GENDER AND HEADEDNESS IN SPANISH BLENDS

Metta Crouse

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Approved by:

Katya Pertsova

Elliott Moreton

Jennifer L. Smith

ABSTRACT

Metta Crouse: Gender and headedness in Spanish blends
(Under the direction of Katya Pertsova)

This thesis builds on previous experiments on English lexical blends (Shaw 2013, Moreton et al. forthcoming) that argued that semantic heads, nouns, and proper nouns are positions privileged by universal phonological constraints. Using novel Spanish blends as stimuli, I conduct three experiments with native Spanish speakers. The first, a survey, revealed significant predictors of blend gender, including the inflection, gender, and headedness of the source words. These results contribute to the study of blend formation as a morphological process by providing valuable information to compare with the formation of Spanish compounds. Additionally, I strengthen arguments for the existence of a constraint privileging semantic heads by showing a stronger effect of head faithfulness in Spanish than was found in similar English experiments. I discuss what it means for a position to be privileged within positional faithfulness (Beckman 1997) and test whether masculine gender is one of these privileged positions.

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CHAPTER 1: INTRODUCTION

Lexical blending is an intentional word formation process that is attested in Spanish (Casado Velarde 1985, Piñeros 2004, Rodríguez González 1989). It involves concatenation of two or more source words to form a single blend. When a blend is formed from two source words, segmental material is overlapped or truncated from at least one of the source words. An example of a blend in Spanish is shown in Example 1.

Example 1 - Spanish blend

cantante ('singer') + **autor** ('author') = *cant***autor** ('singer-songwriter')

In Example 1, the initial portion of the first source word (*cantante* 'singer') is combined with the final portion of the second source word (**autor** 'author') to yield the blend (*cant***autor** 'singer-songwriter'). The process of blending is similar to compounding but crucially differs in that compounds retain all segmental material from both source words. In Example 2, the source words *boca* ('mouth') and **calle** ('street') are combined sequentially to yield the compound *boca***calle** ('street intersection') without the truncation or overlap of segmental material.

Example 2 - Spanish compound (from Piñeros 2004)

boca ('mouth') + **calle** ('street') = *boca***calle** ('street intersection')

Unlike in compounding, when a novel blend is formed the speaker must choose which portions of each source word to retain in the final blend. Blends usually retain enough of each source word to maintain recoverability of the source words, as a blend without additional context will only be comprehensible to the listener if it is clear what the source words are. However, there are some exceptions to this, such as English *breakfast* + **lunch** = *br***unch**, which only

preserves a small portion of the first source word. Beyond recoverability and abiding by the phonological rules of the language there may still be multiple ways to combine two source words into a blend. One hypothesis is that some concept of prominence determines how much information is retained from each source word in the final blend. While this notion of prominence could be conceived of in different ways -- semantic, structural, or some other type of prominence -- the more relatively prominent source word would preserve more information in the blend. Shaw (2013) developed several experiments that tested whether manipulating certain properties of source words would determine how speakers combine those source words into a blend. The results of Shaw's experiments showed that the status of source words as semantic heads or non-heads affects both stress placement and the preservation of segmental content in novel blend formation in English. From this finding, she concluded that "semantic head" is a prominent position that is privileged by the constraint set of English. Moreton et al. (forthcoming) extended Shaw's methodology to nouns and proper nouns, providing evidence for these morphological positions as privileged.

There are several reasons that the Spanish language provides an excellent opportunity to further this research program. First, nouns in Spanish receive inherent grammatical gender. The relationship between masculine and feminine gender in Spanish shows a morphological asymmetry which I will argue shows evidence for hypothesizing the privileged status of masculine gender over feminine gender. If evidence for privilege is found, comparing the privileged gender with established privileged positions such as semantic heads, nouns, and proper nouns could shed some light on what the criteria are for some position to be considered privileged or "strong." Second, the presence of not only right-headed but also left-headed blends and compounds allows an experiment on morphological heads to be designed that differs from

similar previous experiments, as the limitations of English did not allow left-headed blends to be tested. Finally, on a practical level, it is easy to access judgments from a large number of native Spanish speakers.

The experiments described in this thesis test two questions: Do nouns of one grammatical gender enjoy greater privilege than nouns of the opposite grammatical gender in Spanish -- that is, is segmental material better preserved in a blend if it comes from a noun of a particular gender?; and does a language with both left- and right-headed blends, like Spanish, show a greater effect of head faithfulness in blend experiments similar to those that have been conducted with English speakers? Beyond the specific results of these experiments, I am interested in considering the requirements for a position to be considered "strong" in the theory of positional faithfulness (Beckman 1997). I consider whether masculine gender noun is one of these strong positions, and the arguments for this hypothesis are compared with the arguments for other positions that have been considered strong within positional faithfulness.

After running the experiments described in this thesis, I found no evidence for preferential faithfulness in blend formation to nouns of one grammatical gender over the other, although I show that Spanish speakers have strong intuitions about the gender that individual blends should receive and that there may be several different factors influencing this judgment. I found evidence for head faithfulness in a blend experiment modeled on Shaw (2013), and the implications of these findings are discussed. In addition to the goals mentioned above, this thesis aims to validate the results of previous experiments run with English speakers.

I will first provide some background on previous experiments that have laid the groundwork for the current project and discuss relevant background information on grammatical gender and headedness in Spanish. In Chapter 2, motivation will be provided for the experiments

that were run in this thesis, and predictions for the experiments will be made. In Chapter 3, I present the design and results for a blends survey, an experiment on blend gender, and an experiment on blend headedness. Chapter 4 will discuss the implications of these results and suggest possible directions for future research.

1.1 Previous experiments

In this thesis, "source word 1" or "first source word" will always refer to the left-most source word (in Example 1, *cantante*) and "source word 2" or "second source word" will always refer to the right-most source word (in Example 1, **autor**). All blends considered in this thesis will be of the type that start like the first source word and end like the second source word, with some truncation and overlap of at least one of the source words. Italics and bolding will be used to represent the respective contributions of the source words to the blend, as in Example 1. If a segment in a blend corresponds to input segments from both source words, it will be both italicized and bolded.

"Headedness" will refer to a relationship of hyponymy between the blend and one or both of the source words; in a semantically headed blend, the blend is a hyponym of the head. A blend that is a hyponym of the first source word is left-headed, while a blend that is a hyponym of the second source word is right-headed. Blends with one semantic head are either left-headed or right-headed, blends where both words are semantic heads are coordinating, and blends without a semantic head are termed exocentric. All of these headedness types are attested in Spanish, as shown in Example 3:

Example 3 - Attested Spanish blends (Piñeros 2004)

Blend	Source Word 1	Source Word 2	Definition	Headedness
*crist**a**ñola*	*cristalería* (glassware)	**española** (Spanish)	Spanish glassware	Left-headed
*bru**j**eres*	*bruja* (witch)	**mujeres** (women)	Mean women	Right-headed
*amig**o**vio*	*amigo* (friend)	**novio** (boyfriend)	Friend and boyfriend	Coordinating
*inteli***burro**	*inteligente* (intelligent)	**burro** (donkey)	Stupid person	Exocentric

*Crist**a**ñola* is left-headed because the blend as a whole refers to a type of glassware and the left-most source word refers to glassware. *Bru**j**eres* refers to a type a women, not a type of witches, and therefore is right-headed: the blend is a hyponym of the right-most source word . *Amig**o**vio* is defined as a friend who is also a boyfriend. In this case, both the first source word and the second source word are semantic heads, making the blend coordinating. Finally, *inteli***burro** does not refer to a type of donkey or a type of intelligence, but rather to a type of person. Because the blend is not a hyponym of either of the source words, this blend is exocentric.

While blend formation is subject to phonological constraints, there are pairs of words that could reasonably be blended in two different ways, therefore forcing the speaker to choose between preserving more segmental material from one source word or the other. Shaw (2013) calls these "ambiblendable word pairs." This fact about blending has been exploited to perform experiments that test for preferential faithfulness to one type of source word over another. While the experiments in Shaw (2013) dealt with faithfulness to the stress of the source words as well as segmental faithfulness, this thesis focuses solely on segmental faithfulness.

In a typical trial, the participant is presented with two source words that can be blended in two different ways: one option preserves more of source word 1 and the other preserves more of

source word 2. The participant is forced to match each of these two blend options with definitions that manipulate the status of one of the source words. An example of this is shown in Example 4, using one of the stimuli created by Shaw (2013) and also used in Moreton et al. (forthcoming).

Example 4 - Forced-choice novel blend experiment stimulus

a. Source words:
   i. *flamingo*
   ii. **mongoose**

b. Blends:
   i. *flami**ng**goose*
   ii. *fla**m**ongoose*

c. Definitions:
   i. A hybrid of a mongoose and a flamingo (coordinating)
   ii. A mongoose that preys on flamingos (right-headed)

Definition (4ci) is coordinating because it has two heads: it is both a type of mongoose and a type of flamingo. Definition (4cii), however, is only a type of mongoose and not a type of flamingo: it is semantically right-headed. If participants consistently attribute blend (4bii), which preserves more of "mongoose," to the right-headed definition (4cii) at a rate significantly above chance, this is evidence of faithfulness to a noun that has the status of a semantic head.

The experimental results of Shaw (2013) and Moreton et al. (forthcoming) were modeled in Optimality Theory (Prince & Smolensky 1993/2004) using relativized faithfulness constraints. For example, the privilege of heads over non-heads can be formalized with a faithfulness constraint relativized to heads in addition to a general faithfulness constraint, stated formally in Example 5. Similarly, Moreton et al. (forthcoming) posited a constraint privileging nouns (over verbs) and another constraint privileging proper nouns (over nouns). Example 6 shows the predictions made by the constraints in Example 5 applied to the stimuli from Moreton et al. (forthcoming) previously discussed in Example 4.

Example 5 - Constraints for novel blend head faithfulness experiment

a) Max: Assign one violation for each segment in the input that does not have a corresponding segment in the output (McCarthy & Prince 1995)
b) Max-Head: Assign one violation for each segment in the input of the head that does not have a corresponding segment in the output

Example 6 - Predictions of Max-Head in a novel blend experiment

The blends in both cases are composed of flamingo (*fləmɪngo*) + mongoose (**mangus**)

		Candidate	Max-Head	Max
☞ a.	(1)	*fləmɪ**ng**us* (coordinating)	*** (o, m, a)	*** (o, m, a) flamingo: o mongoose: m, a
	(2)	*flə**m**angus* (right-headed)	✓	**** (ɪ, n, g, o) flamingo: ɪ, n, g, o mongoose: ✓
b.	(1)	*fləmɪ**ng**us* (right-headed)	** (m, a)	*** (o, m, a) flamingo: o mongoose: m, a
	(2)	*flə**m**angus* (coordinating)	****! (ɪ, n, g, o)	**** (ɪ, n, g, o) flamingo: ɪ, n, g, o mongoose: ✓

In order to determine the correct number of violations incurred by a given constraint, some assumptions have to be made about correspondence relationships between source word inputs and blend outputs. I assume, following Moreton et al. (forthcoming), that it is possible for an output segment to be simultaneously faithful to identical input segments from both source words. Violations are not assigned when the segment in question is contiguous with the remainder of the source word. For instance, in (6a1), *fləmɪ**ng**us*, the /n/ and /g/ are simultaneously italicized and bolded, indicating that they are output correspondents from both source words. These segments are contiguous with the source word 1 segments preceding them as well as the source word 2 segments following them. However, the /m/ is only italicized, indicating that this segment is a faithful output correspondent of source word 1 only; the /ɪ/ separates the /m/ from the remainder of the second source word, so this segment is not treated as

a correspondent of any segment from source word 2. Therefore, a violation is incurred for /mangus/ having an input segment /m/ with no corresponding output segment. This practice is followed for all tableaus in this thesis. The specific segments incurring these violations are listed in the Max column in Example 6.

