reasons that are somewhat unclear. Future work on givenness effects in German ditransitive sentences might also examine the potential interaction between verb type and sentence type in order to determine if the HNPS construction is in fact preferred by a subset of ditransitive verbs.

Future work might additionally investigate the extent to which different degrees of givenness influence speakers' acceptance of PO sentences. While the current study found that monolingual English speakers in the FCT chose PO sentences in over 50% of trials in both givenness conditions, a very similar FCT conducted by Park (2011, 2014) found that 'native' English speakers chose DO sentences with given-new constituent order over POs with new-given constituent order. I speculated that the discrepancy between these two tasks was the result of the experimental manipulations employed when establishing a referent as given: While Park's stimuli referred to the given referent multiple times, the stimuli used in the current study referred to the given referent only once. Multiple references to the given referent in Park's study may have resulted in that referent being comparatively 'more given' than the given referent in the current

study. As a result, Park's participants preferred the DO, which allowed given-new constituent ordering, over the PO. If this speculation is accurate, two potential interpretations are allowed: one interpretation is that the PO-specific realization of the givenness constraint allows the constraint to be violated only to a certain point; once a referent becomes 'too given,' even the inherently weak givenness constraint can win out against more heavily weighted constraints, like an undersized boxer using loaded gloves. Another possible interpretation is that the PO construction truly is not subject to the givenness constraint, and the referent in Park's study was given enough to evoke the language-general preference for given-before-new ordering. Further work might clarify whether PO sentences are in fact subject to the givenness constraint, and if so, might further elucidate the specific way that the givenness constraint is instantiated for PO sentences.

Finally, this study represents one component of a larger research program, in which the general goal is to determine why word order alternations happen. In pursuit of this goal, two questions are considered: First, to what degree do each of the relevant factors contribute to the occurrence of one word order variant instead of another? and second, how does the influence of each factor differ across populations? The givenness constraint has been the focus of this study, and two populations, monolingual English speakers and bilingual speakers, were considered. By examining the effects of the givenness constraint on the three sentence types considered here, this study provides evidence relevant to the first question regarding which factors contribute to the occurrence of one word order variant over another.

Evidence relevant to the second question was generated by considering speakers from different populations, populations which are distinguished in this case by their linguistic backgrounds. The second question in particular is important to address experimentally, as other approaches, such as computational modeling, typically require larger corpora which are not

available for all populations and languages (or language varieties). For example, while there are many large corpora available for English, most of those corpora primarily contain data from healthy adult speakers. Experimental approaches are particularly well suited to expanding word order alternation research to populations from underrepresented cognitive-linguistic backgrounds, such as bilingual speakers, or persons with language disorders, such as aphasia. It is necessary to continue employing approaches that increase diversity in the study of word order alternations in order to develop a satisfactory account explaining why word order alternations happen.

## APPENDIX A: BILINGUAL GROUP CHARACTERISTICS

	German-English (n = 60)	Spanish-English (n = 60)
Age	Mean: 29 min.18, max. 50	Mean: 26 min. 18, max. 44
Age began learning English	Mean: 9 min. 6, max. 14	Mean: 8 min. 3, max. 20
Gender (count)	Female: 18 Male: 41 Non-binary: 1	Female: 24 Male: 35 Non-binary: 1
Language most comfortable with (count)	German: 31 German and English: 29	Spanish: 24 Spanish and English: 36
General English proficiency (LEXTale score /100. Higher score = more proficient)	Mean 84.54 min. 51.25, max. 100	Mean 74.42 min. 51.25, max. 97.50
Speaking English (self-rating /10. Higher score = more proficient)	Mean: 7.183 min. 1, max. 10	Mean: 6.783 min. 2, max. 10
Reading English (self-rating /10. Higher score = more proficient)	Mean: 8.617 min. 5, max. 10	Mean: 8.4 min. 3, max. 10
Understanding English (self-rating /10. Higher score = more proficient)	Mean: 8.433 min. 4, max. 10	Mean: 7.717 min. 2, max. 10
English use (self-rating /5. Higher score = more English)	Mean: 3 min. 1.5, max. 5	Mean: 3.008 min. 1, max. 4.5
English exposure (self-rating /5. Higher score = more English)	Mean: 4.033 min. 2.750, max. 5	Mean: 4.312 min. 2.5, max. 5
Level of education (count)	elementary school: 1 attended high school: 1 high school completed: 17 attended university: 13 bachelor's degree completed: 17 graduate degree completed: 11	elementary school: 0 attended high school: 3 high school completed: 14 attended university: 15 bachelor's degree completed: 18 graduate degree completed: 10
Years,months in Eng. speaking country	Mean: 0,2 min. 0, max. 2	Mean: 0,5 min. 0, max. 7



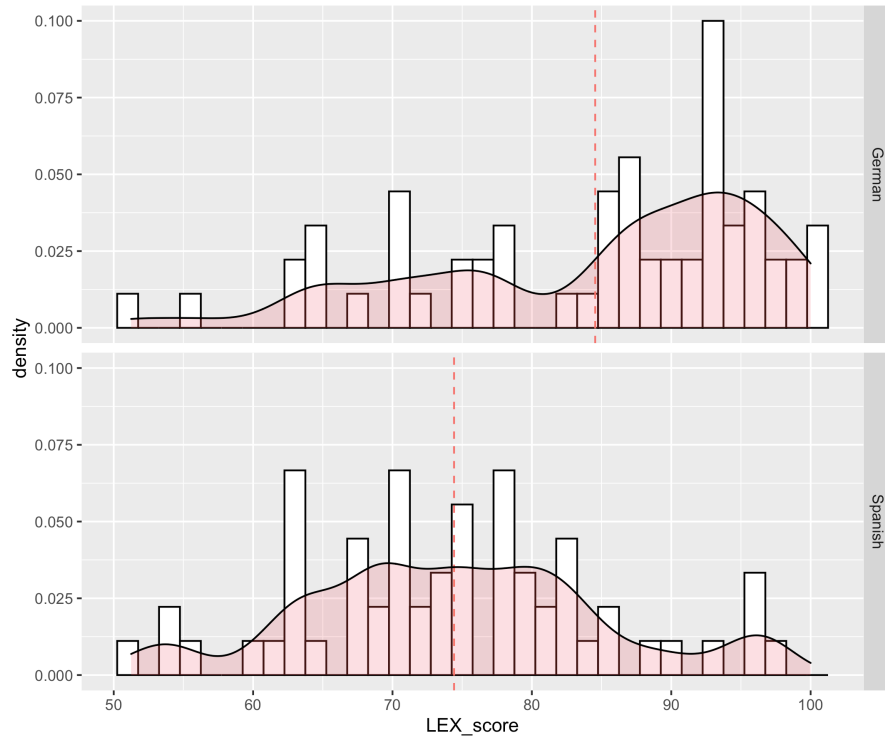


Figure A-6-1. General English Proficiency (LEXTale Score).

