Asymmetric grammatical gender systems in the bilingual mental lexicon

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Thesis submitted to the
Faculty of Graduate and Postdoctoral Studies
In partial fulfillment of the requirements
For the Doctorate in Philosophy degree in Spanish

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Abstract

The nature of the bilingual mental lexicon and how the L1 and the L2 interact in language production and processing has been the focus of decades of research from linguistic, psycholinguistic and neurolinguistic perspectives. In spite of this significant body of evidence, the degree to which the L1 influences L2 production and processing remains an area of debate, especially with respect to formal features such as grammatical gender. While it is clear that non-nativelike production and processing of L2 grammatical gender persist even in highly-proficient adult bilinguals, the underlying representation of the L1 and L2 gender features and how this representation affects the use of gender in the L2 is currently unclear. Furthermore, there is no evidence at present regarding the nature of the L1-L2 grammatical gender system when the L1 and the L2 have asymmetric gender systems (in other words, differ in number of gender values), as is the case with German, which bears three gender values (masculine, feminine and neuter), and Spanish and French, which each display two gender values (masculine and feminine).

This dissertation investigates the representation of and interactions between the L1 and the L2 at the level of the formal gender feature, with a particular focus on language pairings with asymmetric gender systems. Through complementary data from L2 production and processing, I examine the representation of the asymmetric grammatical gender systems in the mental lexicon of L1 Spanish-L2 German and L1 French-L2 German bilinguals and the consequences this asymmetry between the L1 and L2 gender systems has on gender use strategies in the L2. From the perspective of bilingual lexical access, this research contributes new evidence to inform existing psycholinguistic theories of L1-L2 gender interactions and also proposes the *Asymmetric gender representation hypothesis*, a new model to account for the unique integrated nature of the gender system in bilinguals with L1-L2 asymmetric gender systems. From a language acquisition

perspective, the present study provides new data on L2 gender use strategies with asymmetric gender systems, formulating the *L1 transfer continuum*, which extends existing proposals to include the degree of (a)symmetry between the L1 and the L2. This research also connects theoretical proposals regarding gender agreement in functional-lexical code-switches (specifically, switches within the Determiner Phrase such as *die*$_{\text{GER-F}}$ *mesa*$_{\text{SPA-F}}$ or *el*$_{\text{SPA-M}}$ *Tisch*$_{\text{GER-M}}$) to bilinguals' preferences in code-switching between two languages that display formal gender. Taken together, all of these complementary perspectives addressed in this dissertation offer a well-rounded perspective of grammatical gender in asymmetric gender systems specifically, and contribute novel evidence regarding the interactions between the L1 and the L2 in the bilingual mental lexicon in general.

Acknowledgements

First and foremost, I would like to thank my supervisor, Juana M. Liceras, who truly went above and beyond in supporting and guiding me. No challenge was too great and no issue too small for her to concern herself with, and she gave selflessly of her time and resources. You are an excellent mentor, and these few sentences hardly express the depth of my gratitude to you.

I also wish to thank the two members of my working committee, Alain Desrochers and Holger Hopp, whose input along the way helped to hone my research. To Alain, who invested many hours in my experimental design and data analyses, and to Holger, who graciously hosted me as I collected data and whose insightful feedback pushed me to think critically about my work.

Thank you to my external examiner, Leah Roberts, as well as my internal examiners, Alain Desrochers, Holger Hopp, and Elena Valenzuela, for their support, genuine interest in my research, and invaluable comments that undoubtedly improved this dissertation and have opened the door to future directions in my research.

I would like to acknowledge that this research was funded through a Doctoral Fellowship from the Social Sciences and Humanities Research Council of Canada, an Ontario Graduate Scholarship from the Province of Ontario, and also through an Excellence Scholarship from the University of Ottawa. I am also grateful for the financial support from the Faculty of Arts and the Faculty of Graduate and Postdoctoral Studies at the University of Ottawa as well as the Association of Part Time Professors of the University of Ottawa that allowed me to present my research at conferences and to collect data in Spain and Germany.