Using relativized constraints to model the behavior of strong positions is based on the proposal of positional faithfulness (Beckman 1997). Beckman proposes universal constraints that are specifically indexed to strong positions to explain why these positions resist neutralization cross-linguistically. When predictions are made based on these relativized constraints, as in Example 6, the strong position in question will be more faithful than other positions not protected by that constraint. The general Max constraint does not distinguish between candidate (6a) and candidate (6b), as the candidates do not differ at all in their violations.

The strong positions tested in the novel blend experiments of Moreton et al. (forthcoming) were shown to be psycholinguistically, morphosyntactically, or semantically prominent cross-linguistically in order to motivate the original hypotheses that they would show greater faithfulness in the type of novel blend experiment just described. In the following sections, an overview of grammatical gender in Spanish will lay out the rationale for hypothesizing a difference in faithfulness between nouns of different genders by showing that they differ in psycholinguistic and morphosyntactic prominence. Then, an overview of headedness in Spanish will explain why significant results are expected for the head faithfulness experiment.

1.2 Grammatical gender in Spanish

In Spanish, all nouns have grammatical gender. Articles, adjectives, and other determiners agree with the noun in gender. In Example 7, below, the noun *zapato* ‘shoe (masc)’

determines the agreement of the other words in the sentence in (7a). In (7b), changing *zapato* to a feminine noun like *camisa* 'shirt (fem)' affects the agreement of the other words in the sentence.

Example 7 - Gender agreement in Spanish

a.

Este	zapato	hermoso	es	mío.
This.M	shoe.M	beautiful.M	is	mine.M

"This beautiful shoe is mine."

b.

Esta	camisa	hermosa	es	mía.
This.F	shirt.F	beautiful.F	is	mine.F

"This beautiful shirt is mine."

Masculine gender is the default, or unmarked, gender in Spanish for several reasons. When using a pronoun to refer to a group of people, groups made up of a mix of males and females receive the masculine pronoun. Only when a group is entirely composed of females is the feminine pronoun used. Because masculine is used as the default in this situation, it is arguably less morphologically marked than feminine.

Example 8 - Masculine as the morphologically unmarked gender

Spanish	**English**	**Composition of group**	**Inflection**
Ellos están aquí.	'They (m) are here.'	All males	Masculine
Ellas están aquí.	'They (f) are here.'	All females	Feminine
Ellos están aquí.	'They (m) are here.'	At least one male	Masculine

Many words in Spanish, such as prepositions, conjunctions, and phrases, do not have inherent grammatical gender. However, when these words are used as names or nominalized, masculine agreement is employed by default (Hualde et al. 2009). This is another indication that masculine is the unmarked gender.

Example 9 - Nominalization of words without inherent grammatical gender (Hualde et al. 2009)

a) *Dio* ***un*** *'sí'* *entusiasmado*.
Give a.M yes enthusiastic.M
"He gave an enthusiastic 'yes.' "

b) ***El*** *fumar* *tanto* *no* *es* *muy* *bueno*.
The.M smoking so much.M not is very good.M
"Smoking so much is not very good"

c) *Quita* ***ese*** *'con'* *y* *pon* ***un*** *'sin.'*
Remove that.M with and put a.M without
"Take out that 'with' and put a 'without' "

Further evidence for a difference in morphological markedness between grammatical genders comes from noun suffixes. Masculine is most often marked by the suffix *-o* whereas feminine is marked by *-a*. Neither of these is more complex than the other. However, while there are exceptions to this *-o*/*-a* pattern, there are only a finite number of ways that masculine/feminine noun pairs can be realized. These different possibilities are summarized in Example 10.

Example 10 - Possible masculine-feminine pairs (Hualde et al. 2009)

Masculine	Feminine	Example (masc. / fem.)	English translation
-o	-a	(el) amigo / (la) amiga	the friend
-o	-o	(el) modelo / (la) modelo	the model
-a	-a	(el) artista / (la) artista	the artist
-e	-e	(el) cantante / (la) cantante	the singer
-e	-a	(el) monje / (la) monja	the monk/nun
-Ø	-Ø	(el) juez / (la) juez	the judge
-Ø	-a	(el) profesor / (la) profesora	the professor

Masculine and feminine nouns can both be equally marked with different suffixes, both be marked with the same suffix, or both be zero-marked. However, in some cases masculine is unmarked and feminine is marked (*el profesor* 'the professor' masc. vs. *la profesora* 'the professor' fem.), while the opposite is never true. Masculine forms also often serve as the basis of derivation for feminine forms, as in *el tigre* ('the tiger' masc.) / *la tigresa* ('the tigress' fem.) (Prado 1982, Anderson 1961). Prado gives several more reasons that masculine should be

considered relatively unmarked when compared to feminine in Spanish, including the inventory of sounds that indicate masculine and a strong tendency of words borrowed into Spanish to receive masculine gender.

In addition to the morphosyntactic evidence, masculine gender is arguably more psycholinguistically prominent than feminine gender. There is evidence that masculine gender is acquired earlier than feminine gender and that children will often indiscriminately attribute masculine gender to all words before learning how to properly attribute gender (Pérez-Pereira 1991). Experimental results from Italian, a closely related language, also show psycholinguistic differences between its two grammatical genders. In a task where subjects were asked to touch one of two buttons corresponding to masculine and feminine after hearing a word, masculine words were identified with significantly more accuracy than feminine words (Bates et al. 1995).

The behavior of masculine gender in Spanish as the default gender, along with the psycholinguistic evidence from Italian that shows that words of differing grammatical genders show differences in language processing, gives good reason to hypothesize that the more morphologically prominent of the grammatical genders, masculine, would enjoy greater faithfulness comparable to the privilege of morphosyntactically prominent positions tested in previous experiments. Chapter 2 will discuss more specific predictions of the gender experiment.

1.3 Headedness in Spanish

While evidence for preferential segmental faithfulness in nouns of a particular grammatical gender has not been found previously, effects of head faithfulness have been seen in English (Shaw 2013) and Japanese (Broad 2015) blend experiments, showing that lexical blending can be used effectively to observe these effects. Furthermore, cross-linguistic evidence points towards the morphological head as a strong position in a variety of languages. Moreton et

al. (forthcoming) reviews various proposals for head faithfulness in the literature, such as the position of morphological head affecting stress in Greek and Russian (Revithiadou 1999) and segmental content in Hebrew (Ussishkin 1999) in derived words. The growing body of evidence supporting the privileged behavior of heads provides strong motivation for a similar experiment in Spanish.

Beyond simply replicating the same effect of head faithfulness in Spanish, there is some reason to believe that the Spanish results should show a stronger effect than previous English results. The English novel blend experiments that were run on heads versus non-heads forced participants to choose between two blend options: one which preserved more of the first source word and one that preserved more of the second source word. In Example 11, from Moreton et al. (forthcoming), this choice is between *baboon***dit**, which preserves more of the first source word, and *ba**b***andit**, which preserves more of the second source word. Participants were asked to match these blends with definitions that manipulate the headedness of the source words. The blends are matched with the choice of definition that participants were expected to make under the hypothesis that semantic heads will preserve more segmental material. Because a baboon-stealing bandit is a type of bandit and not a type of baboon, it is expected that participants would match this definition to the blend that preserves more of the source word **bandit**. The other blend, by contrast, is both a type of baboon and a type of bandit.

Example 11 - Coordinating vs. right-headed forced choice (from Moreton et al. forthcoming)

Source words		Blend	Definitions	
baboon	**bandit**	*baboon***dit**	Coordinating	a baboon who steals like a bandit
		*ba**b***andit**	Right-headed	a baboon-stealing bandit

The experiment was structured using coordinating instead of left-headed definitions because English does not have a significant number of left-headed blends. Spanish, however, is a

language that allows both left- and right-headed blends, a fact that was confirmed in the blends survey described in Chapter 3.

Example 12 shows exactly how a positional faithfulness constraint relativized to semantic heads predicts that substituting coordinating definitions with left-headed definitions should create a stronger effect. (12a) shows a forced choice blend experiment using left-headed and right-headed definitions, while (12b) shows the same ambiblendable pair but with coordinating instead of left-headed interpretations. In (12a), the best candidate pair (12aii) is better than the best candidate pair in (12b): (12bii). (12aii) has only one total violation of Max-Head, while (12bii) has three violations of that constraint. Max has an equal number of violations for both pairs and therefore would have no effect on the outcome even if ranked above Max-Head. The worst candidate pairs -- (12ai) and (12bi) -- have the same amount of violations in both (12a) and (12b). The participants should be able to make a more informed choice if the winning pair has the least amount of violations possible. In other words, a stronger effect is expected from the Spanish headedness experiment over the English headedness experiments in Moreton et al. (forthcoming) and Shaw (2013) if head faithfulness is represented in a universal constraint set.

Example 12 - Coordinating versus left-headed blends as stimuli

a. Choice between left-headed and right-headed

		Source words	Candidate	Max-Head	Max
i	(1)	*saxófono* + **fantasma** (hd)	*saxofo**n**tasma*	**	***
	(2)	*saxófono* (hd) + **fantasma**	*saxo**f**antasma*	***	***
☞ ii	(1)	*saxófono* (hd) + **fantasma**	*saxofo**n**tasma*	*	***
	(2)	*saxófono* + **fantasma** (hd)	*saxo**f**antasma*	✓	***

b. Choice between right-headed and coordinating

		Source words	Candidate	Max-Head	Max
i	(1)	*saxófono* + **fantasma** (hd)	*saxofo**n**tasma*	**	***
	(2)	*saxófono* (hd) + **fantasma** (hd)	*saxo**f**antasma*	***	***
☞ ii	(1)	*saxófono* (hd) + **fantasma** (hd)	*saxofo**n**tasma*	***	***
	(2)	*saxófono* + **fantasma** (hd)	*saxo**f**antasma*	✓	***

Spanish was originally singled out as an interesting language to pursue for an extension of English headedness experiments because of the prevalence of left-headed compounds in the language (Guevara 2012). The availability of left- and right-headed structures allows stimuli to be designed that ask subjects to match blends to left- and right-headed definitions, instead of the coordinating and right-headed definitions that were employed in the English experiments.

CHAPTER 2: PREDICTIONS

2.1 Gender experiment predictions

Based on the relative morphological and psycholinguistic prominence of masculine over feminine gender in Spanish discussed in Chapter 1, my hypothesis for a forced-choice novel blend experiment on grammatical gender is that nouns with masculine gender should be subject to greater faithfulness than nouns with feminine gender. This can be tested by presenting participants with an ambiblendable word pair where one of the source words is ambiguous for grammatical gender. Common gender nouns in Spanish vary in gender agreement based on the semantic gender of the referent. However, unlike most nouns, they do not change in phonological form when the gender agreement is changed. Without any context or evidence from agreement, speakers have only the phonological form to rely on, which is indistinguishable between masculine and feminine. In a case without sufficient context, masculine is assigned to these types of nouns as the default gender.