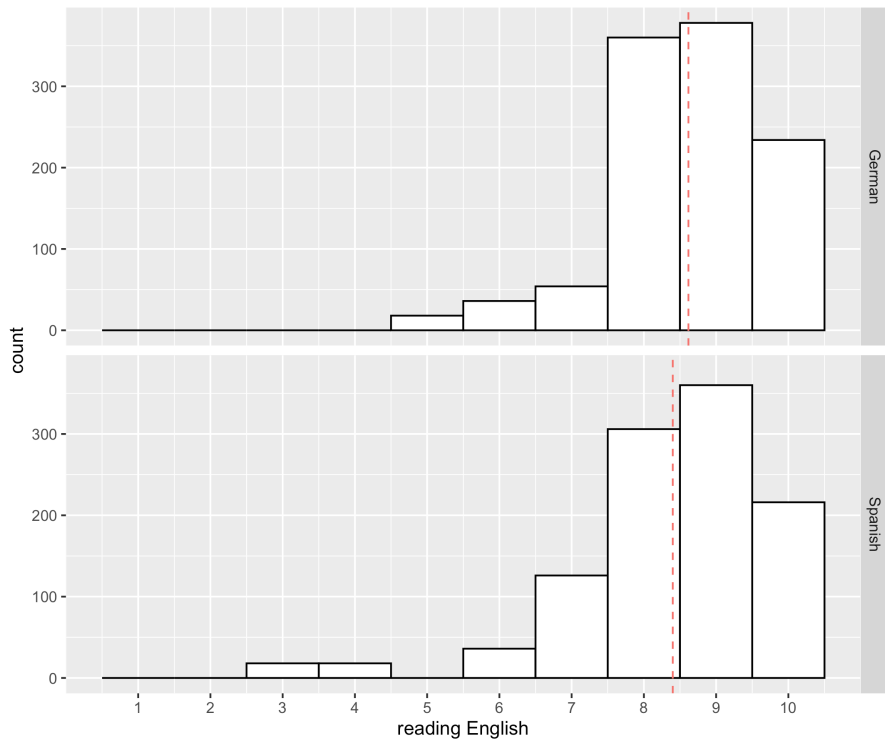


Figure A-6-2. Self-rated English Reading Proficiency.

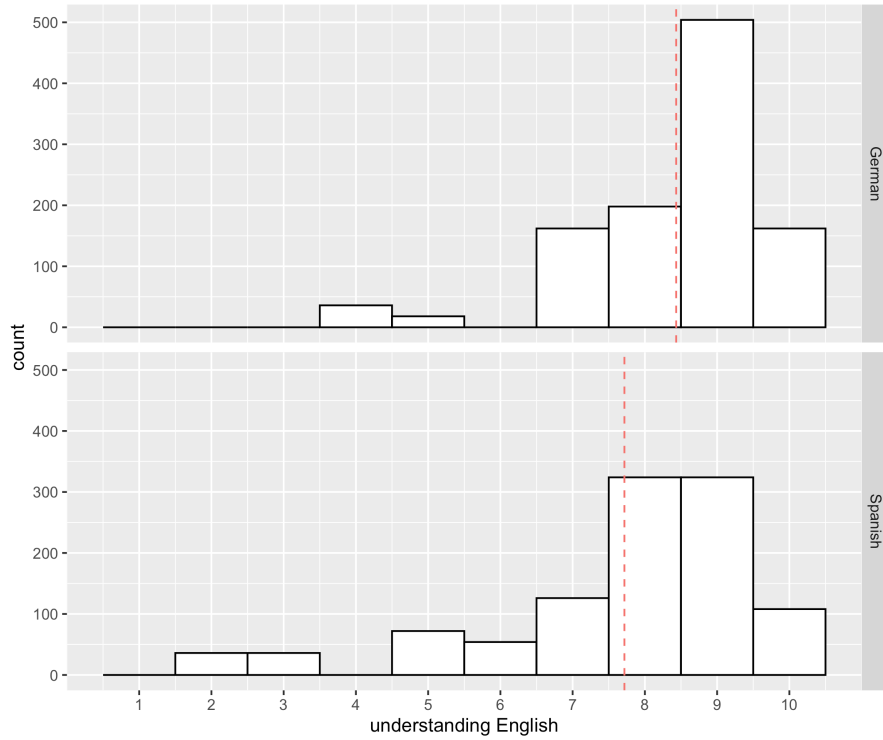


Figure A-6-3. Self-rated English Understanding Proficiency.

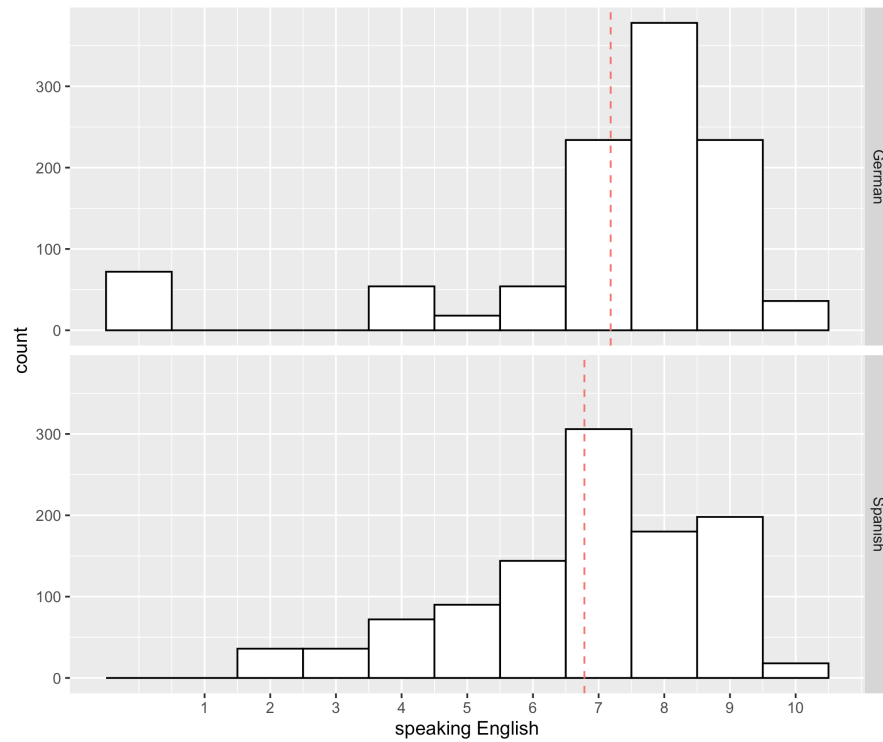


Figure A-6-4. Self-rated English Speaking Proficiency.

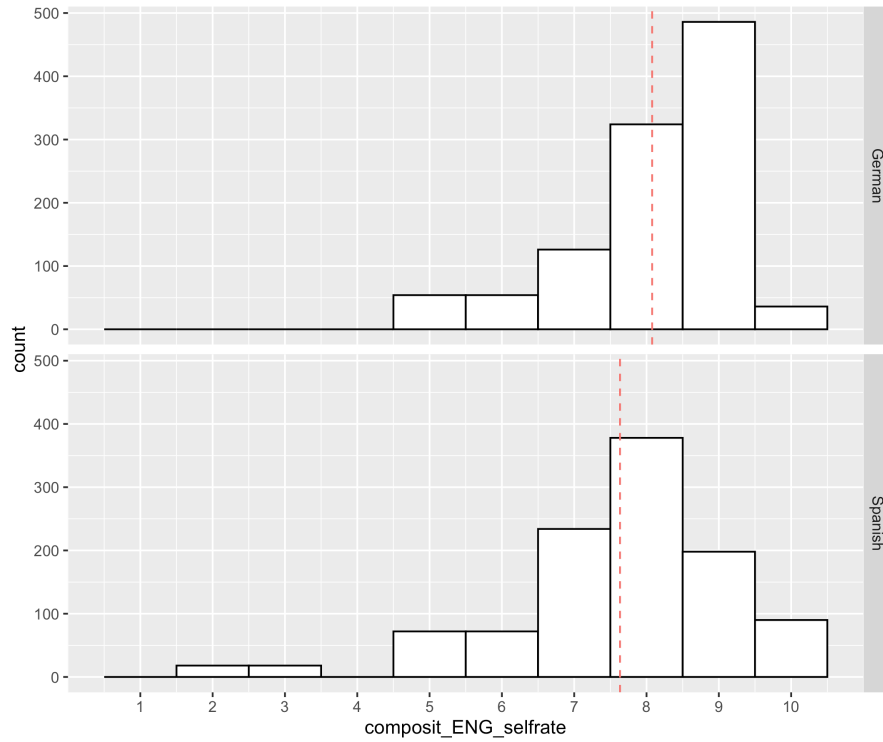


Figure A-6-5. Composite self-rated English Proficiency.