Of course none of this research would have been possible without the 123 people who were willing to participate in the three experiments in this dissertation, even though many of them

seemed convinced I was trying to torture them with grammatical gender in German. Much of the data was collected abroad, and I am grateful for all those who generously assisted me in recruiting participants at the *Escuela Oficial de Idiomas de Valladolid*, the *Centro de Idiomas* at the *Universidad de Valladolid*, the *Bergische Universität Wuppertal*, and the *Universität Mannheim*. I would particularly like to thank Raquel Fernández Fuertes and Mayte Serrano Matos who were instrumental in connecting me with participants in Spain, as well as Natascha Müller, the members of the Wuppertal Bilingualism Group (current and back in 2013), Dieter Thoma, Ira Gawlitzek, and Rosemarie Tracy, without whom I would not have been able to recruit participants in Germany. A special thanks also goes to Ira Gawlitzek for pointing out some possibly problematic stimuli and also to Malin Hager for connecting me with resources in German I would have otherwise been unable to attain.

Thank you to my colleagues and friends at the Language Acquisition Research Lab – I consider it a privilege to have been part of such an excellent group of researchers who foster a true collegial spirit.

I am also very grateful to my friends and family who have supported and encouraged me throughout this period of my life. Thanks for lending a listening ear and for adding some humour to life at just the right moments.

And to Scott – you have been there for me through it all, offering your skills when necessary and your unconditional love and support always. You're the best!

Finally, thank you to God who has poured out His blessings on me, surrounding me with all these colleagues, friends, and family, and giving me the ability to do this research.

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1. Introduction

The representation of and interaction between the L1 and the L2 in the bilingual mental lexicon is an important area of research as it informs not only psycholinguistic theories of lexical access but also provides the foundation for theories in language acquisition and bilingualism. A significant body of research has shown that the bilingual's languages interact and thus it is generally assumed that L1 and the L2 have an integrated representation in the lexicon (ie. Kroll & Stewart, 1994; Hermans et al, 1998; Dijkstra, 2005; Colomé & Miozzo, 2010).

At the conceptual level, the interaction of the L1 and the L2 has been illustrated through the semantic interference effect. It has repeatedly been shown that bilinguals are slower to process and produce words when presented with a distractor word in one language that is semantically related to the word they must produce in the other language (ie. German target *Katze*$_{\text{cat}}$ – Spanish distractor *perro*$_{\text{dog}}$) than when the distractor presented is not related in meaning to the target (ie. German target *Katze*$_{\text{cat}}$ – Spanish distractor *mesa*$_{\text{table}}$) (Costa, Miozzo & Caramazza, 1999; Costa & Caramazza, 1999; Vigliocco et al, 2002; Costa, Alario & Caramazza, 2005). This effect is created by the parallel activation of multiple L1 and L2 words within the shared conceptual system which results in a slower response due to the increased competition for selection relative to when the L1 and L2 words are not related semantically. The semantic interference effect has supported the conclusion that L1 and the L2 share the same conceptual system given that cross-linguistic competition at the semantic level would not be expected if the L1 and the L2 had independent conceptual representations.

At the lexical level, interactions between the L1 and the L2 are evident in the cognate facilitation effect in which cognates between the L1 and the L2 are processed and produced more quickly (ie. *Dusche*$_{\text{German}}$-*douche*$_{\text{French}}$, 'shower') than translation equivalent words unrelated in form (ie.

Zeitung$_{\text{German}}$-*journal*$_{\text{French}}$, 'newspaper') (De Groot & Nas, 1991; Costa et al, 2000; Vigliocco et al, 2002; Gollan & Acenas, 2004; Salamoura & Williams, 2007; Lemhöfer, Spalek & Schriefers, 2008). This effect is the result of the L1 and the L2 activating words that overlap in form in the shared lexical store. Activation from both of the bilinguals' languages increases the activation of the target word, facilitating selection and resulting in a faster response compared to non-cognate translation equivalents. As with the semantic interference effect, no facilitation at the lexical level would be expected for cognates were the L1 and L2 not integrated.

While it seems clear that the L1 and the L2 have an integrated representation at the conceptual and lexical levels, more research is required to inform other levels in the bilingual lexicon, such as the representation L1 and L2 features. One such feature is grammatical gender, an inherent lexical feature of the noun that is reflected morphosyntactically through agreement (Kibort & Corbett, 2008). Investigating the representation of the gender feature in the bilingual lexicon represents a complementary perspective to previous research at the conceptual and lexical levels given that formal gender has neither a clear meaning (Audring, 2014) nor a consistent link to nominal form (Corbett, 1991). Furthermore, interactions between L1 and L2 gender features is an area of much interest in L2 studies given the difficulty that correct L2 noun classification and implementation of gender agreement presents for the learner, as illustrated in the variability in gender agreement that often characterizes L2 production, even in highly-proficient adult L2 speakers (Franceschina, 2005; Alarcón, 2011; Grüter, Lew-Williams & Fernald, 2012).