Example 13 - Spanish common gender nouns

el artista / la artista ‘the (male/female) artist’
el dirigente / la dirigente ‘the (male/female) leader’
el testigo / la testigo ‘the (male/female) witness’

Just as definitions have been used by Shaw (2013) and Moreton et al. (forthcoming) in previous head faithfulness experiments to suggest a right-headed or a coordinating definition of each blend, the definite articles “el” and “la,” for masculine and feminine, respectively, can be used to suggest a masculine and feminine interpretation of a common gender noun. A crucial assumption being made here, which will be motivated in Chapter 3 with the results of the blends

survey, is that the gender of a blend is determined by the gender of the second source word. In other words, when a speaker chooses which article to assign to a blend with a second source word that is common gender, the common gender noun should also be interpreted as that gender. In Example 14, the novel blend *ardor***igente** is formed from the source words *ardor* (‘zeal’ masc.) and **dirigente** (‘leader’ common gender). The gender of the first source word is masculine in both cases, but the gender of the second source word is ambiguous. I assume that the participants will interpret the second source word as masculine in (14a) and as feminine in (14b).

Example 14 - Blend interpretation in gender experiment

ardor (‘zeal’ masc.) + **dirigente** (‘leader’ common gender)
a. el *ardor***igente** = interpretation of **dirigente** as masculine
b. la *ardor***igente** = interpretation of **dirigente** as feminine

By supplying another blend option where more of the second source word is preserved (*ar**dirigente*** as opposed to *ardor***igente**), the participant will be forced to interpret one instance of **dirigente** as masculine and the other as feminine. If masculine gender is indeed subject to greater faithfulness, the blend that preserves a greater portion of source word 2 would be attributed masculine gender by subjects, who would be preferring to preserve the common gender noun with a masculine interpretation over the common gender noun with a feminine interpretation. This can be modeled with a positional faithfulness constraint relativized to masculine gender. Example 15 introduces the constraints that are needed to model this constraint ranking in Optimality Theory, and Example 16 shows how a ranking of Max-Masc >> Max-Fem leads to a clear prediction of one blend pair candidate over the other.

Example 15 - Constraints for gender experiment

a) Max-Masc: Assign one violation for each segment in the input of a masculine word that does not have a corresponding segment in the output
b) Max-Fem: Assign one violation for each segment in the input of a feminine word that does not have a corresponding segment in the output

Example 16 - Gender experiment predictions

ardor (‘zeal’ masc.) + **dirigente** (‘leader’ common gender)

Definition (right-headed): A leader who is overzealous

		Candidate	Max-Masc	Max-Fem	Max-Hd
a	(1)	el *ardor***rixente**	**!	✓	**
	(2)	la *ard***irixente**	**	✓	✓
☞ b	(1)	la *ardor***rixente**	✓	**	**
	(2)	el *ard***irixente**	**	✓	✓

In Example 16, *ardor* incurs the same number of violations in both (16a) and (16b), because the only change between these two candidate pairs is which gender is attributed to which blend. Similarly, the headedness status of the source words does not change between the candidate pairs, so there is no difference in violations of a Max-Head constraint. This will be true for any candidate pair that follows this design. The source word 2, **dirigente**, will incur different violations depending on which gender it is attributed.

In previous experiments, stress placement of the source words was controlled to ensure that this was not a confounding factor in participants’ decisions. Spanish, unlike English, has the advantage of having predictable stress from its orthography. In all of the candidates in Example 18, the stress falls on the penultimate syllable in accordance with the stress rules of Spanish. This means that the first source word loses its stress in all cases, incurring a violation, and the second source word keeps its stress in all cases. There is no difference on this measure between any of the candidates. Because there is no reason to assume a change in headedness between the candidates (participants will be given right-headed definitions for all candidates), a Max-Stress constraint relativized to the head would not differentiate these candidate pairs either.

Example 17 - Stress related constraints

Max-Stress (Masc): Assign a violation for every stress in the input of a masculine word that does not have an output correspondent
Max-Stress (Fem): Assign a violation for every stress in the input of a feminine word that does not have an output correspondent

Example 18 - Gender experiment stress predictions

ardór ('zeal' masc.) + **dirigénte** ('leader' common gender)
Tableau showing that stress is not a factor in the decision

		Candidate	Max-Stress (Masc)	Max-Stress (Fem)
☞ a	(1)	el *ardor***ixénte**	*	✓
	(2)	la *ard***irixénte**	*	✓
☞ b	(1)	la *ardor***ixénte**	*	✓
	(2)	el *ard***irixénte**	*	✓

In Example 18, above, the stress from the second syllable of *ardor* is lost in each case, incurring one violation of Max-Stress (Masc) in each blend of both candidate pairs. The stress of this blend will fall on the penultimate syllable in each blend, making stress related constraints a non-factor for determining the winning candidate.

It is possible that there is a constraint penalizing the attribution of the non-default feminine gender to a common gender noun. However, this would not affect the results of the gender experiment, as both candidate pairs assign the default masculine gender once and the non-default feminine gender once, incurring the same amount of violations per pair.

Example 19 - Default violation constraint

Assign-Default: Assign one violation for each word that is not assigned the default (masculine) gender

Example 20 - Assign-Default predictions

ardor ('zeal' masc.) + **dirigente** ('leader' common gender)

		Candidate	Assign-Default
☞ a	(1)	el *ardor***ixente**	✓
	(2)	la *ard***irixente**	*
☞ b	(1)	la *ardor***ixente**	*
	(2)	el *ard***irixente**	✓

I have put forward the argument that masculine gender, being the more prominent gender morphosyntactically, will be assigned to the blend that preserves more of the second source word. This prediction rests on the evidence discussed in Section 1.2 that masculine is the less morphologically marked gender in Spanish. However, Iscrulescu (2006) gives several case studies that show that more morphologically marked categories are licensed in more marked phonological structure. For example, in Old Saxon, the less marked Nominative-Accusative case marker is deleted in certain marked phonological structures while the more marked Dative-Instrumental case marker is preserved in those same structures. In this case, the more marked category behaves as we would expect from a "strong" position. I have argued that this behavior should be expected from the less marked category rather than the more marked category, which would make the opposite predictions in the examples that Iscrulescu cites.

If participants consistently assigned feminine to the blend that preserves more of the second source word, this could be due to the effect that Iscrulescu describes in his thesis, which he calls "Marked in the Marked" due to the presence of marked morphological categories in marked phonological structures. In the context of novel blend experiments, the prediction of feminine as a strong position due to its greater morphological markedness would be modeled by reordering the constraints in Example 16 so that Max-Fem dominates Max-Masc. While I predict that masculine nouns should preserve more segmental material in the gender experiment, the preferential treatment of feminine nouns would prompt a more thorough investigation of the theory argued for in Iscrulescu (2006) and how to fit feminine gender into the group of "strong" positions along with heads, nouns, and proper nouns.

2.2 Headedness experiment predictions

A experiment that manipulates the headedness of the source words similar to experiments run in Shaw (2013) and Moreton et al. (forthcoming) is expected to show a significant effect of head faithfulness. This experiment will provide the participant with two blend options and two definitions to match them with, as in Example 21.

Example 21 - Sample headedness blend experiment stimulus

saxófono ('saxophone') + **fantasma** ('ghost')
Blend Option 1 (preserves more of source word 1): *saxofo**n*****tasma**
Blend Option 2 (preserves more of source word 2): *saxo**f*****antasma**
Definition 1 (left-headed): A type of saxophone that sounds like a ghost
Definition 2 (right-headed): A type of ghost that plays the saxophone

The expected outcome is for Blend Option 1 to be matched with Definition 1 and for Blend Option 2 to be matched with Definition 2 -- this is the equivalent of saying that the blend that preserves more of the first (left-most) source word should be matched with the left-headed definition, while the blend that preserves more of the second (right-most) source word should be matched with the right-headed definition. While all of the information concerning the blend options and source words is available in Example 21, this is not how participants would be presented with the information. A detailed explanation of the headedness design, including a screenshot of a sample stimulus page, can be found in Section 3.3.1.

Example 22 - Max-Head >> Max

saxófono ('saxophone') + **fantasma** ('ghost')

			Source words	Candidate	Max-Head	Max
	a	(1)	*saksófono* + **fantasma** (hd)	*saksofo**n*****tasma**	**	***
		(2)	*saksófono* (hd) + **fantasma**	*saksof**a*****ntasma**	***	***
☞	b	(1)	*saksófono* (hd) + **fantasma**	*saksofo**n*****tasma**	*	***
		(2)	*saksófono* + **fantasma** (hd)	*saksof**a*****ntasma**	✓	***

The tableau in Example 22 shows how a constraint relativized to the head can influence a participant's decision of blend pair candidates. When a right-headed definition is attributed to a

blend that preserves the entire second source word, no violations are incurred for the Max-Head constraint, which is the decisive constraint in this case since Max incurs equal violations for all candidates. In previous experiments, the second source word was a head in all candidates, and the first source word was a head in one candidate. In this experiment, the second source word will be a head in only one candidate, and the first source word will be a head in the other. In other words, the two candidates are more distinguishable in a language with left- and right-headed blends than in a language where a left-headed interpretation is not possible or natural. This fact suggests the possibility of a stronger effect for head faithfulness in Spanish than has been seen in previous experiments.

The headedness experiment also serves as a check for the gender experiment; the methodology used has yielded significant results in other languages, and the headedness experiment here only makes minor modifications to that design. Additionally, evidence of head faithfulness is seen across many languages. A significant result in the headedness experiment makes the results of the gender experiment easier to interpret. In the following chapter, the design and results of the experiments will be discussed.

CHAPTER 3: EXPERIMENTS

Several web experiments were run to gather the necessary data for this project. The intuitions of native Spanish speakers were solicited on an online labor exchange called Amazon Mechanical Turk. Mechanical Turk has been shown to be effective in collecting judgments for linguistic experiments (Sprouse 2011). Furthermore, in a survey of language demographics on Mechanical Turk, Spanish was included in the top 13 languages out of 100 rated for availability of workers as well as quality and speed of work (Pavlick et al. 2014). Requirements on all experiments run for this thesis were set so that workers must have completed 100 tasks previously with an approval rating of at least 95%. This was done both to increase the likelihood that all workers would give reliable judgments as well as to replicate the conditions set on workers in Moreton et al. (forthcoming).

While Mechanical Turk was used to recruit subjects, Experigen (Becker and Levine 2013), an online experiment platform developed for linguistic experiments, was used to present the stimuli to the participants. In the following sections I will describe the rationale and design of a blends survey, an experiment on blend gender, and an experiment on blend headedness.