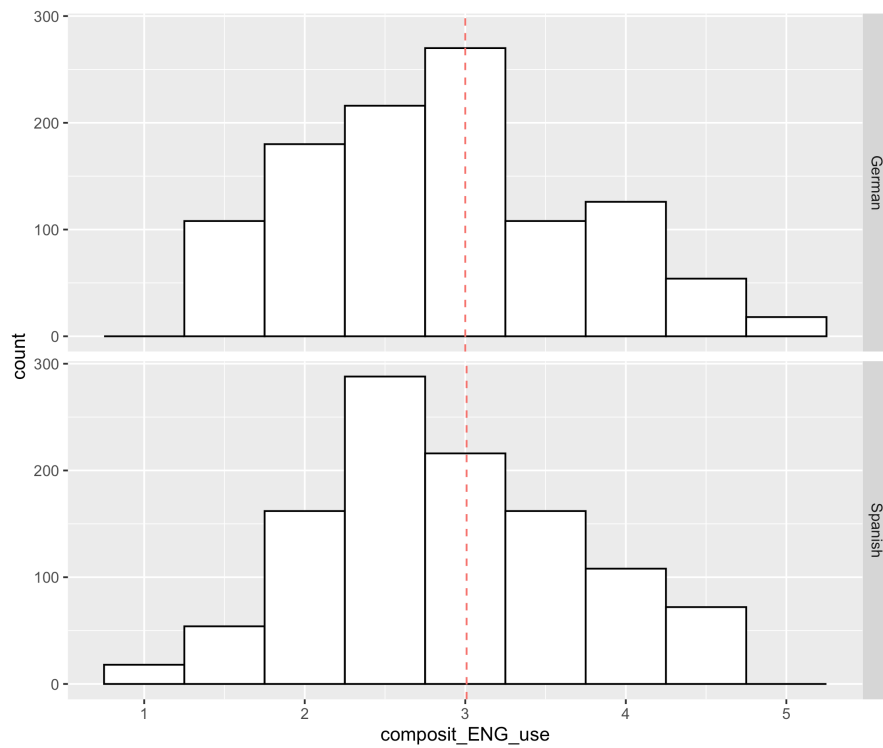


Figure A-6-6. Composite Self-rated English Use Score.

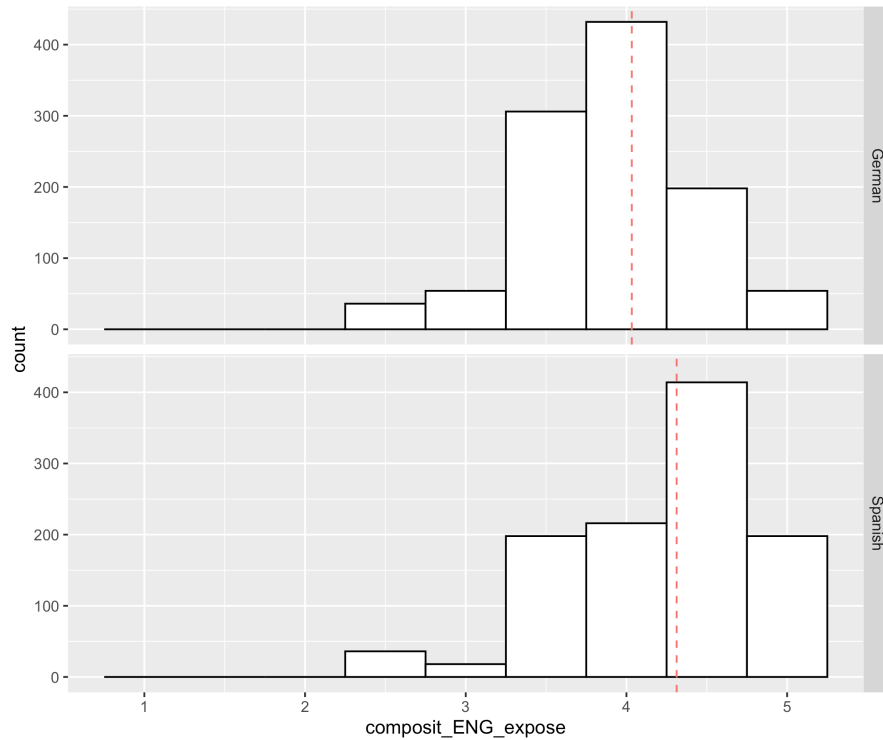


Figure A-6-7. Composite Self-rated English Exposure Score.

### Bilingual Speaker Demographic Characteristics: Additional Variables

Additional participant demographic information and other study materials can be found by accessing the data files in the following OSF repository: <https://osf.io/534jz/>.

## APPENDIX B: SCREENER SURVEY (SPANISH VERSION)

*Please complete this short survey about your language background. Please answer the questions accurately. Your responses will not affect compensation for this study.*

Please select gender:

- ☐ Female
- ☐ Male
- ☐ Non-binary
- ☐ Other (option to specify below)
- ☐ Prefer not to say

If gender is "other", feel free to specify in the box:

Have you ever had a vision problem (excluding glasses or contacts), hearing impairment, language disability, or learning disability?

- ☐ Yes
- ☐ No
- ☐ Prefer not to say

If yes, please explain, including any corrections:

What is your age (in years)?

What is your country of birth?

If not born in Mexico, how old were you when you immigrated?

What is your occupation?

What is the highest degree or level of education you have completed? Choose one.

- ☐ elementary school completed
- ☐ attended high school but did not finish

- ☐ high school completed
- ☐ attended university but did not finish
- ☐ bachelor's degree completed
- ☐ graduate degree completed

Other (please specify):

What language or languages did you learn as a child from your parents or caregivers?

Do you consider Spanish to be your native language?

- ☐ Yes
- ☐ No

What dialect or dialects of Spanish did you speak as a child with your parents or caregivers?

Other than the language(s)/dialect(s) you learned at home as a child, which other languages do you speak?

In which country or countries were you educated (including elementary school through university)?

Which language or languages were you formally educated in?

What age were you (in years) when you began learning English?