As an area of interest in multiple fields of linguistics, grammatical gender in the bilingual lexicon has been the focus of a significant body of research from various psycholinguistic perspectives, including lexical access (ie. Salamoura & Williams, 2007; Costa et al, 2003) and language acquisition (ie. Franceschina, 2005; White et al, 2004; Sabourin & Stowe, 2008). In spite of this,

whether or not the bilingual lexicon is integrated at the level of features such as grammatical gender and how this representation is borne out in bilinguals' use of grammatical gender in the L2 is still a matter of debate. In addition, there is currently no evidence regarding the nature of the representation of the grammatical gender information when the L1 and the L2 display different gender values; namely, for L1-L2 asymmetric gender systems such as Spanish-German and French-German.

The aim of this study is to investigate the representation of asymmetric grammatical gender systems in the bilingual mental lexicon and the consequences of the asymmetry between the L1 and L2 gender systems for the bilinguals' L2 gender use strategies. Specifically, I examine complementary data from L2 production (L2 picture-naming) and L2 processing (L2 grammaticality judgments as well as code-switched acceptability judgments) tasks to shed light on the grammatical gender system in the Spanish-German and French-German bilingual lexicon. I address lexical access, language acquisition and formal proposals regarding the representation and use of grammatical gender in the L2 to determine whether and how they can account for asymmetric gender systems.

The contribution of this dissertation is three-fold. At the theoretical level, I test psycholinguistic and syntactic proposals through second language and code-switched experimental data, and propose extensions of current models to accommodate L1-L2 asymmetric gender systems. At the descriptive and experimental level, I contribute novel production and processing data from two asymmetric language pairings (Spanish-German and French-German) and show how the unique nature of the asymmetric gender system is borne out in bilinguals' use of the L2. Finally, at the applied level, this research has valuable applications in second language teaching and pedagogy, including designing innovative teaching materials and teacher training courses.

The dissertation is structured in the following manner:

Chapter 2 offers a broad overview of the formal feature of gender, its distribution and realization in the languages of the world. It also addresses gender in Spanish, French, and German, including the proposed default (or least-marked) values, phonological and morphological regularities in gender marking and nominal gender agreement in each of these three languages of interest.

Chapter 3 summarizes the current accounts of the representation of grammatical gender from psycholinguistic and theoretical perspectives, including background information on the models of bilingual lexical access in spoken word production and word recognition as well as a syntactic analysis of gender as illustrated in code-switching within the Determiner Phrase (DP). From a psycholinguistic perspective, it presents the two current proposals for the representation of gender, the *gender integrated representation hypothesis* (Salamoura & Williams, 2007) and the *gender autonomous representation hypothesis* (Costa et al, 2003), which posit that the L1 and L2 gender systems have either a shared or independent representation (respectively). From a theoretical perspective, the *double-feature valuation hypothesis* (Liceras et al, 2008) and the *gender congruency algorithm* (González Vilbazo, 2005) proposals for DP agreement in code-switching are outlined. The *double-feature valuation hypothesis* posits that there are two features that need to be valued in code-switched DPs—one on the determiner (D) and one on the noun (N)—and that as a result, the D in the code-switched DP will always be marked for the gender of the translation equivalent N. The *gender congruency algorithm* proposes a process in which the D in the code-switched DP is marked (to the extent possible in the case of asymmetric gender systems) for the gender of the N in the switch, making opposite predictions to the *double-feature valuation hypothesis* regarding agreement within the code-switched DP. This chapter also presents the research questions and hypotheses regarding the representation of asymmetric gender systems, the representation of the

additional gender value in the L2, and the dominant L2 gender use strategies in which these psycholinguistic and theoretical proposals are examined and which serve to motivate the study.