3.1 Blends survey

The first experiment that was run on Amazon Mechanical Turk was a survey using attested Spanish blends as stimuli, which were gathered from Piñeros (2004), Casado Velarde (1985), Pharies (1987), and Rodríguez González (1989). A corpus was built from these sources listing blends along with their grammatical gender (if available), the gender of both source words, the lexical categories of the blend and both source words, pronunciation, and headedness

information. Gender information was missing for the majority of blends in the corpus, and it was not clear that all speakers would necessarily agree in headedness and meaning with whoever coined the word originally; with a few exceptions, the blends in the corpus are not in widespread usage. Once the corpus was assembled, there were several outstanding questions:

Example 23 - Questions concerning the blends corpus

a) Do Spanish speakers have consistent intuitions about the headedness and gender of blends that they have not been exposed to previously?
b) How is gender determined in Spanish blends?
c) To what extent are Spanish blends left- or right-headed?

These questions formed the basis for the design of an online blends survey, which sought to provide answers using evidence from native speaker intuitions. (23b) was especially of interest to this project, as it affected the design of the stimuli for the gender experiment described in 3.2.

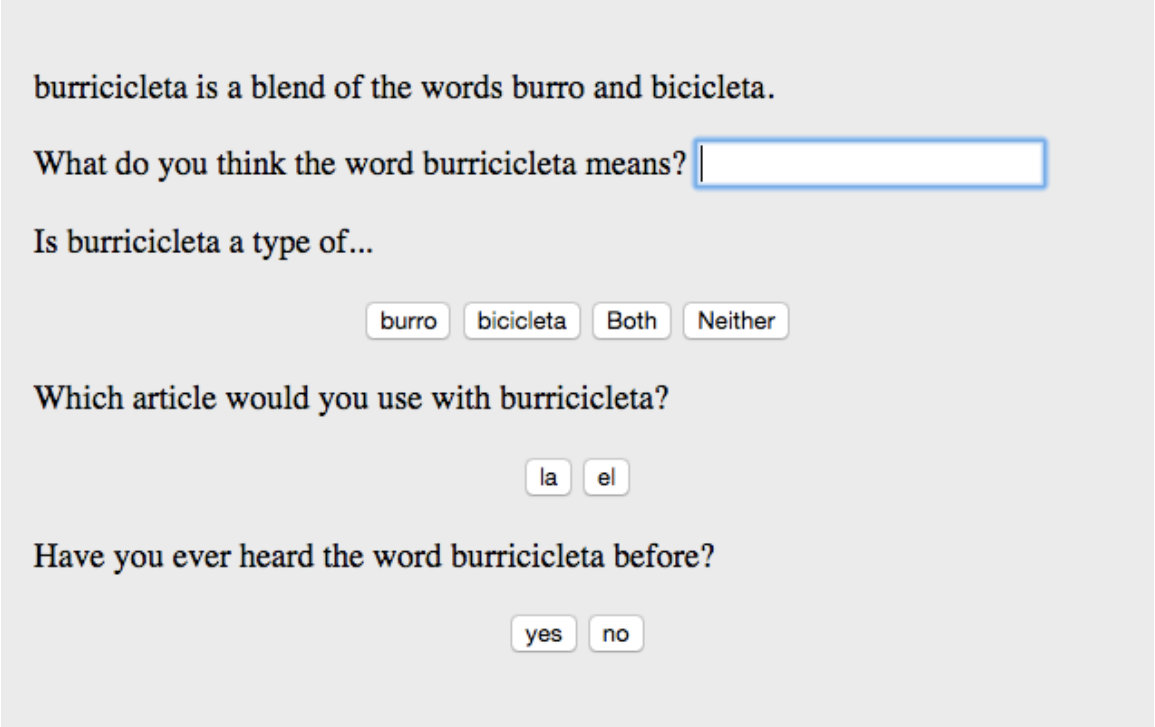
3.1.1 Stimuli

Each participant was presented with 20 attested Spanish blends. The source words in each blend were opposite in grammatical gender: 10 of the blends had a masculine source word 1 and a feminine source word 2, while the other 10 had a feminine source word 1 and a masculine source word 2. All source words were nouns. Blends that used regionally specific words or proper nouns as source words were avoided as stimuli. Two versions of the survey were run using a different set of stimuli due to concerns about the length of the experiment, so that 40 blends were tested overall. Participants were asked to complete the following tasks for each blend (a translated stimulus page is presented in Figure 3.1):

Example 24 - Tasks in blends survey

a) Give a definition for the blend
b) Choose the semantic head of the blend by choosing whether the blend was a "type of" the first source word (left-headed), the second source word (right-headed), both (coordinating), or neither (exocentric)
c) Assign an article to the blend -- either the masculine article 'el' or the feminine article 'la'
d) Answer whether or not the blend is familiar to the participant

Figure 3.1: Example stimulus from the blends survey (English translation)



Demographic information was gathered at the end of the experiment. Native language, any additional languages spoken, gender, place of birth, current location, and age were all collected, although participants were not required to answer all demographic questions. Data from any participant that listed a language other than Spanish as a native language were excluded from analysis. There was also a field that asked participants to include any additional blends that they knew.

The free-response definitions were coded manually for headedness and checked against the answers for the multiple choice headedness question. Because these two headedness judgments did not line up reliably across the responses, the coded definitions were used as the final criterion for interpreting participants' headedness judgments. It was not clear that the multiple choice headedness question was delivering reliable results, and these responses were disregarded.

3.1.2 Participants

64 participants were included in the analysis after excluding those subjects that listed a language other than Spanish as their native language or consistently failed to provide coherent Spanish answers to the free definition portion of the survey. Some individual responses were excluded from analysis due to the difficulty of coding that particular definition for headedness, but this did not necessarily entail the complete exclusion of all of that participant's answers. Overall, 1023 responses were included in the final analysis. Subjects were compensated $4.00 each upon completion of the survey.

3.1.3 Results

The results of the blends survey found that the attribution of gender to blends by native speakers follows certain principles. Three variables were investigated as predictors of the attribution of blend gender by survey participants: the gender that the participant attributed to the second source word (source word 2 gender), the inflectional ending (if any) found on the end of the second source word (inflection), and the gender of the source word that the participant identified as the semantic head of the blend (head gender). All three of these variables were found to be significant predictors of blend gender. The raw numbers for participants' responses are shown in Example 25. The totals for (25b) and (25b) differ from those of (25a) because only

a subset of the responses were considered. For inflection, responses that did not have the typical Spanish inflectional ending for masculine (-o) or feminine (-a) were excluded. For headedness, coordinating and exocentric blends were excluded from the analysis.

Example 25 - Gender experiment raw results

a)

		Blend Gender		
		Masculine	Feminine	Total
Source Word 2 Gender	Masculine	407 (78.57%)	111 (21.43%)	518
	Feminine	87 (17.23%)	418 (82.77%)	505
	Total	494	529	1023

b)

		Blend Gender		
		Masculine	Feminine	Total
Inflection	Masculine	217 (91.56%)	20 (8.44%)	237
	Feminine	61 (14.77%)	352 (85.23%)	413
	Total	278	372	650

c)

		Blend Gender		
		Masculine	Feminine	Total
Head Gender	Masculine	263 (67.78%)	125 (32.22%)	388
	Feminine	142 (36.22%)	250 (63.78%)	392
	Total	405	375	780

A logistic regression taking into account multiple observations within subjects, summarized in (26a), found that source word 2 gender was a significant predictor of blend gender. This same analysis was applied to a model with inflection as the predictor (26b) and another with head gender as the predictor (26c), finding significant results in both cases. In all three models, the masculine and feminine options were tested as predictors for an outcome of masculine as the blend gender, and in all three models the masculine option significantly predicted that outcome while the feminine option significantly predicted the opposite outcome.

Example 26 - Logistic regression results for blends survey

a) Source word 2 gender as predictor of masculine blend gender

SW2 gender	Intercept	Standard error	z value	p
feminine	-1.57	0.17	-9.22	<.0001
masculine	1.299	0.124	10.51	<.0001

b) Inflectional ending of source word 2 as predictor of masculine blend gender

Inflection	Intercept	Standard error	z value	p
feminine	-1.753	0.19	-9.24	<.0001
masculine	2.384	0.229	10.43	<.0001

c) Head gender as predictor of masculine blend gender

Head gender	Intercept	Standard error	z value	p
feminine	-0.566	0.117	-4.83	<.0001
masculine	0.744	0.118	6.31	<.0001

Apart from inflectional endings, which overlap with source word 2 gender and only apply to blends that have inflectional endings, the source word 2 gender is the strongest single predictor of blend gender. Source word 2 gender predicts the outcome variable of blend gender above chance in all cases, not just in the subset of the data where inflection or headedness is relevant. The fact that inflection can only make predictions about blend gender in a subset of all cases makes source word 2 gender a more valuable predictor -- in 373 out of 1023 responses (36% of all responses), inflection cannot make any prediction at all about the outcome.

The information gathered in this survey could be analyzed more extensively in the future and would be an especially useful resource in comparing Spanish blends to Spanish compounds. For the purposes of this thesis, the significant correlation between the gender of the second source word and the gender of the blend was the most important piece of information needed in order to motivate the design for the gender experiment, especially due to the possibility of controlling for inflection in the experimental design.

3.1.4 Discussion

The responses of participants in the blends survey provide an opportunity for future research, especially regarding how the behavior of blends differs from compounds in Spanish. A more sophisticated statistical analysis of the blends survey could investigate the interaction of headedness and gender. Guevara (2012) makes claims about the way that compounds behave with regard to gender and headedness, separating different kinds of compounds into different groups. Comparing Guevara's results to a similar analysis of the blends survey could provide some insight into blend formation and the differences that exist between blends and compounds. Additional data on compounds could also be gathered by conducting a similar survey that asks native Spanish speakers for their intuitions on compounds that have source words of opposing grammatical genders. The survey stimuli were not selected with inflection in mind, and it may be illuminating to get more native speaker judgments on how gender is attributed to blends where the second source word does not have explicit inflection.

3.2 Gender experiment

3.2.1 Stimuli

The results of the blends survey found a significant correlation between blend gender and source word two gender. This result forms the basis for the design of the gender experiment. When two nouns differ in the gender of the referent, this fact is usually indicated by the inflection, as in Example 27:

Example 27 - Masculine/feminine word pair
el hermano ('the brother' masc.) vs. *la hermana* ('the sister' fem.)

Here, the typical masculine ending *-o* changes to the typical feminine ending *-a* in order to indicate the difference in sex of the referent. There are some nouns in Spanish, however, that do not change in phonological form when the semantic gender is changed. The gender of these

nouns can only be distinguished by the context or the agreement of other elements of the sentence and, as mentioned earlier, are called common gender nouns:

Example 28 - Masculine/feminine word pairs for common gender nouns

el estudiante ('the student' masc.) vs. *la estudiante* ('the student' fem.)
el artista ('the artist' masc.) vs. *la artista* ('the artist' fem.)
el mártir ('the martyr' masc.) vs. *la mártir* ('the martyr' fem.)

