The Representation of Asymmetric Grammatical Gender Systems in the Bilingual Mental Lexicon

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Previous research has led to conflicting notions of the representation of L1 and L2 grammatical gender systems in the mental lexicon: under the *gender-integrated representation hypothesis* (Salamoura & Williams, 2007) the L1 and L2 gender nodes are shared, while nodes are language-specific in the *gender autonomous representation hypothesis* (Costa et al, 2003). We address this debate, extending this research to L1 and L2 systems mismatched in number of gender classes. L1 Spanish-L2 German speakers performed an L2 picture-naming task in which gender congruency (congruent, incongruent and neuter) between L1 and L2 nouns was manipulated. Latencies were shorter for gender-congruent than gender-incongruent nouns, and latencies for neuter nouns were also shorter than gender-incongruent ones. These gender congruency effects support the *gender-integrated representation hypothesis* and indicate a unique representation of the gender not present in the L1 which interferes with the response significantly less than when the incongruency is between genders present in both languages.

1. Introduction[1]

The aim of this study is to investigate the representation of grammatical gender in the bilingual mental lexicon. While a significant body of research has informed the structure of the bilingual lexicon through L1-L2 interactions at the conceptual (Kroll & Stewart, 1994; Green, 1998; Kroll & Tokowicz, 2005) and lexical levels (De Groot & Nas, 1991; Costa et al, 2000; Vigliocco et al, 2002; Gollan & Acenas, 2004; Salamoura & Williams, 2007; Lemhöfer et al, 2008), interactions between L1 and L2 features, such as grammatical gender, have not yet been fully explored.

Grammatical gender is a unique lexical-syntactic feature present in some languages that is not deducible from the meaning of the noun (Corbett, 1991). This feature serves to classify the nouns of the language into two or more gender classes and is integral in computing agreement. Gender is of particular interest in L2 studies given the difficulty that correct L2 noun classification and implementation of agreement in the L2 presents for the learner. This is evidenced in the variability in gender agreement that often characterizes L2 production, even in highly proficient adult L2 speakers (Franceschina, 2005; Alarcón, 2011; Grüter et al, 2012).

In this study, the L1 and L2 grammatical gender information structure in the bilingual lexicon is investigated in Spanish-German bilinguals through an L2 picture-naming paradigm. Spanish and German differ in number of gender classes (Spanish: two classes; German: three classes) and as such an additional area of interest in this study is the representation of neuter, the German gender class that does not have an equivalent in Spanish. Representational information for languages which have asymmetric gender systems will provide a more rounded picture of L1-L2 interactions in the lexicon and is

[1] We would like to thank three anonymous reviewers for their invaluable comments on a previous version of this manuscript. We also wish to thank the students at the *Escuela Oficial de Idiomas de Valladolid*, the *Centro de Idiomas* at the *Universidad de Valladolid* and the *Bergische Universität Wuppertal* who participated in this study as well as the professors who made the data collection possible.

undoubtedly relevant to L2 research as many bilinguals' languages are not matched in number of gender classes.

2. Grammatical Gender in Spanish and German

2.1. Spanish

Spanish has two gender classes: masculine and feminine. Gender assignment in inanimate nouns is arbitrary as there is no discernible link between gender class assignment and meaning (Corbett, 1991; Harris, 1991). Approximately 52% of nouns in Spanish are masculine and 45% feminine[2] (Bull, 1965). Gender marking in Spanish is also phonologically very regular, with the word ending *–o* corresponding to masculine gender 99.89% of the time and the ending *–a* corresponding to feminine 96.3% of the time (Teschner, 1987).

2.2. German

Unlike Spanish, German has a tripartite gender system comprised of masculine, feminine and neuter. In German, approximately 50% of nouns are masculine, 30% feminine and 20% are neuter (Bauch, 1971). It is generally agreed that semantic, morphological and phonological factors contribute to gender assignment in German (Corbett, 1991). While many proposals have been made for the link between these factors and gender class, the gender marking rules are very complex and not without a significant number of exceptions (see for instance Köpcke, 1982; Mills, 1986).

3. Previous Research

The representation of L1 and L2 grammatical gender in the mental lexicon has been the focus of many studies and continues to be investigated today. Many different accounts have informed the nature of the L2 grammatical gender system including processing accounts, code-switching restraints and error

[2] The 3% discrepancy is accounted for by remaining nouns which can be used either as masculine or feminine (Clegg, 2010).

analyses (see for instance Hopp (2013), Liceras et al (2008) and Franceschina (2005). Research in speech production has provided particular insight into the mental representation of the grammatical gender system, and as such, will be the focus of the present study.

3.1. Lexical access in speech production

The architecture of the bilingual mental lexicon and the representation of multiple grammatical gender systems continue to be relatively unclear with numerous models proposed to account for differing experimental results.

Most models assume that the bilingual's languages interact and therefore L2 processing is affected by the L1 (Kroll & Stewart, 1994; Hermans et al, 1998; Dijkstra, 2005; Colomé & Miozzo, 2010; among many others). There is extensive empirical evidence of interactions between the L1 and the L2 both at the conceptual and at the lexical level (Potter et al, 1984; Schwanenflugel & Rey, 1986; Kroll & Stewart, 1994; Hermans et al, 1998; Lee & Williams, 2001; La Heij et al, 1996; Dijkstra & Van Heuven, 2002; etc). Conceptual interactions have been repeatedly shown through the picture-word interference paradigm in the so-called *semantic interference effect* in which bilinguals are slower to produce words when the distractor word in one language is semantically related to the word they must produce in the other language (Costa et al, 1999a; Costa & Caramazza, 1999; Vigliocco et al, 2002; Costa et al, 2005).