Chapter 4 reports the results of the L2 picture-naming task performed by L1 Spanish-L2 German bilinguals and the L2 grammaticality judgment task performed by L1 French-L2 German bilinguals. Examined in the light of the psycholinguistic *gender integrated representation* (Salamoura & Williams, 2007) and the *gender autonomous representation* (Costa et al, 2003) proposals, these results indicate that the L1 and L2 have a fundamentally integrated gender representation, with a unique representation for the L2 gender value not present in the L1. With respect to L2 gender use strategies, both tasks also show that these bilinguals tend to overgeneralize one gender value as a default strategy.

Chapter 5 reports the results of the code-switched acceptability judgment task performed by L1 Spanish-L2 German and L1 German-L2 Spanish bilinguals. The results show that in code-switched DPs if the language of the D has more gender values than the language of the N (in this case, Spanish D-German N switches), neither bilingual group displays a consistent gender use strategy. When the code-switch goes in the other direction (namely, Spanish D-German N), the bilinguals prefer an L1 transfer-like strategy in which the Spanish D is marked for the gender of the N in their L1, regardless of whether or not it appears in the switched DP. These results do not fully support either the *double-feature valuation hypothesis* (Liceras et al, 2008) or the *gender congruency algorithm* (González Vilbazo, 2005) formal proposals for gender agreement in code-switched DPs.

Chapter 6 discusses the key findings from the experimental components of this study and formalizes the contribution to the existing research under two new proposals: the *asymmetric gender representation hypothesis* and the *L1 transfer continuum*.

Chapter 7 summarizes the study and offers the main conclusions as well as suggestions for further research.

2. Grammatical Gender Systems

Gender is a lexical feature inherent to the noun that serves as a nominal classifier. Not all languages display this feature, in fact, only 112 of the sample of 257 languages (43%) in the World Atlas of Language Structures (Corbett, 2013) currently have a gender system. The nature of the gender feature differs significantly between languages, most notably in the degree to which grammatical gender is linked to biological gender, the number of gender values present, and how gender is reflected morphosyntactically.

Gender systems in the majority of the world's languages have a semantic core and thus grammatical gender is frequently linked to biological gender (Corbett, 1991). The extent to which biological gender can account for the gender assignment system of a language varies, however. In addition to semantic information (biological gender), gender assignment can depend on nominal form information, namely, morphology and phonology (Corbett, 1991). There are few languages that assign gender based on a strictly semantic system which distinguishes animate and inanimate or human (male/female) and non-human. Such languages include Dravidian languages such as Tamil, several Northeast Caucasian languages as well as some indigenous languages (Corbett, 1991). Though English only marks gender pronominally (ie. *he/she/it*), it is also considered to have a semantic, or natural, gender system.

Unlike natural gender systems, formal gender systems are ones in which a significant portion of the gender assignment cannot be attributed to semantic (or biological) rules and other rules based on morphological and/or phonological form information must be used to account for gender assignment (Corbett, 1991). Spanish, French and German are all languages with formal gender systems. The gender systems in Spanish and French have a semantic core with primarily phonological rules regarding gender assignment. The German gender system is significantly

more complex, relying on the interplay of semantic, morphological and phonological information to account for the distribution of gender.

Languages in which the meaning of the noun determines its gender, such as Tamil and English, are not considered to have a formal gender system. Since this research focuses specifically on formal gender systems, in this chapter I will only describe the formal feature of grammatical gender in the target languages: Spanish, French, and German.

2.1 Formal gender feature

Grammatical gender is an abstract lexical feature that is not deducible from the meaning of the noun (Corbett, 1991; Roca, 1989; Harris, 1991). The distribution of grammatical gender is generally considered to be arbitrary (Corbett, 1991; Roca, 1989) as though gender assignment rules based on phonological and morphological endings can—with varying degrees of success—account for the gender of a noun, marking on the noun in and of itself is not indicative of the presence of a gender feature (Kibort & Corbett, 2008). In other words, gender assignment rules can only account for the pre-existent gender distribution and, contrary to what the term implies, do not actually assign gender values to each of the nouns in the language.

Gender as a feature is complex, both in terms of its inherent nature and as compared to other morphosyntactic features. In morphosyntactic feature hierarchies, gender is represented lower than both person and number, indicating that it is more complex than these features due to the fact that it is more embedded (Noyer, 1992; Harley, 1994). Figure 2.1 illustrates the representation of person, number, and gender on the morphosyntactic feature hierarchy, showing the higher level of embedding (and complexity) of the gender feature.