*On a scale from zero to ten, please select your level of proficiency in speaking, understanding, and reading English.*

**Speaking:**

- ☐ 0 - none
- ☐ 1 - very low
- ☐ 2 - low
- ☐ 3 - fair
- ☐ 4 - slightly less than adequate
- ☐ 5 - adequate
- ☐ 6 - slightly more than adequate
- ☐ 7 - good
- ☐ 8 - very good
- ☐ 9 - excellent
- ☐ 10 - perfect

**Understanding spoken language:**

- ☐ 0 - none
- ☐ 1 - very low
- ☐ 2 - low
- ☐ 3 - fair
- ☐ 4 - slightly less than adequate
- ☐ 5 - adequate
- ☐ 6 - slightly more than adequate
- ☐ 7 - good
- ☐ 8 - very good
- ☐ 9 - excellent
- ☐ 10 - perfect

**Reading:**

- ☐ 0 - none
- ☐ 1 - very low
- ☐ 2 - low
- ☐ 3 - fair
- ☐ 4 - slightly less than adequate
- ☐ 5 - adequate
- ☐ 6 - slightly more than adequate
- ☐ 7 - good
- ☐ 8 - very good
- ☐ 9 - excellent
- ☐ 10 - perfect

*Please tell us your present level of contact with English and Spanish in the following contexts.*

**At school:**

- ☐ English only
- ☐ Mostly English
- ☐ Slightly more English

- ☐ Equal English and Spanish
- ☐ Slightly more Spanish
- ☐ Mostly Spanish
- ☐ Spanish only
- ☐ Not applicable

**At home:**

- ☐ English only
- ☐ Mostly English
- ☐ Slightly more English
- ☐ Equal English and Spanish
- ☐ Slightly more Spanish
- ☐ Mostly Spanish
- ☐ Spanish only

**At work:**

- ☐ English only
- ☐ Mostly English
- ☐ Slightly more English
- ☐ Equal English and Spanish
- ☐ Slightly more Spanish
- ☐ Mostly Spanish
- ☐ Spanish only
- ☐ Not applicable

**In social situations:**

- ☐ English only
- ☐ Mostly English
- ☐ Slightly more English
- ☐ Equal English and Spanish
- ☐ Slightly more Spanish
- ☐ Mostly Spanish
- ☐ Spanish only

What language do you feel most comfortable with at this time?

- ☐ Spanish
- ☐ English
- ☐ Both



## APPENDIX C: BACKGROUND QUESTIONNAIRE (SPANISH VERSION)

*Please complete this short questionnaire about your linguistic background. Please answer the questions accurately; your responses will not affect compensation for this study.*

Is there anything you want to tell us about the experiment? If there is, please leave a comment in the box!

*For the questions below, please answer based on your experience using **English**.*

Where did you primarily learn English?

What age were you when you became fluent in English?

What age were you when you began reading in English?

What age were you when you became fluent reading in English?

How many years and months have you spent in a country where English is spoken?

How many years and months have you spent in a family where English is spoken?

How many years and months have you spent in a school and/or working environment where English is spoken?

Do you have a partner (significant other, spouse), or another adult member of your household, with whom you speak English?

☐ Yes ☐ No ☐ Prefer not to say

If so, how frequently do you speak English with them?

☐ Never  
☐ Rarely  
☐ Not much

- ☐ Frequently
- ☐ Very frequently

How frequently do you speak English over the phone?

- ☐ Never
- ☐ Rarely
- ☐ Not much
- ☐ Frequently
- ☐ Very frequently

How frequently do you text in English (including WhatsApp, Facebook messenger, etc.)?

- ☐ Never
- ☐ Rarely
- ☐ Not much
- ☐ Frequently
- ☐ Very frequently

How frequently do you post on social media in English (Facebook, Twitter, Reddit, etc.)?

- ☐ Never
- ☐ Rarely
- ☐ Not much
- ☐ Frequently
- ☐ Very frequently

How frequently do you listen to the radio in English?

- ☐ Never
- ☐ Rarely
- ☐ Not much
- ☐ Frequently
- ☐ Very frequently

How frequently do you watch TV/movies in English?

- ☐ Never
- ☐ Rarely
- ☐ Not much
- ☐ Frequently
- ☐ Very frequently

How frequently do you listen to music in English?

- ☐ Never
- ☐ Rarely
- ☐ Not much
- ☐ Frequently
- ☐ Very frequently

How frequently do you read in English (print materials and online)?

- ☐ Never
- ☐ Rarely
- ☐ Not much
- ☐ Frequently
- ☐ Very frequently

*For the questions below, please answer based on your experience using **Spanish**.*

What age were you when you began learning Spanish?

What age were you when you became fluent in Spanish?

What age were you when you began reading in Spanish?

What age were you when you became fluent reading in Spanish?

How many years and months have you spent in a country where Spanish is spoken?

How many years and months have you spent in a family where Spanish is spoken?

How many years and months have you spent in a school and/or working environment where Spanish is spoken?

Do you have a partner (significant other, spouse), or another adult member of your household, with whom you speak Spanish?

- ☐ Yes ☐ No ☐ Prefer not to say

If so, how frequently do you speak Spanish with them?

- ☐ Never
- ☐ Rarely
- ☐ Not much
- ☐ Frequently
- ☐ Very frequently

How frequently do you speak Spanish over the phone?

- ☐ Never
- ☐ Rarely
- ☐ Not much
- ☐ Frequently
- ☐ Very frequently

How frequently do you text in Spanish (including WhatsApp, Facebook messenger, etc.)?

- ☐ Never
- ☐ Rarely
- ☐ Not much
- ☐ Frequently
- ☐ Very frequently

How frequently do you post on social media in Spanish (Facebook, Twitter, Reddit, etc.)?

- ☐ Never
- ☐ Rarely
- ☐ Not much
- ☐ Frequently
- ☐ Very frequently

How frequently do you listen to the radio in Spanish?

- ☐ Never
- ☐ Rarely
- ☐ Not much
- ☐ Frequently
- ☐ Very frequently

How frequently do you watch TV/movies in Spanish?

- ☐ Never
- ☐ Rarely
- ☐ Not much
- ☐ Frequently
- ☐ Very frequently

How frequently do you listen to music in Spanish?

- ☐ Never
- ☐ Rarely
- ☐ Not much
- ☐ Frequently
- ☐ Very frequently

How frequently do you read in Spanish (printed materials and online)?

- ☐ Never
- ☐ Rarely
- ☐ Not much
- ☐ Frequently
- ☐ Very frequently

*On a scale from zero to ten, please select your level of proficiency speaking, understanding, and reading in Spanish.*

**Speaking:**

- ☐ 0 - none
- ☐ 1 - very low
- ☐ 2 - low
- ☐ 3 - fair
- ☐ 4 - slightly less than adequate
- ☐ 5 - adequate
- ☐ 6 - slightly more than adequate
- ☐ 7 - good
- ☐ 8 - very good
- ☐ 9 - excellent
- ☐ 10 - perfect

**Understanding spoken language:**

- ☐ 0 - none
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- ☐ 5 - adequate
- ☐ 6 - slightly more than adequate
- ☐ 7 - good
- ☐ 8 - very good
- ☐ 9 - excellent
- ☐ 10 - perfect

**Reading:**

- ☐ 0 - none
- ☐ 1 - very low
- ☐ 2 - low
- ☐ 3 - fair
- ☐ 4 - slightly less than adequate
- ☐ 5 - adequate
- ☐ 6 - slightly more than adequate
- ☐ 7 - good
- ☐ 8 - very good
- ☐ 9 - excellent
- ☐ 10 - perfect