Further investigation into the conceptual links between the L1 and the L2 has led to the current assumption that bilinguals have a shared semantic system in which both languages are activated in parallel (Kroll & Stewart, 1994; Green, 1998; Costa et al, 2003; Kroll & Tokowicz, 2005). Lexical interactions, on the other hand, are apparent in the well-documented *cognate facilitation effect* in which cognates in the bilingual's languages are named more quickly than translation equivalent nouns not related in form (De Groot & Nas, 1991; Costa et al, 2000; Vigliocco et al, 2002; Gollan & Acenas, 2004; Salamoura & Williams, 2007; Lemhöfer et al, 2008).

While previous research has shed much light on the nature of the L1 and L2 interactions at the conceptual and lexical levels, how features like grammatical gender interact between the bilingual's languages is not yet clear. There are essentially two possibilities: 1) that the grammatical gender systems of each language interact, much like what has been shown for the bilingual's semantic system, or 2) the gender systems do not interact at all because it is illogical that a bilingual would treat grammatical properties from different languages as a single shared property.

These possibilities have given rise to two hypotheses regarding the representation of grammatical gender in the bilingual mental lexicon. The *gender-integrated representation hypothesis* (Salamoura & Williams, 2007) posits that the L1 and the L2 have a grammatical gender system that is shared between the two languages. According to this hypothesis, L1 and L2 lexical items activate shared gender nodes such that L1 and L2 words that share the same gender activate the same gender node. L1 and L2 words of different genders activate different nodes; however, the nodes are still common to both languages (Figure 1). In contrast, the *gender autonomous representation hypothesis* (Costa et al, 2003) maintains that the L1 and L2 gender systems are entirely independent and therefore L1 lexical activation results in the activation of gender nodes specific to the L1 whereas L2 lexical activation activates the L2 gender nodes (Figure 2).

In monolingual speech production, prominent models converge on the representation and selection of grammatical gender. In spite of their significant differences, according to both the WEAVER++ (Roelofs, 1992; Levelt et al, 1999) and the Independent Network (Caramazza, 1997) models, gender is represented as a feature node that is linked to the lexical representation of the word form. Each gender present in the L1 has its own node to which all nouns classified as that gender are linked (e.g. all feminine nouns are linked to the feminine gender node). While the requirements for the activation of the gender node differs between models, both models posit that selection of the gender node is only necessary (and indeed only occurs) in contexts in which gender information is required for agreement.

3.2. Gender congruency effect

3.2.1.Monolingual studies

One of the ways the representation of grammatical gender in the mental lexicon is evidenced is in the interaction between words belonging to the same language (in the case of monolinguals) and between a word in one language and a word from the other (in bilinguals). It is widely held that words compete for selection in speech production (Finkbeiner et al, 2006). While many words may receive activation based on their features or meaning, one word will eventually receive more activation than the others and that is the word that is selected. Given that word selection is a competitive process, it follows that increased activation of the same or of different gender nodes will affect the selection process of the target word.

Schriefers (1993) first reported an effect of gender in L1 Dutch speakers performing a picture-word interference task. In this experimental paradigm, pictures are presented with a distractor word and participants are asked to name the pictures while disregarding the distractors. The gender of the target-distractor pairs is manipulated such that words with the same gender (gender congruent) and words of different genders (gender incongruent) are compared. Schriefers found that naming latencies were significantly shorter with gender congruent distractors than with gender incongruent ones.

These initial findings gave rise to the term *gender congruency effect* which has since been illustrated in many studies of both monolinguals and bilinguals. This effect is measured by comparing naming latencies between gender congruent (L1-L1 or L1-L2) stimuli and gender incongruent stimuli. As first illustrated by Schriefers (1993), in monolingual studies an interaction within the L1 gender system is evident in shorter naming latencies for stimuli in which the target and distractor nouns have the same gender. In this case, gender congruency facilitates lexical selection by the increasing the activation of the gender feature shared by both the target and the distractor nouns thus enabling faster selection of the target word. Similarly, in bilingual studies an interaction between the L1 and L2 gender systems is assumed when naming latencies are shorter given stimuli in which the target L2 noun has the same gender as the translation equivalent noun in the L1. Here there is a facilitation effect in the lexical selection process due to both the L1 and L2 words activating the same gender node which is shared between the L1 and the L2.

While gender congruency effects are often reported, when they appear seems to vary based on the production context (bare noun versus noun phrase) and on language typology. In monolingual studies, the picture-word interference paradigm has revealed shorter naming latencies in NP production when the target word and the distractor word have the same gender in Dutch (Schriefers, 1993; Schiller & Caramazza, 2003), German (Schriefers & Teruel, 2000; Schiller & Caramazza, 2003) and Czech (Bordag & Pechmann, 2008). Contrary to these findings, no effect of gender congruency in NP naming has been observed in French (Alario & Caramazza, 2002), Italian (Miozzo & Caramazza, 1999), Catalan (Costa et al, 1999b) or Spanish (Costa et al, 1999b). The reverse pattern has been shown in bare noun production, however no gender congruency effect has been reported in languages such as Dutch (Starreveld & La Heij, 2004).