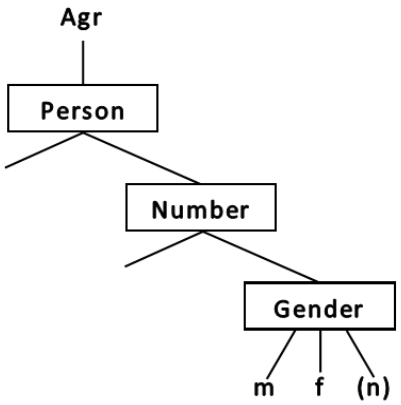


Figure 2.1. *Morphosyntactic feature hierarchy (adapted from Harley, 1994).*

Fundamentally, gender is complex because neither its precise function nor its meaning is clear (Audring, 2014). Gender rarely contributes additional information to an utterance (as Audring (2014) points out, *a red chair*, bearing no gender information, and una_{Dfem} $silla_{Nfem}$ $roja_{Adjfem}$, in which the gender of the noun is marked on both the determiner (D) and the adjective (Adj), express the same semantic information), and, as is exemplified in formal gender systems, often does not have clear semantic content. There are three dimensions of the complexity of the gender feature: (i) the number of gender values; (ii) the nature of the assignment rules; and (iii) the level of formal marking (Audring, 2014). According to the World Atlas of Language Structures (Corbett, 2013), two-value gender systems are the most common (45%), followed by languages with three (23%) or five or more (21%) values, with four-value gender systems being the least common (11%). Though the realization of the gender feature differs substantially between languages, it can be argued that gender systems with fewer gender values would be simpler than those with many values, and thus languages with two gender values, such as Spanish and French, would be considered simpler than languages such as Swahili, in which the gender feature has 15 values.

With respect to gender assignment rules in formal gender systems, word form information (specifically, morphology and phonology) accounts for the distribution of gender values for the

majority of the nouns of the language. The simplest systems are those that rely primarily on one type of form information and have broad assignment rules with relatively few exceptions. Complex systems, on the other hand, are those that rely on intricately-connected morphological and phonological information and have many small-scope assignment rules that often conflict (Audring, 2014). As I will discuss further in 2.2 and 2.4, Spanish is a good example of a simpler gender assignment system, relying on primarily phonological information for relatively broad, straight-forward rules, with languages such as German, which relies on many small assignment rules based on the interplay of morphological and phonological information, at the other end of the spectrum.

Finally, gender is often formally marked via agreement on words other than the noun (ie. D, Adj)[1], to the extent that gender information is redundantly expressed. Redundant marking, in addition to providing no semantic information, adds to the level of complexity of the feature due to the violation of the one-to-one mapping of form and function (Audring, 2014). In spite of the fact that gender is an inherent feature of the noun, it is expressed, often repeatedly, on other words. Restrictions on agreement (ie. gender is marked on the French D in singular forms but not plural) and syncretism of forms (ie. in German a single definite D form, *der*, is used for masculine agreement in nominative case but feminine agreement in dative case) also contribute to the complexity of the gender feature (Audring, 2014).

[1] Though there is a body of research in language acquisition that distinguishes agreement between the noun and the determiner from agreement between the noun and the adjective (such that agreement between the D and the N is posited to be indicative of lexical gender assignment while agreement between the N and the Adj represents syntactic gender agreement), in this study no such distinction is made given that this is not the focus of this research. All experiments in this research are assumed to tap the representation of lexical gender, though the term 'agreement' is used in Chapter 5 to be consistent with the formal proposals examined.

In terms of formal gender marking, languages such as Spanish and French are among the simplest with respect to number of gender values (two is the lowest possible number of gender values), with languages such as Swahili marking the high end of the complexity continuum with 15 gender values (Figure 2.2). Regarding gender assignment rules, languages such as Qafar, an East Cushitic language in which the gender of all nouns can be inferred from two phonological rules (Corbett, 1991), is among the languages that mark the simple end of the continuum, with languages such as German among the most complex due to the many rules (often with limited scope) that are required to account for gender assignment. Finally, with respect to gender marking, English is among the languages marking the low end of the complexity continuum with gender only marked on certain pronouns, while languages such as Chichewa, a Bantu language, mark the other end of the continuum with redundant gender marking on almost every word in the sentence, including the noun itself (Audring, 2014).