Common gender nouns were used in the gender experiment because it is possible for these words to be ambiguous for gender, just as in previous experiments one of the source words of each blend was ambiguous for some characteristic (noun/verb, common noun/proper noun, head/non-head). The stimuli for the gender experiment were pairs of words that could be blended in two different ways:

Example 29 - Example ambiblendable pair for gender experiment

ardor ('zeal' masc.) + **dirigente** ('leader' common gender) = *ardo***r**igente / *ard***d**irigente

Potential stimuli were found using a computer program that searched for word pairs with the following criteria:

Example 30 - Criteria for gender experiment stimuli

a) All source words were singular nouns
b) The first source word was masculine gender
c) The second source word was common gender
d) The second source word ended with "-e"
e) The two words had a string of two identical consonants separated by a distinct vowel
f) None of the source words were proper nouns
g) The blend could be attributed a plausible right-headed definition

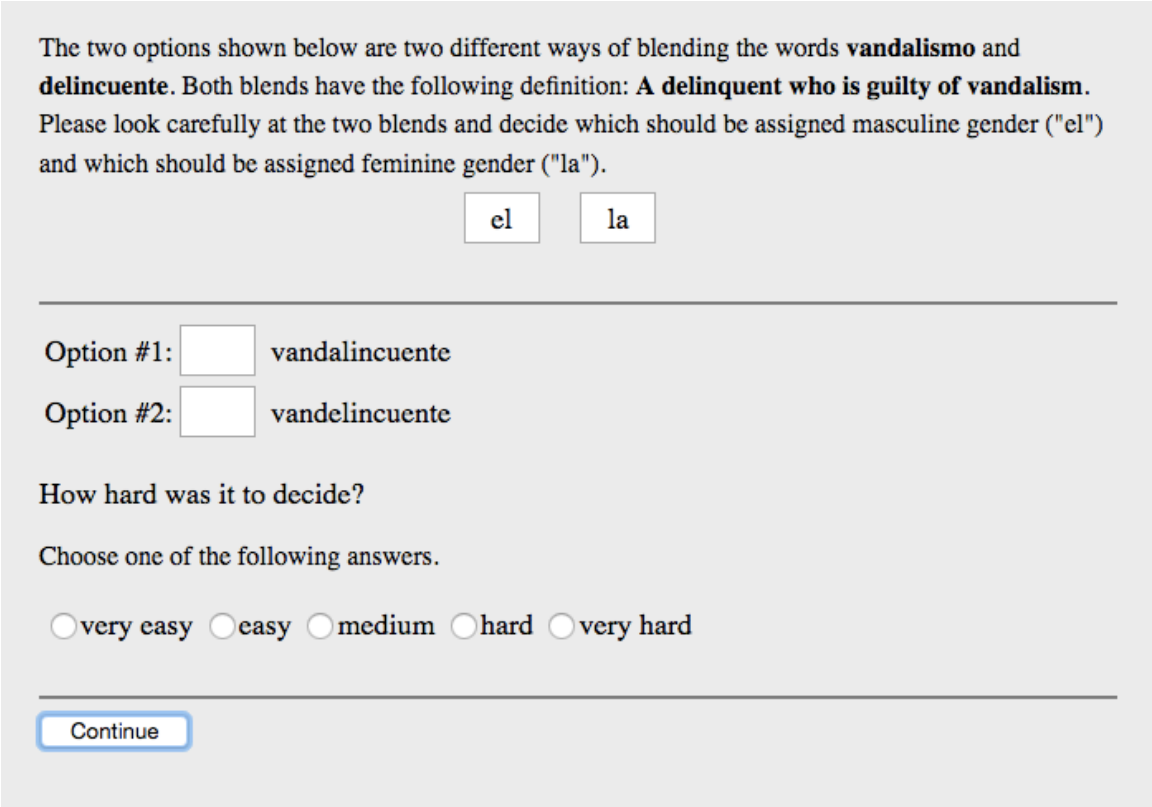
I searched the Spanish database LEXESP (Sebastián-Gallés et. al. 2000) using these criteria to find acceptable word pairs. Using the list of generated word pairs, 11 were selected based on semantic plausibility, recoverability of the source words, and frequency of the source words (not using rare or specialized vocabulary). The stimuli are listed in the appendix.

The participants were given a short introduction to the concept of lexical blending, a warm-up that explained the drag-and-drop interface of the experiment, and 11 stimuli to complete. Each stimulus page supplied both source words and a right-headed definition. The participants were told that the two blend options were different ways of blending the source words, and that both blends had the same definition. The main task of the experiment was to drag a box that contained a definite article -- either the masculine “el” or the feminine “la” -- to one of two boxes that appeared before the two blend options. This setup can be seen in Figure 3.2. When one article was assigned to one blend, the other article was automatically assigned to the opposite blend by the Experigen software. The participant had the option of switching the placement of the articles as many times as desired before submitting a response.

While the blends survey showed that participants should be looking to the second source word when assigning gender to a blend regardless of whether the blend is right-headed or not, a right-headed definition was provided to further ensure that the second source word was the focus of the task. Varying the article associated with the blend would in turn vary the gender of the second source word, whereas the first source word stayed constant for gender across blend candidate pairs.

The survey also asked the participant to rate the difficulty of the decision on a scale of 1 (very easy) to 5 (very difficult). The design did not allow participants to skip any questions. Following completion of all the stimuli, participants were asked to fill out a similar demographic survey as in the blends survey, with a few additions. Changes to the demographic page included check boxes which asked if intuition or strategy were used to complete the task. Participants had the option of checking either, both, or none. There was space for elaboration if a specific strategy was used.

Figure 3.2: Example stimulus page for the gender experiment (English translation)



3.2.2 Participants

72 participants were run on Amazon Mechanical Turk. All participants were told at the beginning of the experiment that only native Spanish speakers should take part. All directions and stimuli were in Spanish, and a demographic survey at the end of the experiment asked for each speaker's native language as well as other language experience. 2 participants who listed a language other than Spanish as their native language were excluded, leaving 70 subjects for the analysis. Participants were paid $2.50 for their participation in the experiment.

3.2.3 Results

The first analysis of the data was done on all individual responses in the experiment. Using the GLIMMIX procedure in SAS, a mixed logistic regression with random effects for

subjects and items was used to analyze the data. The results of this analysis are reported in (31a). The results of the experiment did not find that participants were more likely to assign masculine gender to blends preserving more of source word 2, nor were participants more likely to assign feminine gender to blends preserving more of source word 2; in other words, these results are consistent with the participants arbitrarily assigning gender to blends.

An analysis was also done "by-participant," following Shaw (2013) and Moreton et al. (forthcoming). Participants with 6 or more responses that supported a Max-Masc >> Max-Fem constraint ranking were coded as a "1," and participants with 5 or fewer of these responses were coded as a "0." This proportion was compared to the chance level of 0.5 with an exact binomial test using the statistical software R (R Core Team 2015). The results are reported in (31b).

Example 31 - Gender experiment results

a. Logistic regression analysis of total responses in gender experiment

Mean Estimate	Confidence Limits		Standard Error	p
0.5268	0.3852	0.6642	0.2580	0.6862

b. Exact binomial test "by-participant" in gender experiment

Max-Masc >> Max-Fem Responses		95% Confidence Interval			
6 or more	5 or fewer	Min.	Est.	Max.	p
40	30	0.45	0.57	0.69	0.282

Example 32 - Results by blend for the gender experiment

Ordered from most strongly supporting the Max-Masc >> Max-Fem constraint ranking to least strongly supporting that ranking

	Blend Option 1 (preserves more of source word 1)	**Blend Option 2 (preserves more of source word 2)**	**Responses supporting Max-Masc >> Max-Fem**	**Responses supporting Max-Fem >> Max-Masc**
1	vandalincuente	vandelincuente	56	14
2	jarabelde	jarebelde	54	16
3	tomatante	tomutante	51	19
4	volcanvaleciente	volconvaleciente	47	23
5	acantilevidente	acantelevidente	41	29
6	animalitante	animilitante	37	33
7	uniformante	unifirmante	27	43
8	vampirticipante	vamparticipante	23	47
9	ratoniente	rateniente	23	47
10	ardorigente	ardirigente	22	48
11	simposeante	simpaseante	21	49

The results by blend for the gender experiment are shown in Example 32. While I did not find support for my hypothesis in my analysis of the total responses, some individual stimuli behaved in the way that I hypothesized across most participants. In Example 32, stimuli 1 through 5 numerically support the Max-Masc >> Max-Fem hypothesis. However, stimuli 7 through 11 support Max-Fem >> Max-Masc, the opposite hypothesis. One stimulus, 6, showed only a slight inclination towards Max-Masc >> Max-Fem.

Several explanations were considered for the behavior of the blends in this experiment. Only after the experiment was run was it realized that many of the stimuli had possible phrasal interpretations, where the second source word could be ambiguous between a noun and an adjective. For example, instead of "militant who fights for the rights of animals," *animal* + **militante** could have been taken to mean "militant animal." While a right-headed definition was explicitly supplied to participants, there is no guarantee that all participants used this definition to analyze the blends as they were expected to. If the blend was interpreted as *animal* (noun) +

militante (adjective) as opposed to the intended *animal* (noun) + **militante** (noun), the phrasal interpretation would have implied a left-headed reading of the blend -- in this case, the blend as a whole would be a type of animal and not a type of militant. The possible ambiguity in headedness in those blends that were amenable to a phrasal interpretation interferes with one of the factors that I tried to control for in the experiment: all blends were intended to be interpreted as right-headed.

This phrasal interpretation was not available for all blends, and for the blends that supporting a phrasal interpretation, the expected result was not always seen. For example, *animal* + **militante** was nearly equally divided between responses that favored Max-Masc >> Max-Fem and responses that favored Max-Fem >> Max-Masc. This factor would have been controlled for if the possibility of a phrasal interpretation had been considered prior to the experiment. However, further information would be required in order to be confident about the effect of a phrasal interpretation on gender assignment in Spanish blends. As a complete explanation of the blends separating into two groups with clear differences, the phrasal interpretation explanation does not suffice.

Another possibility is that the task was not performed correctly, either because it was not clearly enough defined or because it was too difficult. The only difference between the blend options in each stimulus was a single vowel, which I will refer to as the "crucial vowel." For example, in tomatante versus tomutante, the fourth letter (either "a" from "tomate" or "u" from "mutante") is the only difference between the two blends. It may be that these vowels provided a phonological cue for one blend gender over the other. If participants were paying attention to the crucial vowel rather than trying to apply a gender to the second source word, then a different task was being performed than what was intended. With only one exception, blend options where the

crucial vowel is “a” received a majority of feminine responses, while blend options where the crucial vowel is “o” received a majority of masculine responses. This is summarized in Example 33. The vowels in question are bolded in the table. Four out of five blend pairs that support the Max-Masc >> Max-Fem hypothesis (stimuli 1-5) have an “a” as the crucial vowel in Blend Option 1 and assign feminine to that blend option; five out of five blend pairs that support the Max-Fem >> Max-Masc hypothesis (stimuli 7-11) have an “o” as the crucial vowel in Blend Option 1 and assign masculine to that blend option OR have an “a” as the crucial vowel in Blend Option 2 and assign feminine to that blend option (or both).