These variable results with regards to gender effects in bare noun and NP production have led to different accounts of the representation and selection of grammatical gender in the mental lexicon. Paolieri et al (2010) have summarized these contrastive accounts under the *syntactic hypothesis* and the *lexical hypothesis*. According to the *syntactic hypothesis*, gender is a node linked to the lexical representation of a word that is only selected in NP production and therefore no gender effect would be observed in bare noun production. Both the WEAVER++ and the IN speech production models maintain that the gender feature is only selected in contexts requiring the computation of agreement and therefore cannot account for gender effects in bare noun naming (Caramazza & Miozzo, 1997; Levelt et al, 1999). The *lexical hypothesis*, on the other hand, posits that grammatical gender is an intrinsic part of the lexical representation and therefore gender information is always available upon noun retrieval (Cubelli et al, 2005; Paolieri et al, 2011). Under this hypothesis, effects of gender would be evident in both NP and bare noun production.

3.2.2. Bilingual studies

In bilingual studies, the L2 picture-naming paradigm has shown gender congruency effects in both NP and bare noun production in Czech-German bilinguals (Bordag, 2004; Bordag & Pechmann, 2007), German-Czech bilinguals (Bordag, 2004), German-Dutch bilinguals (Lemhöfer et al, 2008), and Italian-Spanish bilinguals (Paolieri et al, 2010). These results support the *gender-integrated representation hypothesis* (Salamoura & Williams, 2007), according to which the naming response is facilitated when the

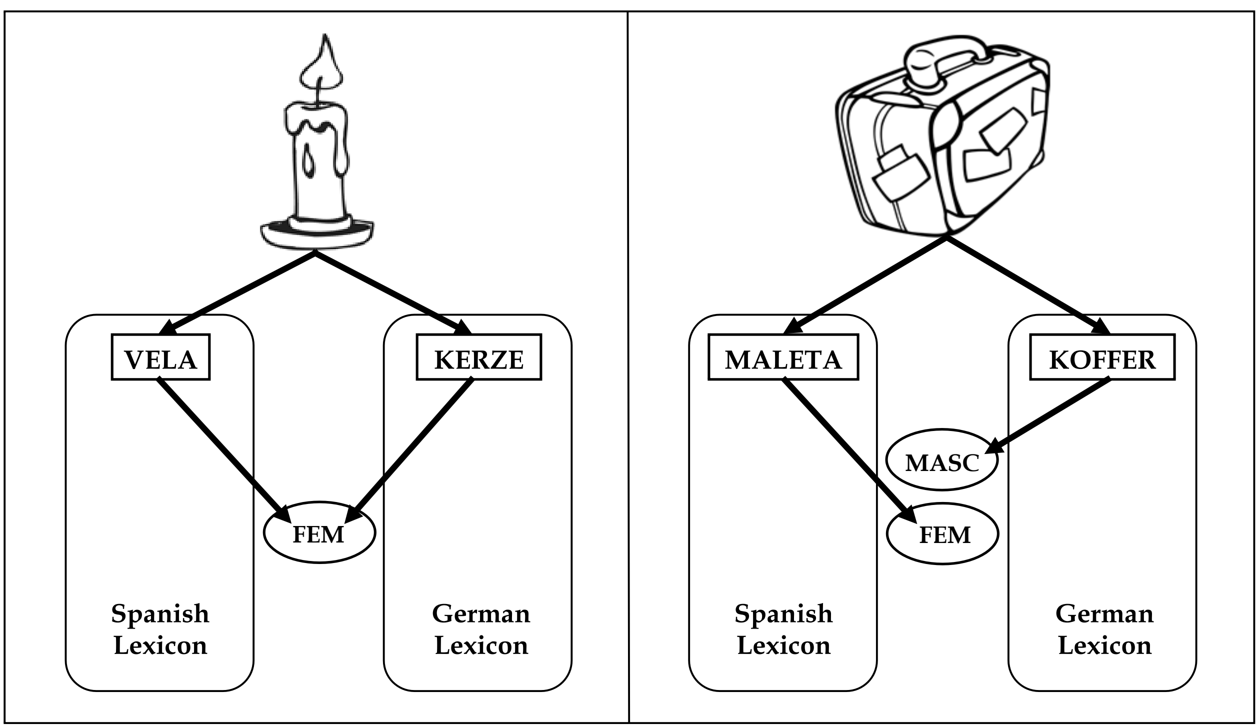

Figure 1. Gender-integrated representation hypothesis for L1-L2 gender congruent nouns (left) and L1-L2 gender incongruent nouns (right) (adapted from Costa et al, 2003).

L1 translation equivalent noun and the L2 target word have the same gender but is inhibited when the L1 and L2 equivalent words have different genders (Figure 1).

In contrast, no gender effect has been reported in NP production[3] for Croatian-Italian bilinguals, Spanish-Catalan and Catalan-Spanish bilinguals or Italian-French bilinguals (Costa et al, 2003)[4], lending evidence for the *gender autonomous representation hypothesis* (Costa et al, 2003) under which the gender nodes are specific to each language and therefore no facilitation or interference due to the activation of the L1 gender nodes would be expected (Figure 2).