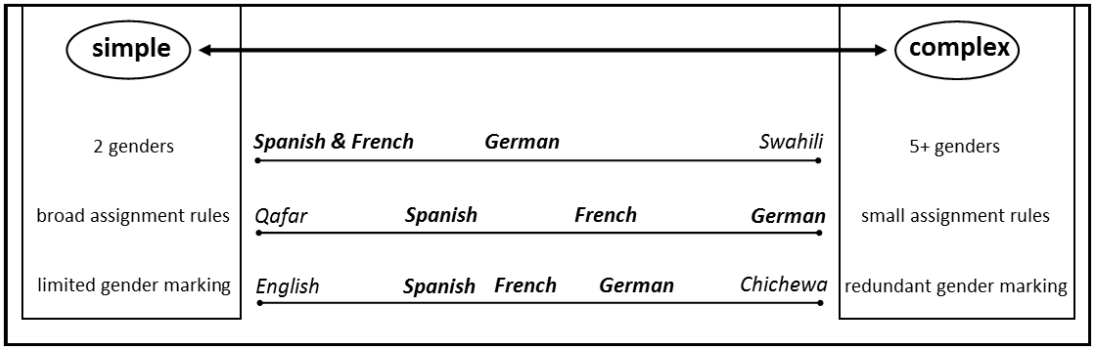


Figure 2.2. *Placement of Spanish, French and German on the continuum of the complexity of the gender feature (adapted from Audring, 2014).*

Turning to the target languages in this research, Spanish, French, and German differ with respect to the complexity of the gender feature. In terms of number of gender classes, Spanish and French are the simplest, with only two gender values, while German's three values make it somewhat more complex. With respect to gender assignment rules, Spanish is significantly simpler than either French or German as it relies primarily on phonological information and has broad

assignment rules. French, while also relying primarily on phonological information (Corbett, 1991), has significantly more gender assignment rules that are also smaller in scope than those in Spanish. In terms of gender assignment, German is again the most complex given the interplay of morphological and phonological information that contributes to small assignment rules with many exceptions. Interestingly with respect to gender marking all three languages pattern together, as they all mark gender redundantly (though French and German display some agreement restrictions and syncretic forms that Spanish does not have). In 2.2, 2.3, and 2.4 I will consider the gender feature in Spanish, French, and German (respectively) in greater detail. In the context of the present study, the number and distribution of the gender values in each of the target languages, the transparency (or lack thereof) of the gender marking on the noun, and the degree of syncretism in gender agreement is of particular relevance.

2.2 Spanish

Spanish has two gender values: masculine and feminine. The default, or unmarked gender is considered to be masculine (Roca, 1989; Harris, 1991) and thus in Spanish the gender feature is often formalized as [±feminine] (ie. Roca, 1989; González Vilbazo, 2005). Approximately 52% of nouns in Spanish are masculine and 45% feminine[2] (Bull, 1965).

2.2.1 Gender assignment in Spanish

Gender marking on nouns in Spanish is phonologically regular, with the word ending *–o* corresponding to masculine in almost all occurrences (99.87%) and *–a* corresponding to feminine somewhat less reliably (96.30%), though still in the vast majority of occurrences (Teschner &

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

Russell, 1984). Table 2.1 illustrates other phonological gender assignment rules with approximately 90% reliability or higher, as outlined by Teschner and Russell (1984). Of the 12 rules that meet this criterion, only two of them apply to feminine nouns. Word endings *–o*, *–m*, *–r*, *–l*, *–u*, *–i*, *–t*, *–x*, and *–e* reliably indicate masculine nouns, while only *–a* and *–d* reliably indicate feminine nouns.

Table 2.1. Phonological gender assignment rules in Spanish.

Word Ending	**Gender**	**Reliability**	**Example**
-o	masculine	99.87%	el dedo
-m	masculine	100%	el ítem
-r	masculine	98.55%	el carácter
-l	masculine	97.85%	el papel
-u	masculine	95.10%	el tabú
-y	masculine	93.68%	el jersey
-i	masculine	93.13%	el rubí
-t	masculine	93.86%	el deficit
-x	masculine	90.91%	el clímax
-e	masculine	89.35%	el bosque
-a	feminine	96.30%	la casa
-d	feminine	97.57%	la ciudad

Nouns ending in *–n*, *–s*, and *–z* only show a slight bias for one gender value over the other and thus are not considered reliable gender assignment rules. According to Teschner and Russell (1984), nouns ending in *–n* are divided almost equally between masculine (48.39%) and feminine (51.61%), nouns ending in *–s* show only a slight bias for masculine over feminine (57.32% versus 42.68%), and nouns ending in *–z* showing the most bias, though in this case in favour of feminine (61.63%) over masculine (38.37%).