Example 33 - Phonological cue explanation

	Blend Option 1 (preserves more of source word 1)	**Blend Option 2 (preserves more of source word 2)**	**Responses supporting Max-Masc >> Max-Fem**	**Responses supporting Max-Fem >> Max-Masc**
1	vand**a**lincuente	vandelincuente	56	14
2	jar**a**belde	jarebelde	54	16
3	tom**a**tante	tomutante	51	19
4	volc**a**nvaleciente	volc**o**nvaleciente	47	23
5	acantilevidente	acantelevidente	41	29
6	anim**a**litante	animilitante	37	33
7	unif**o**rmante	unifirmante	27	43
8	vampirticipante	vamp**a**rticipante	23	47
9	rat**o**niente	rateniente	23	47
10	ard**o**rigente	ardirigente	22	48
11	simp**o**seante	simp**a**seante	21	49

While this pattern seems robust at a glance, no statistical analysis was run to tell whether these vowels were significant predictors of participants’ article choices due to the pattern being found after data collection. A further experiment may be able to tell whether or not this is a factor in gender assignment in the sort of blend experiment described here, but it would not have any bearing on the central hypothesis being investigated: that nouns of one gender have greater

faithfulness over nouns of the other gender. However, understanding the bimodal distribution of these data could be applied to controlling for confounding factors in any future experiments on this topic. Without subjecting the data to further analysis, the phonological cue explanation does a better job of explaining the results than the phrasal interpretation explanation. It would take further controlled experiments to draw any definitive conclusions regarding the behavior of these stimuli.

Whether or not the explanations discussed here are valid, separately or in some combination, the results of the experiment were clear: there was no evidence supporting the hypothesis that masculine gender nouns preserve more segmental material than feminine gender nouns.

3.2.4 Discussion

The results of the gender experiment did not provide evidence for positional faithfulness constraints relativized to either gender. It may be that there is no such hierarchical relationship between the grammatical genders in the phonology of Spanish despite the differences that are seen in the morphology and in some psycholinguistic experiments. However, it is also possible that the task that subjects were asked to perform did not adequately test the hypothesis. While the experiment was modeled after Shaw (2013) and Moreton et al. (forthcoming), there were necessarily differences in the design. The participants were asked to match an article with a blend, rather than to match a definition with a blend. The article was dragged to the blend, whereas in previous experiments the blend was dragged to a definition and not the other way around.

Several assumptions were made in the gender experiment: that the participant would consider themselves to be assigning gender to the second source word, which was a common

gender noun; that the participant would assign masculine to the blend that preserved more of the second source word; that testing common gender nouns, which change in gender based on the real world semantics of the referent, is no different than testing nouns that always carry the same, inherent grammatical gender. Participants were required to make several steps in logic in order to arrive at the interpretation that would favor the hypothesis of Max-Masc >> Max-Fem. The headedness experiment, in comparison, did not require such a complicated analysis of each stimulus in order to interpret each blend option according to some definition. If the explanation put forth in Chapter 3 is correct -- that participants were using the differing vowel in each stimulus as a phonological cue for gender rather than considering the common gender source word 2 to make their decisions -- then the task tested something else entirely than the original intention of the experiment.

Future research on this topic would benefit from avoiding the possible confounds discussed in this thesis. New stimuli could be designed that avoided phrasal interpretations and the vowels that may be providing strong phonological cues for gender. The use of common gender nouns as a component of the novel blend stimuli could also be reconsidered. Using homophones that differ only in their grammatical gender could be a way to avoid complicating the experiment unnecessarily. While there are not many, some words in Spanish change in meaning with a change in gender. An example of this is *el capital* 'the capital (money, resources) (masc.)' vs. *la capital* 'the capital (city) (fem.). Using *capital* as the source word 2 and matching with two different definitions that concerned either money or a city would make it easier to ensure that the participants are interpreting the gender of the second source word as expected. This change in design would also cause the gender experiment to become more comparable with the headedness experiment. While it would be difficult to create stimuli that avoided all of these

confounds and retained semantic plausibility in the definitions -- which is why this design was not initially pursued -- it would be worth exploring this direction for future research in an attempt to further approximate the experimental design of Shaw (2013) and Moreton et al. (forthcoming).

3.3 Headedness experiment

3.3.1 Stimuli

The stimuli for the headedness experiment were also novel, ambiblendable pairs, but the conditions that stimuli needed to meet were different from the gender experiment. The stimuli had the following conditions:

Example 34 - Criteria for headedness experiment stimuli

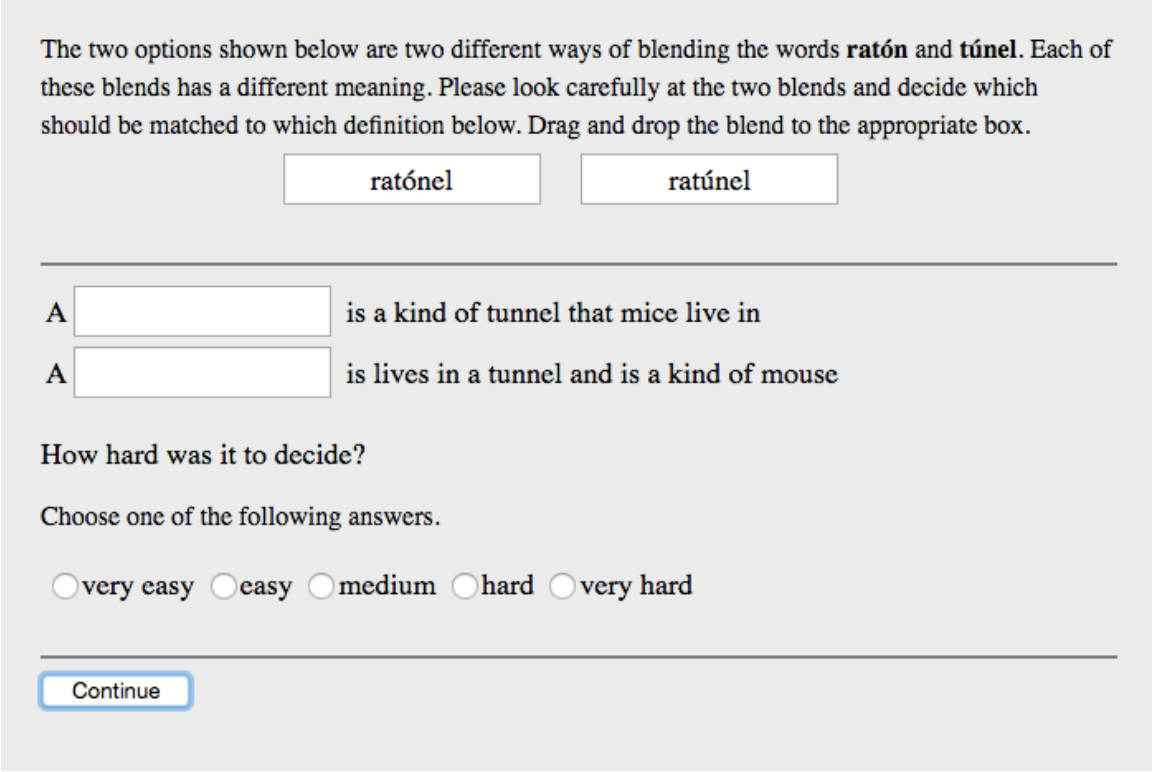
a) All source words were nouns.
b) The blends were either made up of a feminine source word one and a feminine source word two, or a masculine source word one and a masculine source word two. No blends were composed of source words with differing genders.
c) All blends could be attributed plausible left- and right-headed definitions.
d) Blends that could be attributed a phrasal (N+A) interpretation were avoided.
e) The two words had a string of two identical consonants separated by a distinct vowel.

Again, LEXESP (Sebastián-Gallés et. al. 2000) was searched by a computer program to find stimuli that complied with the above criteria. The results of this search were inspected manually to find semantically and phonologically plausible blend pair candidates. A native speaker inspected the definitions and experiment instructions before the experiment was run. The word order of the definitions was kept constant, with the second source word appearing before the first source word in order to resemble the blends less and hopefully encourage the participants to focus on the meanings of the definitions. This resulted in one of the definitions in each blend pair to have slightly less natural syntax than the other.

The participants were given a short introduction to the concept of lexical blending, a warm-up that explained the drag-and-drop interface, and 11 stimuli to complete. They were asked to drag a blend from the top of the page to a box corresponding to one of two definitions.

One of the definitions was left-headed and the other was right-headed. It was possible to switch the answer before submitting the response. Each stimulus page also asked the participant to rate the difficulty of their decision on a scale of 1 (very easy) to 5 (very difficult). The stimulus pages looked like the example in Figure 3.3. The design did not allow participants to skip any questions. Following completion of all the stimuli, participants were asked to fill out the same demographic survey as in the gender experiment. They were then given a unique code to enter on the Mechanical Turk page.

Figure 3.3: Example stimulus page for the headedness experiment (English translation)



Four versions of the experiment were designed in order to ensure that the order in which the information on the stimulus page was presented to the participants did not influence the results. Each ambiblendable pair was presented in four different ways in the four different versions, including all combinations of the order of the blends in the drag boxes and the order of

the definitions. These variations were distributed among participants so that each participant saw a set of stimuli balanced for blend and definition order.

3.3.2 Participants

80 participants took part in the experiment online through Amazon Mechanical Turk. 8 subjects were excluded from the analysis; 5 people listed languages other than Spanish as their native language in the demographic survey, 1 person gave incoherent answers to the demographic survey suggesting a lack of understanding, 1 person had responses that did not record correctly to the server, and 1 person answered each question identically without any indication of effort. This left data from 72 subjects in the final analysis. Participants were paid $2.00 each.

3.3.3 Results

Upon analyzing the results, one of the blend options for one stimulus was found to have been misspelled. The results for this blend (*hospital* + **telegram**, misspelled as 'hospitel**i**grama' instead of the correct 'hospitel**e**grama' for the blend option preserving more of the second source word) are included in the table of stimuli for reference but excluded from all other analysis.

The responses were coded as either "conforming," which means that they showed evidence for the head faithfulness hypothesis, or "non-conforming," which means they did not support that hypothesis. Participants were coded as "conforming" if they supplied more conforming responses than non-conforming responses. There were originally 11 stimuli to ensure that all participants would fall into one of these two categories. However, because one stimulus had to be removed from the analysis, a small number of participants had equal numbers of conforming and non-conforming stimuli. These participants are listed under the "Tied" column in Example 36.

Example 35 - Conforming vs. non-conforming responses in the headedness experiment

Conforming responses	Non-conforming responses	Total responses
513 (71%)	207 (29%)	720

Example 36 - Conforming vs. non-conforming participants in the headedness experiment

Conforming participants	Non-conforming participants	Tied	Total participants
54 (75%)	13 (18%)	5 (7%)	72

As with the gender experiment, an analysis was done both "by-response" and "by-participant." For the by-response analysis, a mixed logistic regression with random effects for subjects and items, fit with the GLIMMIX procedure in SAS, was used to analyze the data. The results of this analysis can be seen in (37a). The analysis found a significant effect of head faithfulness in the total responses. (37b) details the "by-participant" analysis. Participants with 4 or less head faithful responses were coded as a "0". Participants with 6 or more head faithfulness responses were coded as a "1." Participants whose responses were "tied" were excluded from the by-participant analysis. An exact binomial test was run using R (R Core Team 2015), as in the analysis for the gender experiment. The results for this test show that the number of conforming participants was statistically significantly greater than the number of non-conforming participants.