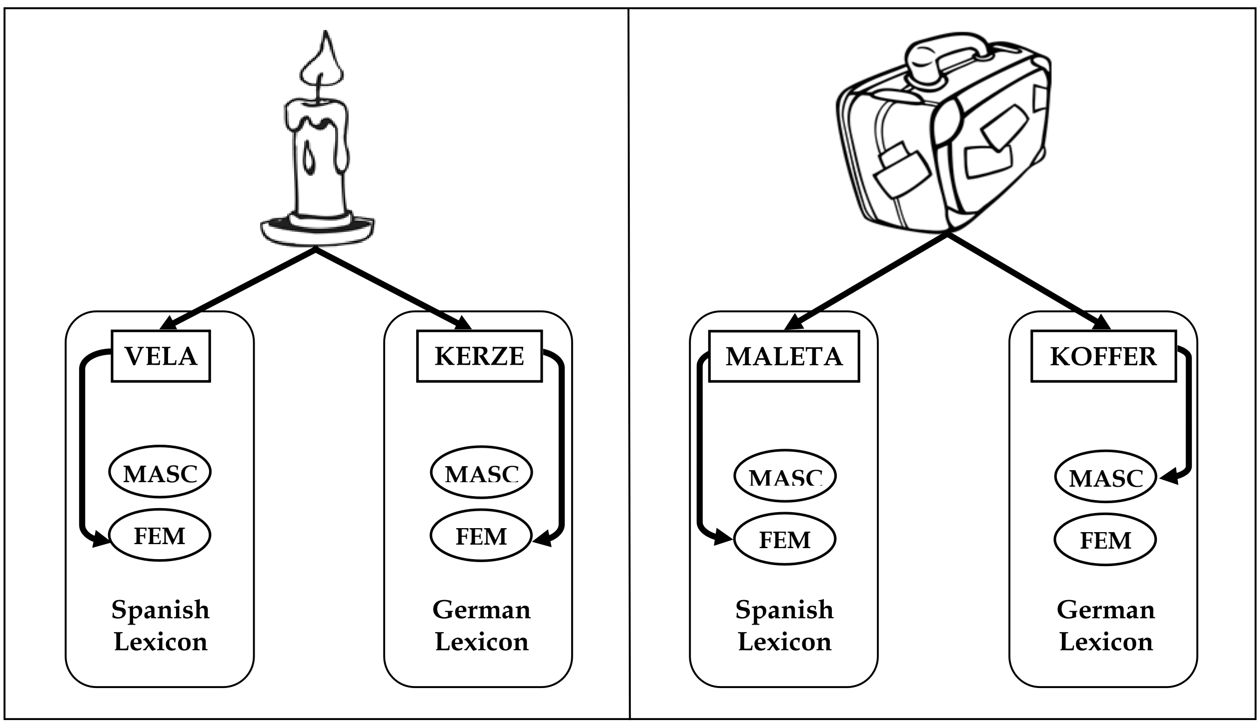

Figure 2. Gender autonomous representation hypothesis for L1-L2 gender congruent nouns (left) and L1-L2 gender incongruent nouns (right) (adapted from Costa et al, 2003).

The previous findings in bilingual studies are inconclusive with regard to the representation of multiple gender systems. Additionally, existing research has focused almost exclusively on the representation of

[3] Bare noun production was not tested in this series of experiments.

[4] All of these experiments have focused exclusively on languages that have the same number of gender classes. While Croatian has a three-class gender system, neuter nouns were not included in this study.

symmetric grammatical gender systems, providing no information regarding the representation of L2 gender classes not present in the L1.

The present study addresses these limitations by bringing to light further research on the representation of gender systems as well as providing new insight into the representation of gender systems that are mismatched in number of gender classes (Spanish: two classes; German: three classes). Given the significant body of evidence (Bordag, 2004; Bordag & Pechmann, 2007; Lemhöfer et al, 2008; Paolieri et al, 2010) in support of the *gender-integrated representation hypothesis* (Salamoura & Williams, 2007), it is predicted that the L1 and L2 gender systems of Spanish-German bilinguals are represented as shared gender nodes. The shared representation of the bilinguals' gender systems would be evident in the presence of a gender congruency effect in which L1-L2 gender congruent nouns are named more quickly than L1-L2 gender incongruent ones. It is also predicted that this effect of gender congruency will be present in both bare noun and Determiner Phrase (DP) naming, thus supporting the lexical hypothesis according to which gender information is always available upon noun retrieval (Cubelli et al, 2005; Paolieri et al, 2010). As the gender not present in the bilinguals' L1, it is anticipated that neuter does not have the same representation as masculine and feminine, and thus naming latencies in the neuter condition are not expected to pattern like those in the gender-congruent or gender-incongruent conditions.

4. Method

4.1. Participants

The main experimental group consisted of 19 L1 Spanish-L2 German bilinguals (mean age=39.9, SD=13.7) recruited from intermediate German language courses in Valladolid, Spain. Mean proficiency in German, as measured by the proficiency test of the Goethe-Institut (2010), was 53.7% (SD=3.5). Two participants had to be excluded due to technical failures and misinterpreted instructions. An additional group of 25 L1 German speakers (mean age=27.9, SD=8.1) recruited in Wuppertal, Germany served as the control group in this study. All participants had normal or corrected-to-normal vision.[5]

4.2. Materials

Black-and-white line drawings were selected from the picture stimuli of Costa et al (2003) and additional pictures were added from a copyright-free clipart subscription service. A total of 78 pictures depicting high-frequency inanimate concrete nouns were selected: 60 experimental stimuli as well as 6 warm-up and 12 practice stimuli.