In Spanish there are also morphological gender assignment rules which provide an account of exceptions to the phonological assignment rules and allow for the classification of *–n*, *–s*, and *–z* words into significantly more reliable rules for gender assignment. Table 2.2 provides gender

assignment rules based on morphological information that have at least a 75% rate of reliability (Teschner & Russell, 1984; Bergen, 1978).

Table 2.2. Morphological gender assignment rules in Spanish. [3]

Suffix	Gender	Example
-an	masculine	el pan
-en		el examen
-in		el jardín
-un		el atún
-ción	feminine	la canción
-gión		la región
-nión		la opinión
-sión		la pasión
-tión		la cuestión
-xión		la conexión
-sis	feminine	la tesis
-tis		la colitis
-az	masculine	el disfraz
-oz		el arroz
-uz		el avestruz
-ez	feminine	la sencillez
-cie	feminine	la especie
-stole	feminine	la sístole
-strofe	feminine	la catástrofe
-umbre	feminine	la certidumbre
-drama	masculine	el drama
-grama		el programa
-orama	masculine	el panorama
-ima	feminine	la lágrima
-uma		la pluma
-lma	feminine	la palma
-rma		la firma

With respect to the nouns without reliable phonological gender assignment rules, for nouns ending in *–n*, morphological assignment rules indicate that *–an*, *-en*, *-in*, and *-un* indicate

[3] Morphological gender assignment rules that follow the phonological assignment rules (such as *–miento* and *–ero* for masculine nouns and *–dora* and *–ería* for feminine nouns) are not included in this summary as they do not provide additional information regarding the exceptions to the rules based on phonological information. Gender assignment rules based on *–ma* morphological endings are included given that *–ma* is a well-known exception to the phonological assignment rule *–a = feminine* and the morphological rules that can account for the distribution of *–ma* nouns between the two gender values are complex and thus represent an area that bears clarification.

masculine nouns while *–ción*, *-gión*, *-nión*, *-sión*, *-tión*, and *-xión* are endings typical of feminine nouns (Teschner & Russell, 1984). For *–s* nouns, the only reliable assignment rule contributed by morphological information is *–sis* and *–tis* which indicate primarily feminine nouns (Bergen, 1978; Teschner & Russell, 1984). Finally, for *–z* nouns, *-az*, *-oz*, and *–uz* correspond to masculine nouns while *–ez* corresponds to feminine nouns (Teschner & Russell, 1984).

Morphological gender assignment rules also account for exceptions to the phonological gender assignment rules. According to Teschner and Russell (1984), endings *-cie*, *-stole*, *-strofe*, and *–umbre* correspond to feminine nouns and account for the exceptions to the phonological assignment rule that nouns ending in *–e* are masculine. Nouns ending in *–ma* represent a complex combination of phonological and morphological gender assignment rules. These nouns (particularly those of Greek origin) are a frequently-cited exception to the rule that nouns ending in *–a* are feminine, though, according to Teschner and Russell (1984), only 30.33% of nouns ending in *–ma* are, in fact, masculine. Morphological rules indicate that endings *–ima*, *-uma*, *-lma*, and *–rma* correspond to feminine nouns and therefore follow the phonological assignment rules. Endings *–drama*, *-grama*, and *–orama*, on the other hand, correspond to masculine nouns and thus can account for the exceptions to the phonological rule.

While phonological and morphological rules can account in large part for the distribution of nouns between the gender values in Spanish, other authors, such as Harris (1991) point out that there is no evident link between phonology or morphology and gender for nouns that can be either gender (epicene nouns), such as *capital*, which refers to a city as a feminine noun (*la capital*) but refers to money (*el capital*) as a masculine noun.

2.2.2 Gender agreement in Spanish

In Spanish, gender is marked on determiners, adjectives, and pronouns. As gender agreement in Spanish is considered within the NP in this research, in this chapter I will only address nominal agreement, since other forms of gender agreement (ie. clitics and subject pronouns) are beyond the scope of this research.