## APPENDIX D: EXPERIMENTAL ITEMS

1.
  - I. *THEME context*: A professor was exhausted because he had been working on the first draft of a grant all day long.
  - II. *RECIPIENT context*: A professor was exhausted because he was writing long emails to an administrator all day long about personality conflicts.
    - a) *PO/Given-First*: The professor sent the grant to an administrator after he was finally finished.
    - b) *HNPS/New-first*: The professor sent to an administrator the grant after he was finally finished.
    - c) *DO/New-First*: The professor sent an administrator the grant after he was finally finished.
    - d) *DO/Given-First*: The professor sent the administrator a grant after he was finally finished.
    - e) *HNPS/Given-first*: The professor sent to the administrator a grant after he was finally finished.
    - f) *PO/New-First*: The professor sent a grant to the administrator after he was finally finished.
2.
  - I. *THEME context*: A retailer was browsing through a popular website of merchandise and bought a laptop that was on sale.
  - II. *RECIPIENT context*: A retailer often did business with a local university, and one week he was approached by a physicist with a special request.
    - a) *PO/Given-First*: The retailer sold the laptop to a physicist because hers was broken.
    - b) *HNPS/New-first*: The retailer sold to a physicist the laptop because hers was broken.
    - c) *DO/New-First*: The retailer sold a physicist the laptop because hers was broken.
    - d) *DO/Given-First*: The retailer sold the physicist a laptop because hers was broken.
    - e) *HNPS/Given-first*: The retailer sold to the physicist a laptop because hers was broken.
    - f) *PO/New-First*: The retailer sold a laptop to the physicist because hers was broken.
3.
  - I. *THEME context*: An executive at a local company had purchased a new lamp for her office, and she was trying to get rid of her old lamp quickly.
  - II. *RECIPIENT context*: An executive at a local company walked around her employees' cubicles and stopped at the cubicle of an engineer who had just been hired.

- a) *PO/Given-First*: The executive offered the lamp to an engineer because his cubicle was dark.
- b) *HNPS/New-first*: The executive offered to an engineer the lamp because his cubicle was dark.
- c) *DO/New-First*: The executive offered an engineer the lamp because his cubicle was dark.
- d) *DO/Given-First*: The executive offered the engineer a lamp because his cubicle was dark.
- e) *HNPS/Given-first*: The executive offered to the engineer a lamp because his cubicle was dark.
- f) *PO/New-First*: The executive offered a lamp to the engineer because his cubicle was dark.

4.

- I. *THEME context* A flight attendant was browsing through the gift shops in the airport, and she eventually purchased a gift from a gourmet food store.
- II. *RECIPIENT context*: A retiring flight attendant was about to depart for her last flight with United Airlines, and she was saying goodbye to a pilot in the airport.
  - a) *PO/Given-First*: The flight attendant gave the gift to a pilot before she left.
  - b) *HNPS/New-first*: The flight attendant gave to a pilot the gift before she left.
  - c) *DO/New-First*: The flight attendant gave a pilot the gift before she left.
  - d) *DO/Given-First*: The flight attendant gave the pilot a gift before she left.
  - e) *HNPS/Given-first*: The flight attendant gave to the pilot a gift before she left.
  - f) *PO/New-First*: The flight attendant gave a gift to the pilot before she left.

5.

- I. *THEME context*: A webmaster was designing a website for a software company in Boston, and he had just drafted a preliminary schedule for the completion of the project.
- II. *RECIPIENT context*: A webmaster was designing a website for a software company in Boston, and he was collaborating with an executive in the public relations department.
  - a) *PO/Given-First*: The webmaster emailed the schedule to an executive after work on Tuesday.
  - b) *HNPS/New-first*: The webmaster emailed to an executive the schedule after work on Tuesday.
  - c) *DO/New-First*: The webmaster emailed an executive the schedule after work on Tuesday.
  - d) *DO/Given-First*: The webmaster emailed the executive a schedule after work on Tuesday.
  - e) *HNPS/Given-first*: The webmaster emailed to the executive a schedule after work on Tuesday.

- f) *PO/New-First*: The webmaster emailed a schedule to the executive after work on Tuesday.

6.

- I. *THEME context*: An attorney had just finished preparing some files for an important lawsuit, and she put her crumpled notes in a trashcan next to her desk.
- II. *RECIPIENT context*: An attorney was preparing some files for an important lawsuit, and at the end of the day she called an intern into her office to clean up.
  - a) *PO/Given-First*: The attorney handed the trashcan to an intern as she left the office.
  - b) *HNPS/New-first*: The attorney handed to an intern the trashcan as she left the office.
  - c) *DO/New-First*: The attorney handed an intern the trashcan as she left the office.
  - d) *DO/Given-First*: The attorney handed the intern a trashcan as she left the office.
  - e) *HNPS/Given-first*: The attorney handed to the intern a trashcan as she left the office.
  - f) *PO/New-First*: The attorney handed a trashcan to the intern as she left the office.

7.

- I. *THEME context*: A CEO recently fired his secretary, and therefore the secretary's office needed to be reassigned.
- II. *RECIPIENT context*: A CEO was having some trouble running his business, so he hired an analyst to make recommendations on securities.
  - a) *PO/Given-First*: The CEO assigned the office to an analyst after consulting his partner.
  - b) *HNPS/New-first*: The CEO assigned to an analyst the office after consulting his partner.
  - c) *DO/New-First*: The CEO assigned an analyst the office after consulting his partner.
  - d) *DO/Given-First*: The CEO assigned the analyst an office after consulting his partner.
  - e) *HNPS/Given-first*: The CEO assigned to the analyst an office after consulting his partner.
  - f) *PO/New-First*: The CEO assigned an office to the analyst after consulting his partner.

8.

- I. *THEME context*: An understudy for a new Broadway show planned to write a book about his experiences, and he had kept a notebook to document the progress of the show.
- II. *RECIPIENT context*: An understudy for a new Broadway show was waiting to rehearse a scene, and he began conversing with a violinist from the orchestra.
  - a) *PO/Given-First*: The understudy showed the notebook to a violinist as he explained his latest project.



- b) *HNPS/New-first*: The understudy showed to a violinist the notebook as he explained his latest project.
  - c) *DO/New-First*: The understudy showed a violinist the notebook as he explained his ideas.
  - d) *DO/Given-first*: The understudy showed the violinist a notebook as he explained his ideas.
  - e) *HNPS/Given-first*: The understudy showed to the violinist a notebook as he explained his ideas.
  - f) *PO/New-first*: The understudy showed a notebook to the violinist as he explained his ideas.
- 9.
  - I. *THEME context*: A student was taking several art classes, and in her photography course she had taken an exceptional photograph of a flower as part of a project.
  - II. *RECIPIENT context*: A student was completing a research project involving qualitative study of a particular plant species with a well-known botanist from Brandeis.
    - a) *PO/Given-First*: The student sent the photograph to a botanist after the completion of her project.
    - b) *HNPS/New-first*: The student sent to a botanist the photograph after the completion of her project.
    - c) *DO/New-First*: The student sent a botanist the photograph after the completion of her project.
    - d) *DO/Given-first*: The student sent the botanist a photograph after the completion of her project.
    - e) *HNPS/Given-first*: The student sent to the botanist a photograph after the completion of her project.
    - f) *PO/New-first*: The student sent a photograph to the botanist after the completion of her project.
- 10.
  - I. *THEME context*: A surgeon who had worked in a bakery to pay his medical school tuition baked a delicious pie from scratch last Tuesday.
  - II. *RECIPIENT context*: A surgeon who had worked in an airport to pay his medical school tuition invited a stewardess to his apartment last Tuesday.
    - a) *PO/Given-First*: The surgeon served the pie to a stewardess after a romantic dinner.
    - b) *HNPS/New-first*: The surgeon served to a stewardess the pie after a romantic dinner.
    - c) *DO/New-First*: The surgeon served a stewardess the pie after a romantic dinner.
    - d) *DO/Given-first*: The surgeon served the stewardess a pie after a romantic dinner.
    - e) *HNPS/Given-first*: The surgeon served to the stewardess a pie after a romantic dinner.
    - f) *PO/New-first*: The surgeon served a pie to the stewardess after a romantic dinner.