Grammatical gender congruency between the Spanish and German nouns was manipulated to create three main conditions: gender-congruent nouns, gender-incongruent nouns, and neuter nouns. While all neuter nouns are by definition gender incongruent due to the lack of neuter in Spanish, nouns that were gender incongruent due to a mismatch in the gender systems between the two languages were considered separately from masculine-feminine and feminine-masculine mismatches.

Nouns were matched as closely as possible for frequency in German and Spanish using *CELEX* (Baayen et al, 1995) and *LEXESP* (Sebastian & Martí, 2000), respectively. Noun frequency (Table 1) did not differ significantly by condition ($F(2,110)=1.714$, $p=.185$) or by language ($F(1,110)=.032$, $p=.858$).

Table 1

Mean log frequency by language and condition

	congruent nouns	incongruent nouns	neuter nouns
German	1.6 (.38)	1.4 (.65)	1.6 (.52)
Spanish	1.6 (.38)	1.4 (.50)	1.5 (.53)

Standard deviations appear in parentheses.

[5] While there is a large difference in mean age between the experimental and control groups, including age as a covariate in the analyses does not change the pattern of results.

Word ending was also taken into consideration for the Spanish nouns, and only canonical word endings were included (masculine: *-o*, feminine: *-a*). Word ending was not as strictly controlled in German as there are very few strategies L2 learners would be able to adopt to reliably deduce grammatical gender from the word form in German given the significant exceptions in the theories on patterns of word ending and gender in German. No cognates between Spanish and German were included due to the previously found facilitation effect in naming latencies for cognates over translation equivalent nouns that do not overlap in form.

4.3. Design

The main task consisted of a total of 132 experimental trials that were presented in four blocks, each comprised of 3 warm-up stimuli and 30 experimental stimuli. Written instructions in German were presented at the beginning of each block. Each stimulus was presented twice, once in the bare noun naming condition and once in the DP naming condition. The naming conditions alternated between blocks to prevent the participant from anticipating the response and starting to produce the initial phoneme prior to having retrieved the word. This was of particular importance in the DP naming condition as all nominative definite determiners in German start with the same initial phoneme /d/ (der_{M}, die_{F}, das_{N}). Stimuli with some degree of phonological or semantic relationship were assigned to different blocks. Within each block, stimuli were randomized by the presentation software according to the constraint that stimuli from the same congruency condition could appear in no more than three consecutive trials. Four lists were created in order to fully counterbalance the stimuli presentation order across participants. Additionally, there was a practice session consisting of 12 trials prior to the start of the naming task to familiarize the participants with the task.

5. Procedure

Participants were tested individually in an experimental session lasting approximately 60 minutes. They received no remuneration for their participation in the study but were offered a participation certificate as a token of appreciation for their collaboration.

Participants performed an L2 picture-naming task in which they were asked to name each black-and-white line drawing in German as quickly and as accurately as possible. Participants produced either the corresponding bare noun or the definite determiner (in nominative case) and the noun (DP).

Prior to the main experimental task, participants were familiarized with the picture stimuli and the target German nouns. To this end, they received a booklet in which each picture appeared with the target noun written beneath it. Participants were asked to inform the principal investigator of any nouns they were not already familiar with in order to eliminate any nouns not previously known to the participants from the data analysis.

The stimuli were presented on a 17" monitor using *Experiment Builder*, the stimuli presentation software of SR Research. The black-and-white line drawings (each approximately 6 x 6 cm) were centred at fixation on a white screen. Screens prior to the presentation of each stimulus were also white with a fixation cross centered in the middle of the screen and a small black rectangle in the lower right hand corner. This black rectangle was not visible to the participants and allowed for the precise marking of the onset of each picture stimulus. Picture onsets were recorded as changes in frequency (representing the contrast between the white screen and the black rectangle presented on the fixation screen) by a photodiode in a small, custom-designed electronic device attached to the lower right hand corner of the computer screen. The electronic device recorded the participants' verbal responses on one audio channel and the signal from the photodiode on the other audio channel. A custom computer program was used to calculate the latency between the onset of the stimulus and the participants' response so as to create a significantly more accurate version of the current standard voice keys.

Each trial consisted of a fixation cross screen (500 ms) followed by a screen presenting the stimulus which remained until the participant responded or for a maximum of 3,000 ms. While a traditional voice key was not used to measure the naming latencies, one was employed during the course of the experiment in order to detect the participants' responses and advance to the next trial.

Following the L2 picture-naming task, the Spanish-German bilinguals were asked to indicate the corresponding definite determiner and noun (DP) for each picture stimuli in Spanish (effectively an offline L1 picture-naming task). This was done to ensure that the participants were activating the anticipated nouns (and therefore the corresponding anticipated genders). The bilinguals also completed a German proficiency test and all participants completed a language background questionnaire.