Example 37 - Headedness experiment results

a. Logistic regression analysis of total responses in headedness experiment

Mean Estimate	Confidence Limits		Standard Error	p
0.7341	0.6548	0.8007	0.1659	<0.001

b. Exact binomial test of all participants in headedness experiment

Head Faithfulness Responses		95% Confidence Interval			
6 or more	4 or less	Min.	Est.	Max.	p
54	13	0.69	0.81	0.89	<0.001

Example 38 - By-blend results of the headedness experiment

#	Blend	Conforming	Non-conforming
1	sepultura + tortuga tomb + turtle	58	14
2	mariposa + pesadilla butterfly + nightmare	57	15
3	vitamina + manzana vitamin + apple	56	16
4	hipopótamo + tomate hippopotamus + tomato	54	18
5	pergamino + monasterio parchment + monastery	53	19
6	ratón + túnel rat + tunnel	50	22
7	pirámide + medicina pyramid + medicine	50	22
8	saxófono + fantasma saxophone + ghost	48	24
9	pimentón + tenedor pepper + fork	44	28
10	chimpangüíno + pingüíno chimpanzee + penguin	43	29
11	hospital + telegrama hospital + telegram	39	33

Example 38 is sorted by how strongly the stimulus conformed with the head faithfulness hypothesis. Blend #1 had the strongest ratio of conforming to non-conforming responses, while Blend #11 had the least strong. It is not clear whether the relatively low number of conforming responses for Blend #11 is a result of the misspelling of one of the blend options or if similar results would have been found regardless of the error. The implications of the results of the headedness experiment will be considered in Chapter 4.

3.3.4 Discussion

The results of the experiments in this thesis show that segmental content from semantic heads is preferentially preserved in blend formation by Spanish speakers, which bolsters the findings of previous experiments (Shaw 2013, Moreton et al. forthcoming). Evidence of semantic heads acting as a strong position in English implied that similar results should be found cross-linguistically. Because Spanish is a language with left-headed blends, it was hypothesized that the strength of the experimental results might differ. Specifically, the greater difference between left- and right-headed blends, in comparison to the difference between right-headed and coordinating blends, was hypothesized to yield a stronger effect in a comparable task. Indeed, the results from the headedness experiment reported in this thesis show a stronger effect than the results from English in Moreton et al. (forthcoming).

English speakers were given right-headed and coordinating definitions to assign to blends, while Spanish speakers were given left-headed and right-headed definitions. As an extension of this experiment, it would be interesting to give Spanish speakers left-headed, right-headed, and coordinating definitions all in the same experiment. If the design forced a choice between left-headed and right-headed definitions in some trials, between left-headed and coordinating definitions in others, and between right-headed and coordinating definitions in still other trials, it would be possible to see if there is a difference in the size of the effect between these tasks when they are performed by the same speaker.

CHAPTER 4: CONCLUSION

This thesis found significant effects of head faithfulness in a novel blend experiment conducted with native speakers of Spanish. No effects of faithfulness to one grammatical gender over the other was found. A blends survey found that gender of a blend is significantly predicted by the gender and inflection of the second source word, and less strongly by the gender of the head. These types of experiments had not been previously run on Spanish or any other language with the characteristics of Spanish: grammatical gender and left-headed blends in addition to right-headed blends. Further studies on positional faithfulness or blend formation, including the attribution of grammatical gender to blends in Spanish, could benefit from these results. The blends corpus is a combination of all sources of Spanish blends that could be found from various sources, and is therefore the largest collection of Spanish blends that I am aware of. This corpus could be further analyzed in a number of ways to learn more about blending as a word formation process and could also be used to create stimuli for new surveys or experiments. The results from the blends survey were only analyzed enough to motivate crucial assumptions for the design of the gender experiment due to time constraints. These results provide another opportunity for further study, as analyzing the interaction of different factors, such as headedness and gender, could yield interesting results, especially in comparison to how these factors behave in Spanish compounds.

What do these results tell us about what it takes for a position to be “strong”? Moreton et al. (forthcoming) interpreted their experimental results as evidence for the existence of universal constraints privileging the faithfulness of nouns, heads, and proper nouns. The results from

Spanish support the claim that a positional faithfulness constraint relativized to heads is available in all languages. Moreton et al. do not, however, make any conclusions regarding the origins of this universal availability. One possibility that is discussed is some sort of semantic salience that heads, nouns, and proper nouns have that non-heads, verbs, and common nouns lack. While the results of the Spanish headedness experiment may not shed much light on this issue, the gender experiment is a more interesting case. Masculine gender was hypothesized to be a strong position, but as the default gender and the less morphologically marked gender it is arguably less semantically salient than feminine.

Following Smith (2011), Moreton et al. (forthcoming) also tried to situate these effects within a hierarchy of phonological privilege for lexical categories: N > A > V, further subdivided into Proper N > Common N > A > V. Moreton et al. suggest that this seems to be a continuum from prototypical rigid designators on the proper noun side to prototypical predicates on the verb side. If a hierarchy of phonological privilege is driving the observed positional faithfulness effects in these blends studies, grammatical gender may not show any positional faithfulness effects regardless of any redesigning of the experiment. It is unclear how to make an argument for one or the other grammatical gender as more of a prototypical rigid designator or more of a prototypical predicate. While a difference in markedness and psycholinguistic salience creates a distinction between masculine and feminine gender in Spanish, the relationship does not seem parallel to the relationships observed between the strong positions previously tested and their corresponding weaker positions. One hope of the gender experiment was that if significant results were found, the characteristics of the "strong" gender could be compared to other "strong" positions to determine what characteristics they all shared. With a design that avoids some of the pitfalls of the present gender experiment, this may still be possible in the future.

APPENDIX A: Stimuli for experiments

(A1) Stimuli for blends survey

Blend	Source Word 1	Source Word 2	Source Word 1 (English)	Source Word 2 (English)	Source Word Gender
afonanza	aforismo	adivinanza	aphorism	riddle	mf
burricicleta	burro	bicicleta	donkey	bicycle	mf
burrocracia	burro	burocracia	donkey	bureaucracy	mf
centrocracia	centro	democracia	center	democracy	mf
credicasa	crédito	casa	credit	house	mf
credimoda	crédito	moda	credit	style, fashion	mf
criticotilleo	crítica	cotilleo	criticism	gossip	fm
dedocracia	dedo	democracia	finger	democracy	mf
demoplagia	democracia	plagio	democracy	plagiarism	fm
desemplearidad	desempleo	seguridad	unemployment	security	mf
diabliposa	diablo	mariposa	devil	butterfly	mf
dibuteca	dibujo	teca	drawing	teak	mf
dictatoriado	dictadura	proletariado	dictatorship	proletariat	fm
dimicese	dimisión	cese	resignation	cessation	fm
estupidiario	estupidez	diario	stupidity	daily newspaper	fm
expoarte	exposición	arte	exposition	art	fm
galiarte	galería	arte	gallery	art	fm
gobiernocracia	gobierno	democracia	government	democracy	mf
interterror	internacional	terror	international	terror	fm
jetabulario	jeta	vocabulario	face	vocabulary	fm
liberchondeo	libertad	cachondeo	liberty	partying	fm
manipuléndum	manipulación	referéndum	manipulation	referendum	fm
merensalsa	merengue	salsa	merengue	salsa	mf
olipasta	oligarca	pasta	oligarchy	pasta	mf
orotelia	oro	filatelia	gold	stamp collecting	mf
pechonalidad	pecho	personalidad	breast	personality	mf
pipicilina	pipi	penecilina	pee	penicillin	mf
pitopausia	pito	menopausia	penis	menopause	mf
plastillera	plástico	arpillera	plastic	sackcloth	mf
protesposter	protesta	póster	protest	poster	fm
publirreportaje	publicidad	reportaje	publicity	report	fm
pupilentes	pupilas	lentes	pupils	lenses	fm
receradio	recetario	radio	cookbook	radio	mf
teleñeco	televisión	muñeco	television	doll	fm
telerendum	televisión	referendum	television	referendum	fm
televicine	televisión	cine	television	cinema	fm

televisano	televisión	castellano	television	Spaniard	fm
universicato	universidad	sindicato	university	union	fm
urnasmo	urna	orgasmo	urn / ballot box	orgasm	fm
veranidad	verano	banalidad	summer	banality	mf

(A2) Stimuli for gender experiment

Blend 1	Blend 2	Source Word 1	Source Word 2
vampirticipante	vamparticipante	vampiro (vampire)	participante (participant)
tomatante	tomutante	tomate (tomato)	mutante (mutant)
ratoniente	rateniente	ratón (mouse)	teniente (lieutenant)
ardorigente	ardirigente	ardor (zeal)	dirigente (leader)
uniformante	unifirmante	uniforme (uniform)	firmante (signatory)
vandalincuente	vandelincuente	vandalismo (vandalism)	delincuente (delinquent)
animalitante	animilitante	animal (animal)	militante (militant)
simposeante	simpaseante	simposio (symposium)	paseante (passerby)
jarabelde	jarebelde	jarabe (cough syrup)	rebelde (rebel)
acantilevidente	acantelevidente	acantilado (cliff)	televidente (television viewer)
volcanvaleciente	volconvaleciente	volcán (volcano)	convaleciente (convalescent person)

(A3) Stimuli for headedness experiment

1	**blend1**	**blend2**	**sw1**	**sw2**
	vitaminzana	vitamanzana	vitamina	manzana
			vitamin	apple
	Definition type	**Definition**		
	Left-headed	algo con sabor a manzana y es una especie de vitamina		
		something with apple flavor and is a type of vitamin		
	Right-headed	una especie de manzana que contiene muchas vitaminas		
		a type of apple that contains many vitamins		
2	**blend1**	**blend2**	**sw1**	**sw2**
	ratónel	ratúnel	ratón	túnel
			mouse	tunnel
	Definition type	**Definition**		
	Left-headed	algo que vive en un túnel y es una especie de ratón		
		something that lives in a tunnel and is a kind of mouse		
	Right-headed	una especie de túnel en que viven los ratones		
		a type of tunnel that mice live in		
3	**blend1**	**blend2**	**sw1**	**sw2**
	sepulturtuga	sepultortuga	sepultura	tortuga
			tomb	turtle
	Definition type	**Definition**		
	Left-headed	hecho para una tortuga y es un tipo de sepultura		
		made for a turtle and is a type of tomb		
	Right-headed	un tipo de tortuga que sólo vive en sepulturas		
		a type of turtle that only lives in tombs		
4	**blend1**	**blend2**	**sw1**	**sw2**
	pimentonedor	pimentenedor	pimentón	tenedor
			pepper	fork
	Definition type	**Definition**		
	Left-headed	algo que tiene la forma de un tenedor y es una especie de pimentón		
		something that is in the shape of a fork and is a type of pepper		
	Right-headed	una especie de tenedor que sólo se use para comer pimentones		
		a type of fork that is only used to eat peppers		