11.
  - I. *THEME context*: A bartender was closing up at the end of the night, and he had only one remaining beer behind the bar.
  - II. *RECIPIENT context*: A bartender was closing up at the end of the night, and he struck up a conversation with a dancer at the bar.
    - a) *PO/Given-First*: The bartender offered the beer to a dancer because she looked lonely.
    - b) *HNPS/New-first*: The bartender offered to a dancer the beer because she looked lonely.
    - c) *DO/New-First*: The bartender offered a dancer the beer because she looked lonely.
    - d) *DO/Given-first*: The bartender offered the dancer a beer because she looked lonely.
    - e) *HNPS/Given-first*: The bartender offered to the dancer a beer because she looked lonely.
    - f) *PO/New-first*: The bartender offered a beer to the dancer because she looked lonely.
12.
  - I. *THEME context*: A librarian received a novel for her birthday, but she already owned a copy of it.
  - II. *RECIPIENT context*: A librarian was recataloguing her fiction collection with the help of a student who worked in the campus library every weekend.
    - a) *PO/Given-First*: The librarian gave the novel to a student because she had two copies of it.
    - b) *HNPS/New-first*: The librarian gave to a student the novel because she had two copies of it.
    - c) *DO/New-First*: The librarian gave a student the novel because she had two copies of it.
    - d) *DO/Given-first*: The librarian gave the student a novel because she had two copies of it.
    - e) *HNPS/Given-first*: The librarian gave to the student a novel because she had two copies of it.
    - f) *PO/New-first*: The librarian gave a novel to the student because she had two copies of it.
13.
  - I. *THEME context*: A skier was purchasing new equipment for the upcoming winter season, and he found a coupon in a catalog.
  - II. *RECIPIENT context*: A skier wanted to purchase some new equipment for the upcoming winter season, so he wrote to a retailer in Wisconsin.
    - a) *PO/Given-First*: The skier mailed the coupon to a retailer to get a 15% discount.
    - b) *HNPS/New-first*: The skier mailed to a retailer the coupon to get a 15% discount.
    - c) *DO/New-First*: The skier mailed a retailer the coupon to get a 15% discount.

- d) *DO/Given-first*: The skier mailed the retailer a coupon to get a 15% discount.
- e) *HNPS/Given-first*: The skier mailed to the retailer a coupon to get a 15% discount.
- f) *PO/New-first*: The skier mailed a coupon to the retailer to get a 15% discount.

14.

- I. *THEME context*: A secretary at a local church was putting together evangelical brochures and she was using a stapler to bind them.
- II. *RECIPIENT context*: A secretary at a local church was working extra hours to put together evangelical brochures with a priest on Thursday.
  - a) *PO/Given-First*: The secretary handed the stapler to a priest because he asked to use it.
  - b) *HNPS/New-first*: The secretary handed to a priest the stapler because he asked to use it.
  - c) *DO/New-First*: The secretary handed a priest the stapler because he asked to use it.
  - d) *DO/Given-first*: The secretary handed the priest a stapler because he asked to use it.
  - e) *HNPS/Given-first*: The secretary handed to the priest a stapler because he asked to use it.
  - f) *PO/New-first*: The secretary handed a stapler to the priest because he asked to use it.

15.

- I. *THEME context*: A psychologist needed some extra help with a number of her experiments, so she hired an intern over the weekend.
- II. *RECIPIENT context*: A psychologist was running lots of experiments, and stacks of data were piling up on the desk of the statistician in charge of data analysis.
  - a) *PO/Given-First*: The psychologist assigned the intern to a statistician on Monday morning.
  - b) *HNPS/New-first*: The psychologist assigned to a statistician the intern on Monday morning.
  - c) *DO/New-First*: The psychologist assigned a statistician the intern on Monday morning.
  - d) *DO/Given-first*: The psychologist assigned the statistician an intern on Monday morning.
  - e) *HNPS/Given-first*: The psychologist assigned to the statistician an intern on Monday morning.
  - f) *PO/New-first*: The psychologist assigned an intern to the statistician on Monday morning.

16.

- I. *THEME context*: A little boy was at work with his mother, and he was very excited because she had just bought him a new toy with flashing lights.
- II. *RECIPIENT context*: A little boy was at work with his mother, and he was very excited because he was spending all day with a secretary in her office.

- a) *PO/Given-First*: The boy showed the toy to a secretary because she asked to see it.
- b) *HNPS/New-first*: The boy showed to a secretary the toy because she asked to see it.
- c) *DO/New-First*: The boy showed a secretary the toy because she asked to see it.
- d) *DO/Given-first*: The boy showed the secretary a toy because she asked to see it.
- e) *HNPS/Given-first*: The boy showed to the secretary a toy because she asked to see it.
- f) *PO/New-first*: The boy showed a toy to the secretary because she asked to see it.

17.

- I. *THEME context*: A security guard who worked at a local mall had witnessed the theft of a computer, and he was responsible for the videotape documenting the crime.
- II. *RECIPIENT context*: A security guard who worked at a local mall was investigating the theft of a computer, and he was collaborating with a technician at the police department.
  - a) *PO/Given-First*: The security guard mailed the videotape to a technician for digital analysis.
  - b) *HNPS/New-first*: The security guard mailed to a technician the videotape for digital analysis.
  - c) *DO/New-First*: The security guard mailed a technician the videotape for digital analysis.
  - d) *DO/Given-first*: The security guard mailed the technician a videotape for digital analysis.
  - e) *HNPS/Given-first*: The security guard mailed to the technician a videotape for digital analysis.
  - f) *PO/New-first*: The security guard mailed a videotape to the technician for digital analysis.

18.

- I. *THEME context*: A salesman who worked at a local dealership needed to meet his monthly quota, and he had an old car that he wanted to get rid of.
- II. *RECIPIENT context*: A salesman who worked at a local dealership needed to meet his monthly quota, and he started talking to a customer who was looking around the lot.
  - a) *PO/Given-first*: The salesman sold the car to a customer for a very low price.
  - b) *HNPS/New-first*: The salesman sold to a customer the car for a very low price.
  - c) *DO/New-first*: The salesman sold a customer the car for a very low price.
  - d) *DO/Given-first*: The salesman sold the customer a car for a very low price.