6. Results

6.1. Data

Audio files were normalized and denoised using a band pass filter (20 Hz to 20 kHz) and a custom program calculated the naming latencies from the onset of each stimulus (as marked by signal from the photodiode recorded on one audio channel) to the onset of the response (recorded on the other audio channel and marked using a threshold of .05). The following types of responses were coded as errors and thus excluded from the analyses: a) naming errors; b) verbal dysfluencies; c) unfamiliar L2 words and stimuli for which unanticipated L1 names were provided in the post-task; d) responses shorter than 300 ms. Responses exceeding 3 SD of the participants' mean by task were centered within 3 SD of the mean (less than 2% of the data for each group underwent this procedure).

6.2. Analyses

Repeated-measures analyses of variance were run on naming latencies as well as error rates, and on participant and items means (F_1 and F_2 statistics, respectively). The factors were Congruency (congruent vs incongruent vs neuter), Phrase Type (bare noun vs DP) and Native Language (L1 Spanish vs L1 German). In the analyses by participants, Congruency and Phrase Type were within-subjects factors and Native Language a between-subjects factor, while in the analyses by items, Phrase Type and Native Language were within-items factors and Congruency a between-items factor. Mean naming latencies and error rates are reported in Table 2 and naming latencies are also presented in Figure 3.

Table 2

Mean naming latencies (ms) and error rates (%) for all gender conditions

	L1 Spanish – L2 German				**L1 German**			
Gender Condition	*Bare Noun*	*E%*	*DP*	*E%*	*Bare Noun*	*E%*	*DP*	*E%*
congruent	1095 (206)	25.6 (7.8)	1147 (191)	28.4 (10.4)	752 (100)	9.4 (7.8)	749 (108)	9.2 (6.4)
incongruent	1139 (180)	32.9 (19.7)	1174 (177)	43.6 (17.0)	766 (95)	8.7 (7.8)	776 (111)	9.8 (7.4)
neuter	1063 (145)	33.9 (10.1)	1074 (134)	28.3 (12.8)	763 (98)	7.2 (7.0)	768 (106)	6.3 (6.3)
gender effect (cong-incong)	-44*		-27*					
gender effect (neut-incong)	-76*		-100*					
gender effect (neut-cong)	-32		-73					

Note: Standard deviations appear in parentheses. Significant gender effects (p< .05) are marked with an asterisk.

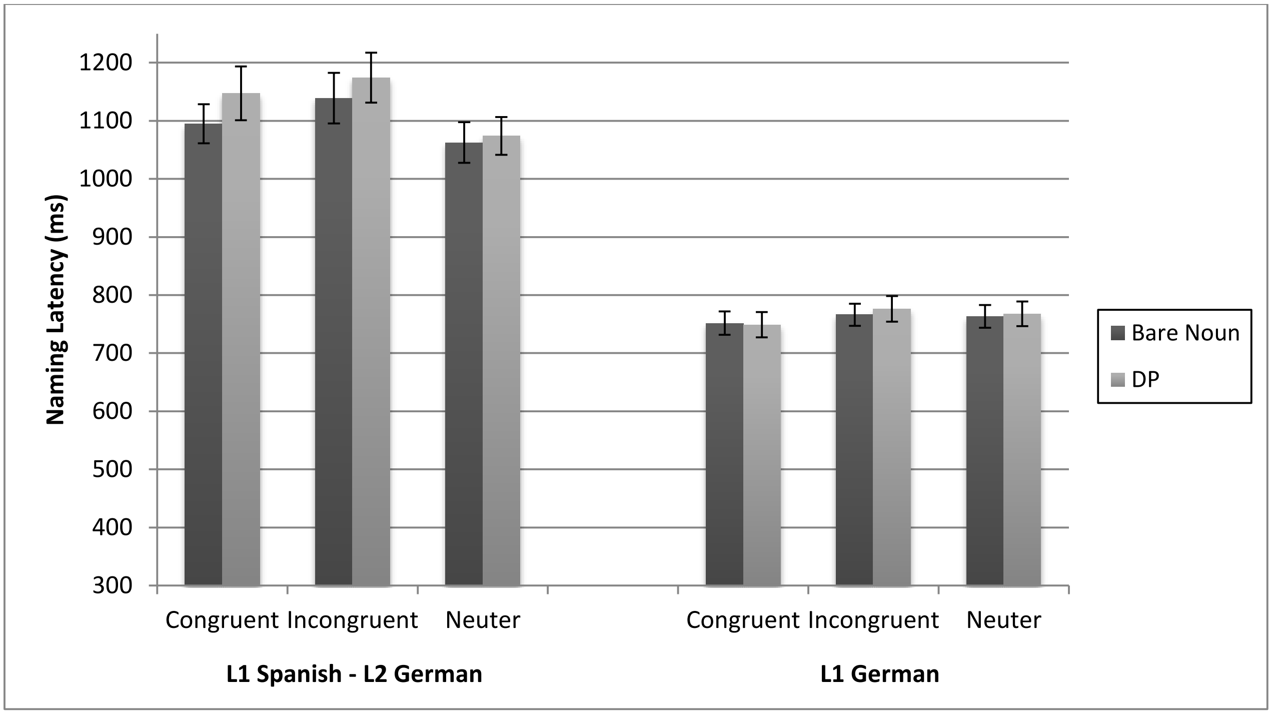

Figure 3. L1 Spanish-L2 German and L1 German mean naming latencies.