5	**blend1**	**blend2**	**sw1**	**sw2**
	pergaminasterio	pergamonasterio	pergamino	monasterio
			parchment	monastery
	Definition type	**Definition**		
	Left-headed	algo hecho por un monasterio y es un tipo de pergamino		
		something that is made in a monastery and is a type of parchment		
	Right-headed	un tipo de monasterio que hace pergamino		
		a type of monastery that manufactures parchment		
6	**blend1**	**blend2**	**sw1**	**sw2**
	saxofontasma	saxofantasma	saxófono	fantasma
			saxophone	ghost
	Definition type	**Definition**		
	Left-headed	algo que suena a fantasmas y es un tipo de saxófono		
		something that sounds like a ghost and is a type of saxophone		
	Right-headed	un tipo de fantasma que toca el saxófono		
		a type of ghost that plays the saxophone		
7	**blend1**	**blend2**	**sw1**	**sw2**
	hospitalegrama	hospitelegrama	hospital	telegrama
			hospital	telegram
	Definition type	**Definition**		
	Left-headed	algo que envia telegramas y es un tipo de hospital		
		something that sends telegrams and is a type of hospital		
	Right-headed	un tipo de telegrama y es enviado por un hospital		
		a type of telegram and is sent by a hospital		
8	**blend1**	**blend2**	**sw1**	**sw2**
	piramidicina	piramedicina	pirámide	medicina
			pyramid	medicine
	Definition type	**Definition**		
	Left-headed	donde los egipcios ejercían la medicina y es un tipo de pirámide		
		where the Egyptians practiced medicine and is a type of pyramid		
	Right-headed	un tipo de medicina y tiene la forma de una pirámide		
		a type of medicine and is in the shape of a pyramid		

9	**blend1**	**blend2**	**sw1**	**sw2**
	hipopotamate	hipopotomate	hipopótamo	tomate
			hippopotamus	tomato
	Definition type	**Definition**		
	Left-headed	algo que sólo come tomates y es un especie de hipopótamo		
		something that only eats tomatoes and is a type of hippopotamus		
	Right-headed	un tipo de tomate que sólo los hipopótamos comen		
		a type of tomato that is only eaten by hippopotamuses		
10	**blend1**	**blend2**	**sw1**	**sw2**
	mariposadilla	maripesadilla	mariposa	pesadilla
			butterfly	nightmare
	Definition type	**Definition**		
	Left-headed	visto sólo en las pesadillas y es un tipo de mariposa		
		seen only in nightmares and is a type of butterfly		
	Right-headed	un tipo de pesadilla y tiene que ver con mariposas		
		a type of nightmare and has to do with butterflies		
11	**blend1**	**blend2**	**sw1**	**sw2**
	chimpangüíno	chimpingüíno	chimpancé	pingüíno
			chimpanzee	penguin
	Definition type	**Definition**		
	Left-headed	algo que caza pingüínos y es una especie de chimpancé		
		something that hunts penguins and is a type of chimpanzee		
	Right-headed	una especie de pingüíno que los chimpances cazan		
		a type of penguin and is hunted by chimpanzees		

APPENDIX B: Sample stimulus pages

Figure B.1: Example stimulus page for the blends survey

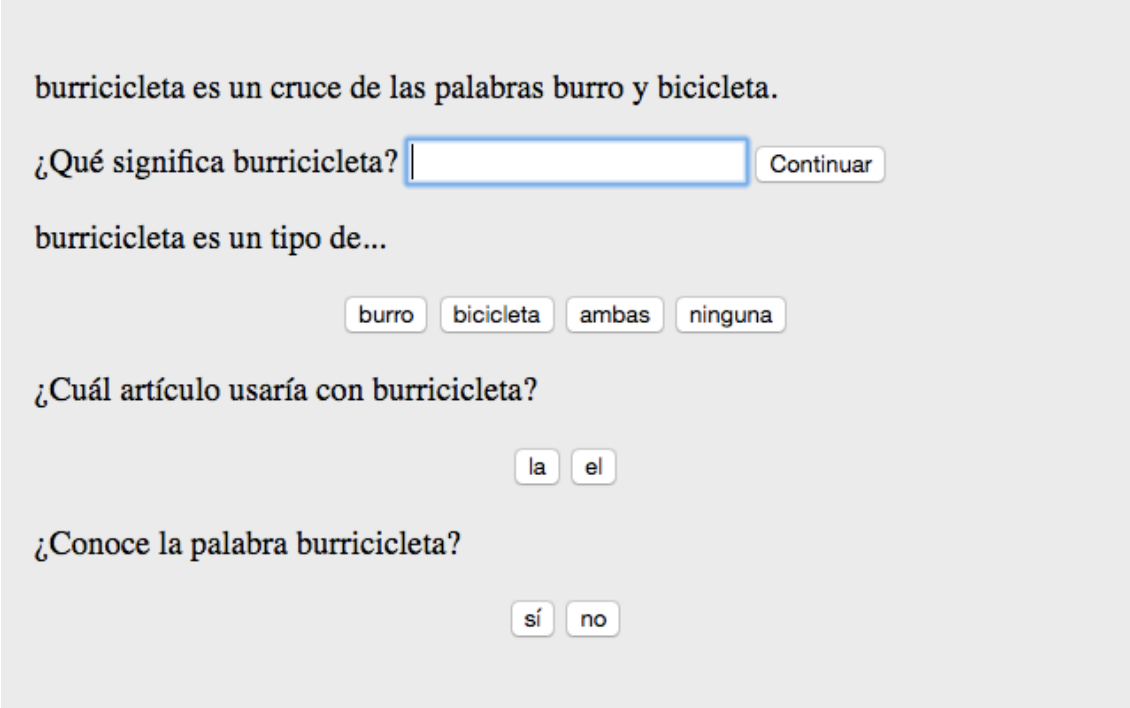


Figure B.2: Example stimulus page for the gender experiment

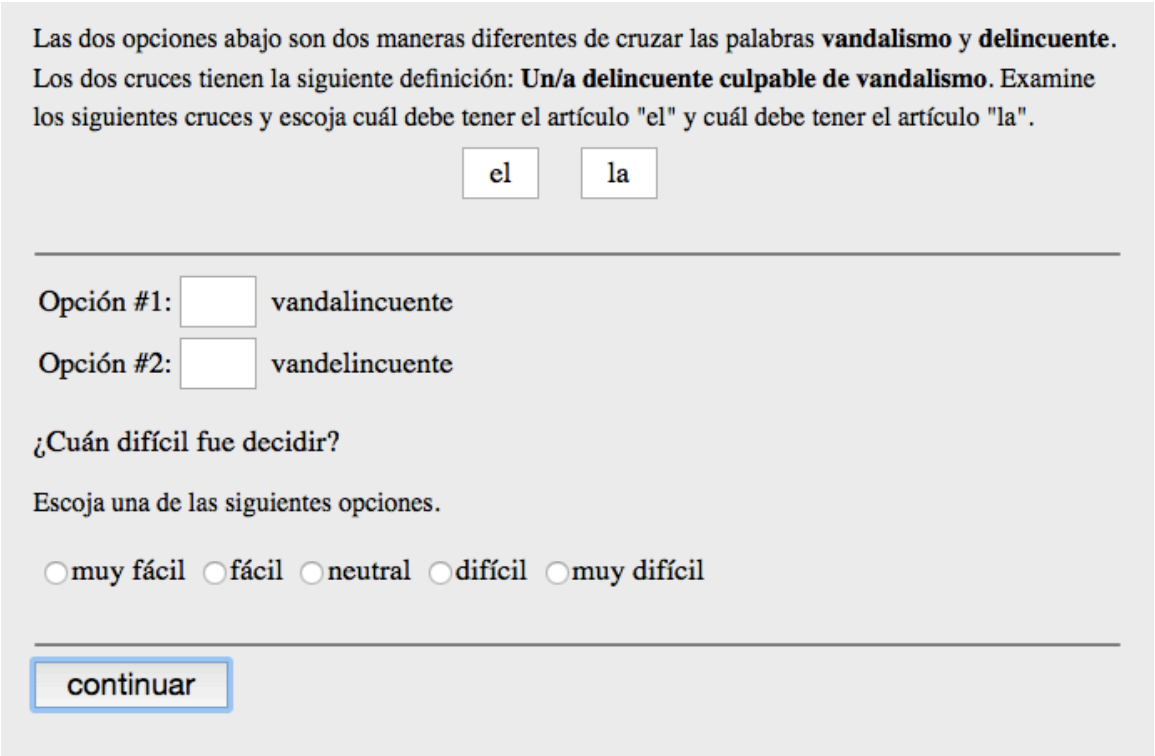
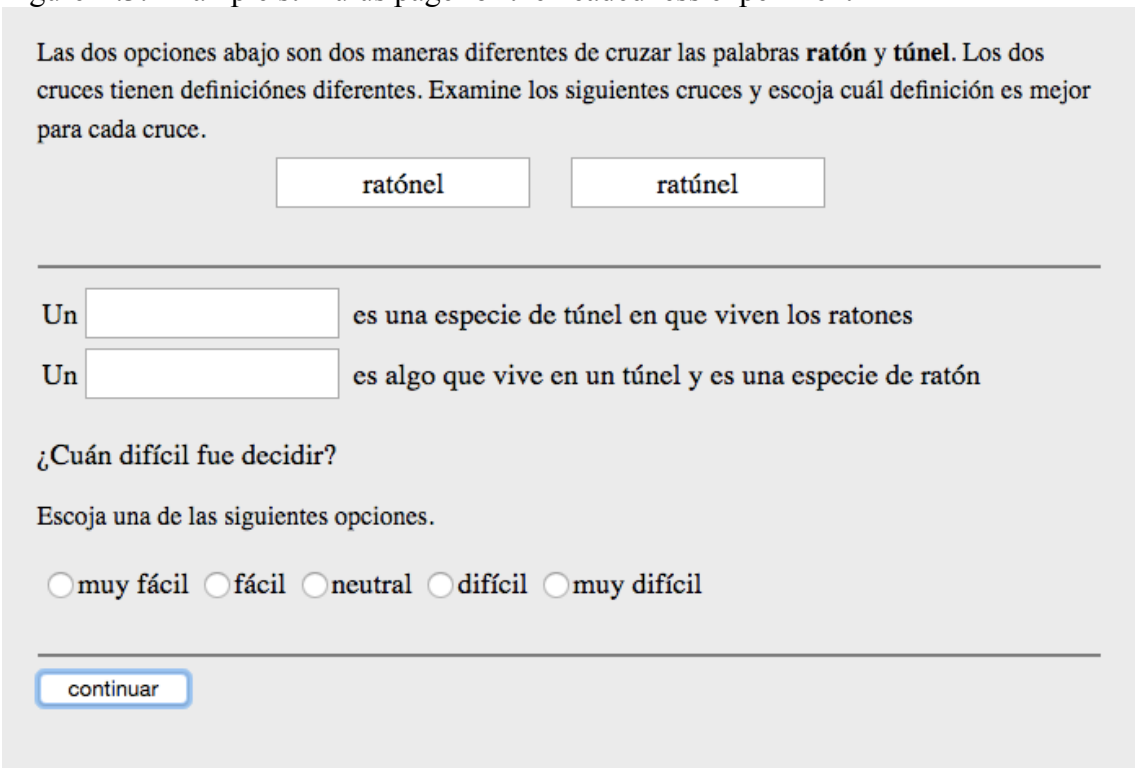


Figure B.3: Example stimulus page for the headedness experiment



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