- e) *HNPS/Given-first*: The salesman sold to the customer a car for a very low price.
    - f) *PO/New-first*: The salesman sold a car to the customer for a very low price.
- 19.
  - I. The chair of a physics department met with a programmer to discuss his role in a research project.
    - a) *PO/Given-First*: The chair offered the programmer to a statistician to help with data analysis.
    - b) *HNPS/New-First*: The chair offered to a statistician the programmer to help with data analysis.
    - c) *DO/New-First*: The chair offered a statistician the programmer to help with data analysis.
    - d) *DO/Given-First*: The chair offered the programmer a statistician to help with data analysis.
    - e) *HNPS/Given-First*: The chair offered to the programmer a statistician to help with data analysis.
    - f) *PO/New-First*: The chair offered a statistician to the programmer to help with data analysis.
- 20.
  - I. A salesman greeted a customer who had arrived at the store just before closing time.
    - a) *PO/Given-First*: The salesman showed the customer to a janitor because they had the same hat.
    - b) *HNPS/New-First*: The salesman showed to a janitor the customer because they had the same hat.
    - c) *DO/New-First*: The salesman showed a janitor the customer because they had the same hat.
    - d) *DO/Given-First*: The salesman showed the customer a janitor because they had the same hat.
    - e) *HNPS/Given-First*: The salesman showed to the customer a janitor because they had the same hat.
    - f) *PO/New-First*: The salesman showed a janitor to the customer because they had the same hat.
- 21.
  - I. The director of an advertising agency met with a marketer who was working on an ad campaign.
    - a) *PO/Given-First*: The director assigned the marketer to a designer in order to help with another project.
    - b) *HNPS/New-First*: The director assigned to a designer the marketer in order to help with another project.
    - c) *DO/New-First*: The director assigned a designer the marketer in order to help with another project.
    - d) *DO/Given-First*: The director assigned the marketer a designer in order to help with another project.

- e) *HNPS/Given-First*: The director assigned to the marketer a designer in order to help with another project.
    - f) *PO/New-First*: The director assigned a designer to the marketer in order to help with another project.
- 22.
  - I. A nurse witnessed a child throwing a violent fit in the inpatient ward.
    - a) *PO/Given-First*: The nurse sent the child to a counselor after consulting a doctor.
    - b) *HNPS/New-First*: The nurse sent to a counselor the child after consulting a doctor.
    - c) *DO/New-First*: The nurse sent a counselor the child after consulting a doctor.
    - d) *DO/Given-First*: The nurse sent the child a counselor after consulting a doctor.
    - e) *HNPS/Given-First*: The nurse sent to the child a counselor after consulting a doctor.
    - f) *PO/New-First*: The nurse sent a counselor to the child after consulting a doctor.
- 23.
  - I. An assistant received a call from an accountant who had just arrived for an appointment.
    - a) *PO/Given-First*: The assistant brought the accountant to a lawyer in order to go over some files.
    - b) *HNPS/New-First*: The assistant brought to a lawyer the accountant in order to go over some files.
    - c) *DO/New-First*: The assistant brought a lawyer the accountant in order to go over some files.
    - d) *DO/Given-First*: The assistant brought the accountant a lawyer in order to go over some files.
    - e) *HNPS/Given-First*: The assistant brought to the accountant a lawyer in order to go over some files.
    - f) *PO/New-First*: The assistant brought a lawyer to the accountant in order to go over some files.
- 24.
  - I. A laboratory supervisor was approached by a technician who needed help processing some samples.
    - a) *PO/Given-First*: The supervisor assigned the technician to a student so they could work together.
    - b) *HNPS/New-First*: The supervisor assigned to a student the technician so they could work together.
    - c) *DO/New-First*: The supervisor assigned a student the technician so they could work together.
    - d) *DO/Given-First*: The supervisor assigned the technician a student so they could work together.

- e) *HNPS/Given-First*: The supervisor assigned to the technician a student so they could work together.
    - f) *PO/New-First*: The supervisor assigned a student to the technician so they could work together.
- 25.
  - I. A manager met with an engineer who was concerned about the availability of building materials.
    - a) *PO/Given-First*: The manager brought the engineer to an architect so they could discuss the plans.
    - b) *HNPS/New-First*: The manager brought to an architect the engineer so they could discuss the plans.
    - c) *DO/New-First*: The manager brought an architect the engineer so they could discuss the plans.
    - d) *DO/Given-First*: The manager brought the engineer an architect so they could discuss the plans.
    - e) *HNPS/Given-First*: The manager brought to the engineer an architect so they could discuss the plans.
    - f) *PO/New-First*: The manager brought an architect to the engineer so they could discuss the plans.
- 26.
  - I. A recruiter asked an electrician if he was available to do contract work in September.
    - a) *PO/Given-First*: The recruiter sent the electrician to a carpenter in order to work on a small project.
    - b) *HNPS/New-First*: The recruiter sent to a carpenter the electrician in order to work on a small project.
    - c) *DO/New-First*: The recruiter sent a carpenter the electrician in order to work on a small project.
    - d) *DO/Given-First*: The recruiter sent the electrician a carpenter in order to work on a small project.
    - e) *HNPS/Given-First*: The recruiter sent to the electrician a carpenter in order to work on a small project.
    - f) *PO/New-First*: The recruiter sent a carpenter to the electrician in order to work on a small project.
- 27.
  - I. An artist interviewed with a critic for a featured story in the local newspaper.
    - a) *PO/Given-First*: The artist showed the critic to a client because they resembled each other.
    - b) *HNPS/New-First*: The artist showed to a client the critic because they resembled each other.
    - c) *DO/New-First*: The artist showed a client the critic because they resembled each other.
    - d) *DO/Given-First*: The artist showed the critic a client because they resembled each other.
    - e) *HNPS/Given-First*: The artist showed to the critic a client because they resembled each other.

- f) *PO/New-First*: The artist showed a client to the critic because they resembled each other.

28.

- I. A government official was monitoring an agent who was working undercover in another country.
- a) *PO/Given-First*: The official offered the agent to a contact so they could compare information.
  - b) *HNPS/New-First*: The official offered to a contact the agent so they could compare information.
  - c) *DO/New-First*: The official offered a contact the agent so they could compare information.
  - d) *DO/Given-First*: The official offered the agent a contact so they could compare information.
  - e) *HNPS/Given-First*: The official offered to the agent a contact so they could compare information.
  - f) *PO/New-First*: The official offered a contact to the agent so they could compare information.

29.

- I. An anthropologist arranged a meeting with the chief of a local indigenous tribe that she was studying.
- a) *PO/Given-First*: The anthropologist brought the chief to an explorer so they could exchange information.
  - b) *HNPS/New-First*: The anthropologist brought to an explorer the chief so they could exchange information.
  - c) *DO/New-First*: The anthropologist brought an explorer the chief so they could exchange information.
  - d) *DO/Given-First*: The anthropologist brought the chief an explorer so they could exchange information.
  - e) *HNPS/Given-First*: The anthropologist brought to the chief an explorer so they could exchange information.
  - f) *PO/New-First*: The anthropologist brought an explorer to the chief so they could exchange information.

30.

- I. A prisoner stole a radio from the warden of the jail as part of his plan to obtain a uniform and escape in disguise.
- a) *PO/Given-First*: The prisoner sent the warden to a guard so they would both be distracted.
  - b) *HNPS/New-First*: The prisoner sent to a guard the warden so they would both be distracted.
  - c) *DO/New-First*: The prisoner sent a guard the warden so they would both be distracted.
  - d) *DO/Given-First*: The prisoner sent the warden a guard so they would both be distracted.
  - e) *HNPS/Given-First*: The prisoner sent to the warden a guard so they would both be distracted.



- f) *PO/New-First*: The prisoner sent a guard to the warden so they would both be distracted.

31.

- I. A scientist was monitoring a cow to study how domesticated animals gather in herds.