6.3. Naming latencies

Results of the ANOVAs on naming latencies showed a main effect of Native Language ($F_1(1,40)=101.968$, $p<.001$, E=.718; $F_2(1,57)=599.39$, $p<.001$, E=.913), indicating that the naming latencies were significantly shorter in the control group than in the experimental group. Congruency was also significant by participants ($F_1(2,39)=8.946$, $p=.001$, E=.314) but not by items ($F_2(2,57)=2.038$, $p=.140$), and this effect was further qualified by the significant interaction between Congruency and Native Language ($F_1(2,39)=7.542$, $p=.002$, E=.279; $F_2(2,57)=3.145$, $p=.051$, E=.099) which was significant in the experimental group ($F_1(2,39)=14.395$, $p<.001$, E=.425) but not the control group ($F_1(2,39)=1.143$, $p=.329$). In the experimental group, latencies were significantly shorter for congruent than incongruent nouns ($p<.001$), and were also significantly shorter for neuter nouns than incongruent ones ($p<.001$). There was no significant effect of Phrase Type ($F_1(1,40)=3.599$, $p=.065$; $F_2(1,57)=.705$, $p=.404$), and thus naming latencies did not differ significantly between naming conditions.

6.4. *Error rates*

In the statistical analysis of error rates Native Language was significant ($F_1(1,40)=148.986$, $p<.001$, E=.788; $F_2(1,57)=128.334$, $p<.001$, E=.692), indicating that the control group made significantly fewer naming errors than the experimental group. There was also a main effect of Congruency, which was significant by participants ($F_1(2,39)=7.696$, $p=.002$, E=.283) but not by items ($F_2(2,57)=.945$, $p=.395$). This effect interacted significantly with Native Language ($F_1(2,39)=6.707$, $p=.003$, E=.256; $F_2(2,57)=2.357$, $p=.104$), and revealed that Congruency was significant in the experimental group ($F_1(2,39)=11.170$, $p<.001$, E=.364) but not the control group ($F_1(2,39)=11.170$, $p=.267$). In the experimental group error rates were significantly lower for congruent than incongruent nouns ($p<.001$) and for neuter nouns than incongruent ones ($p=.003$). There was no significant effect of Phrase Type ($F_1(1,40)=1.681$, $p=.202$; $F_2(1,57)=.710$, $p=.403$).

7. Discussion

The results show that gender congruency between the L1 and L2 nouns significantly affects naming latencies, an effect which is significant in both bare noun and DP production. The shorter naming latencies for gender-congruent than gender-incongruent nouns is consistent with a significant body of previous research in bilinguals with symmetric gender systems (Paolieri et al, 2010; Morales et al, 2011; Lemhöfer et al, 2008; Bordag, 2004; Bordag & Pechmann, 2007) and supports the *gender-integrated representation hypothesis* (Salamoura & Williams, 2007). Under this representation account, in the case of L1-L2 gender congruent nouns, the L2 word receives additional activation from the shared gender node given that it is activated by both the L1 and L2 words. This increased activation of the same shared gender node facilitates the naming response. In the case of L1-L2 gender incongruent nouns, however, the shared gender nodes inhibit the response as the L1 and L2 words activate different gender nodes which then interfere with the response (Figure 4).

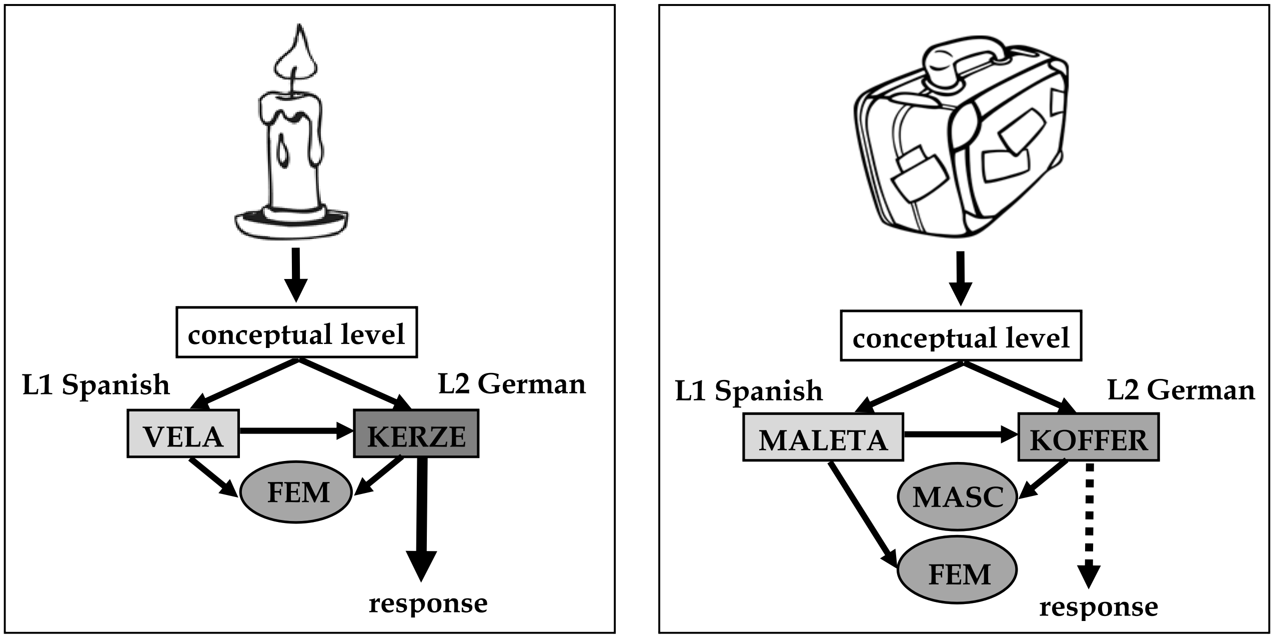

Figure 4. Activation scheme for gender-congruent (left) and gender-incongruent (right) nouns, according to the gender-integrated representation hypothesis.

With regards to neuter, the naming latencies were significantly shorter for L2 neuter nouns than L2 gender-incongruent nouns that were masculine or feminine. Error rates were also significantly lower for neuter nouns than gender-incongruent ones. These findings are of particular interest given that both the gender-incongruent and neuter conditions are, by definition, L1-L2 gender incongruent; the important distinction being that neuter is a gender present only in the L2. Both shorter naming latencies and lower error rates for neuter nouns suggest that the gender node without equivalent in the L1 is encoded separately from the masculine and feminine shared gender nodes and that this separate representation is not subject to interference from the activation of the masculine and feminine shared gender nodes (Figure 5).

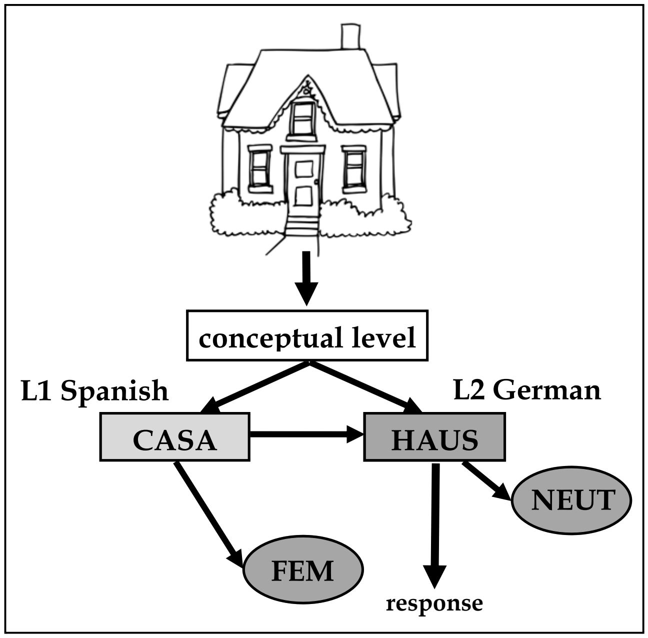

Figure 5. Activation scheme for neuter nouns.

The effect of L1-L2 gender congruency in both the bare noun and DP naming conditions indicates that that gender information is always available in lexical access, regardless of whether gender information is required to compute agreement. These results are consistent with the *lexical hypothesis* (Cubelli et al, 2005; Paolieri et al, 2011), under which grammatical gender is an intrinsic part of the lexical representation and which has also been supported by studies of bilinguals with symmetric gender systems (Paolieri et al, 2010; Lemhöfer et al, 2008).

8. Conclusion

This study has shown that gender congruency between nouns in the L1 and L2 affects speech production, even for L1 Spanish-L2 German bilinguals whose languages differ in number of gender classes. Faster responses in an L2 picture-naming task for L1-L2 gender-congruent nouns than for gender-incongruent ones show that genders common to both languages are represented as L1-L2 shared gender nodes, much like what has been shown for bilinguals whose languages have symmetric gender systems. These results provide new evidence in support of the *gender-integrated representation hypothesis* (Salamoura & Williams, 2007) for bilingual speakers of languages with asymmetric gender systems.

The representation of neuter, the additional gender class in German, was of particular interest in this study. Interestingly, neuter nouns patterned similarly to L1-L2 gender-congruent nouns, illustrating that L1-L2 gender-incongruent nouns (masculine-feminine mismatches) are subject to significantly higher levels of interference in the production of bare nouns and DPs than both L1-L2 gender congruent and L2 neuter nouns. This finding suggests that nouns of different genders in the L1 and the L2 are not all subject to the same levels of interference: gender classes present only in the L2 have a distinct representation that is significantly less affected by the activation of a different L1-L2 shared gender node.

This research also sheds light on the debate regarding the contexts in which the gender node is not only activated but also selected. In this study the naming latencies were not significantly different in bare noun naming than in DP naming, suggesting that gender is always selected upon lexical access and thus supports the *lexical hypothesis (*Cubelli et al, 2005; Paolieri et al, 2010).

Further investigation into the unique representation of neuter is required to discern the locus of the significantly reduced interference for neuter nouns in comparison to gender-incongruent ones. In future studies it would also be relevant to include participant groups of varying proficiency levels to test whether the representation of neuter in relation to the other gender nodes changes with increased proficiency such that it is eventually subject to the same levels of interference as the gender nodes present in the L1. It would also be pertinent to expand the present results in focusing on other languages with asymmetric gender systems.

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