- a) *PO/Given-First*: The scientist brought the cow to a goat in order to see how they interacted.
- b) *HNPS/New-First*: The scientist brought to a goat the cow in order to see how they interacted.
- c) *DO/New-First*: The scientist brought a goat the cow in order to see how they interacted.
- d) *DO/Given-First*: The scientist brought the cow a goat in order to see how they interacted.
- e) *HNPS/Given-First*: The scientist brought to the cow a goat in order to see how they interacted.
- f) *PO/New-First*: The scientist brought a goat to the cow in order to see how they interacted.

32.

- I. A child owned a pet weasel that lived in a tiny cage and was poorly cared for.

- a) *PO/Given-First*: The child fed the weasel to a snake so he could watch them fight.
- b) *HNPS/New-First*: The child fed to a snake the weasel so he could watch them fight.
- c) *DO/New-First*: The child fed a snake the weasel so he could watch them fight.
- d) *DO/Given-First*: The child fed the weasel a snake so he could watch them fight.
- e) *HNPS/Given-First*: The child fed to the weasel a snake so he could watch them fight.
- f) *PO/New-First*: The child fed a snake to the weasel so he could watch them fight.

33.

- I. A farmer was studying a goose that had been abandoned by its flock.

- a) *PO/Given-First*: The farmer showed the goose to a turkey in order to see if they would cooperate.
- b) *HNPS/New-First*: The farmer showed to a turkey the goose in order to see if they would cooperate.
- c) *DO/New-First*: The farmer showed a turkey the goose in order to see if they would cooperate.
- d) *DO/Given-First*: The farmer showed the goose a turkey in order to see if they would cooperate.
- e) *HNPS/Given-First*: The farmer showed to the goose a turkey in order to see if they would cooperate.
- f) *PO/New-First*: The farmer showed a turkey to the goose in order to see if they would cooperate.

34.

- I. A park ranger trapped a hyena as part of an annual cull of diseased animals.
- a) *PO/Given-First*: The ranger threw the hyena to a lion in the park's feeding pen.
  - b) *HNPS/New-First*: The ranger threw to a lion the hyena in the park's feeding pen.
  - c) *DO/New-First*: The ranger threw a lion the hyena in the park's feeding pen.
  - d) *DO/Given-First*: The ranger threw the hyena a lion in the park's feeding pen.
  - e) *HNPS/Given-First*: The ranger threw to the hyena a lion in the park's feeding pen.
  - f) *PO/New-First*: The ranger threw a lion to the hyena in the park's feeding pen.

35.

- I. A show breeder owned a beagle that would howl if left alone, especially at night.
- a) *PO/Given-First*: The breeder offered the beagle to a poodle so they could keep each other company.
  - b) *HNPS/New-First*: The breeder offered to a poodle the beagle so they could keep each other company.
  - c) *DO/New-First*: The breeder offered a poodle the beagle so they could keep each other company.
  - d) *DO/Given-First*: The breeder offered the beagle a poodle so they could keep each other company.
  - e) *HNPS/Given-First*: The breeder offered to the beagle a poodle so they could keep each other company.
  - f) *PO/New-First*: The breeder offered a poodle to the beagle so they could keep each other company.

36.

- I. A farmer was training a raven to control the pest population in his corn fields.
- a) *PO/Given-First*: The farmer fed the raven to a ferret because the training was not working.
  - b) *HNPS/New-First*: The farmer fed to a ferret the raven because the training was not working.
  - c) *DO/New-First*: The farmer fed a ferret the raven because the training was not working.
  - d) *DO/Given-First*: The farmer fed the raven a ferret because the training was not working.
  - e) *HNPS/Given-First*: The farmer fed to the raven a ferret because the training was not working.
  - f) *PO/New-First*: The farmer fed a ferret to the raven because the training was not working.

37.

- I. An emperor bought a pet tiger to compete in his gladiatorial arena.

- a) *PO/Given-First*: The emperor threw the tiger to a bear as his evening entertainment.
- b) *HNPS/New-First*: The emperor threw to a bear the tiger as his evening entertainment.
- c) *DO/New-First*: The emperor threw a bear the tiger as his evening entertainment.
- d) *DO/Given-First*: The emperor threw the tiger a bear as his evening entertainment.
- e) *HNPS/Given-First*: The emperor threw to the tiger a bear as his evening entertainment.
- f) *PO/New-First*: The emperor threw a bear to the tiger as his evening entertainment.

38.

- I. A diver captured an eel in a bucket while he was searching a small bay for fossils.
  - a) *PO/Given-First*: The diver brought the eel to a tuna to see what they would do.
  - b) *HNPS/New-First*: The diver brought to a tuna the eel to see what they would do.
  - c) *DO/New-First*: The diver brought a tuna the eel to see what they would do.
  - d) *DO/Given-First*: The diver brought the eel a tuna to see what they would do.
  - e) *HNPS/Given-First*: The diver brought to the eel a tuna to see what they would do.
  - f) *PO/New-First*: The diver brought a tuna to the eel to see what they would do.

39.

- I. A biologist discovered an owl that seemed to belong to a new species.
  - a) *PO/Given-First*: The biologist showed the owl to a rat to gauge their reactions.
  - b) *HNPS/New-First*: The biologist showed to a rat the owl to gauge their reactions.
  - c) *DO/New-First*: The biologist showed a rat the owl to gauge their reactions.
  - d) *DO/Given-First*: The biologist showed the owl a rat to gauge their reactions.
  - e) *HNPS/Given-First*: The biologist showed to the owl a rat to gauge their reactions.
  - f) *PO/New-First*: The biologist showed a rat to the owl to gauge their reactions.

40.

- I. A rancher bought a horse because he wanted to diversify his herd.
  - a) *PO/Given-First*: The rancher gave the horse to a donkey to see if they would mate.
  - b) *HNPS/New-First*: The rancher gave to a donkey the horse to see if they would mate.

- c) *DO/New-First*: The rancher gave a donkey the horse to see if they would mate.
- d) *DO/Given-First*: The rancher gave the horse a donkey to see if they would mate.
- e) *HNPS/Given-First*: The rancher gave to the horse a donkey to see if they would mate.
- f) *PO/New-First*: The rancher gave a donkey to the horse to see if they would mate.

41.

- I. A hippie bought a sheep so he could gather his own wool.
  - a) *PO/Given-First*: The hippie offered the sheep to a pig because he thought they could be friends.
  - b) *HNPS/New-First*: The hippie offered to a pig the sheep because he thought they could be friends.
  - c) *DO/New-First*: The hippie offered a pig the sheep because he thought they could be friends.
  - d) *DO/Given-First*: The hippie offered the sheep a pig because he thought they could be friends.
  - e) *HNPS/Given-First*: The hippie offered to the sheep a pig because he thought they could be friends.
  - f) *PO/New-First*: The hippie offered a pig to the sheep because he thought they could be friends.

42.

- I. A tourist trapped a beaver when his annual fishing expedition started to get boring.
  - a) *PO/Given-First*: The tourist threw the beaver to a snake in violation of park regulations.
  - b) *HNPS/New-First*: The tourist threw to a snake the beaver in violation of park regulations.
  - c) *DO/New-First*: The tourist threw a snake the beaver in violation of park regulations.
  - d) *DO/Given-First*: The tourist threw the beaver a snake in violation of park regulations.
  - e) *HNPS/Given-First*: The tourist threw to the beaver a snake in violation of park regulations.
  - f) *PO/New-First*: The tourist threw a snake to the beaver in violation of park regulations.

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