Gender marking is relatively straight-forward in Spanish, with many categories displaying a one-to-one mapping between gender inflection and noun gender. As a general rule, determiners, adjectives and pronouns that agree with masculine nouns bear the suffix *–o*, while those that agree with feminine nouns are marked with *–a*. There are few exceptions to feminine gender marking as *–a*, however masculine gender marking may sometimes be null (*–Ø*), in which case the determiner, adjective or pronoun may end in *–e* or a constant (ie. *este* 'this$_M$'; *el* 'the$_M$') that does not mark any particular gender (Bosque & Demonte, 1999).

Definite and indefinite determiners have unique forms in both singular and plural in Spanish (Table 2.3). All of the Spanish determiners are regularly marked for gender (ie. *–o* for masculine and *–a* for feminine), with the exception of the masculine singular forms (*el*$_{DEF}$, *un*$_{INDEF}$) which are unmarked. A small number of feminine nouns exceptionally take the masculine definite determiner in the singular but the feminine determiner in the plural (Clegg, 2011). These nouns begin with accented /a/ (ie. *el/las agua(s)*; *el/las alma(s)*) and take the masculine form *el* in the singular in order to avoid the phonemic clash of *la* + stressed /a/ (Clegg, 2011).

Table 2.3. Determiner forms in Spanish.

		Masculine	**Feminine**
definite	singular	el	la
	plural	los	las
indefinite	singular	un	una
	plural	unos	unas

Spanish demonstrative pronouns also have separate forms for masculine and feminine as well as singular and plural (Table 2.4). Like the determiners, demonstrative pronouns are regularly marked for gender, except for the masculine singular forms (*este*, *ese*, *aquel*).

Table 2.4. Demonstrative pronoun forms in Spanish.

		Masculine	**Feminine**
this	singular	este	esta
	plural	estos	estas
that	singular	ese	esa
	plural	esos	esas
that **(further away)**	singular	aquel	aquella
	plural	aquellos	aquellas

Quantifiers in Spanish (Table 2.5) pattern similarly to determiners and demonstrative pronouns, with the unique forms marked regularly except for one/some in masculine singular (*algún*, *ningún*).

Table 2.5. Quantifier forms in Spanish.

		Masculine	**Feminine**
all	singular	todo	toda
	plural	todos	todas
one/some	singular	algún	alguna
	plural	algunos	algunas
none	singular	ningún	ninguna
	plural	ningunos	ningunas

Interrogative and possessive pronouns are selectively marked for gender in Spanish. Of the interrogative pronouns, only *cuánto* ('how many') is marked for gender (*cuánto*$_{\text{MSg}}$, *cuánta*$_{\text{FSg}}$, *cuántos*$_{\text{MPl}}$, *cuántas*$_{\text{FPl}}$). Spanish distinguishes between tonic and atonic possessive pronouns, and each type is marked differently for gender (Table 2.6). All of the tonic possessive pronouns are marked regularly for gender. Of the atonic possessive pronouns, only 1st and 2nd person plural possessive pronouns are marked for gender, and these have the same form as the 1st and 2nd person plural tonic possessive pronouns (repeated in Table 2.6 for the sake of clarity).

Table 2.6. Possessive pronoun forms in Spanish.

		Tonic		Atonic	
		Masculine	*Feminine*	*Masculine*	*Feminine*
1st person singular	singular	mío	mía	mi	
	plural	míos	mías	mis	
2nd person singular	singular	tuyo	tuya	tu	
	plural	tuyos	tuyas	tus	
3rd person singular	singular	suyo	suya	su	
	plural	suyos	suyas	sus	
1st person plural	singular	nuestro	nuestra	nuestro	nuestra
	plural	nuestros	nuestras	nuestros	nuestras
2nd person plural	singular	vuestro	vuestra	vuestro	vuestra
	plural	vuestros	vuestras	vuestros	vuestras
3rd person plural	singular	suyo	suya	su	
	plural	suyos	suyas	sus	

Spanish adjectives are also marked for the gender of the noun with which they agree (Table 2.7). Many adjectives follow the *–o /–a* paradigm, however, there are other types of adjectives that have invariable forms, or are unmarked for masculine but regularly marked for feminine (Harris, 1991).

Table 2.7. Adjective forms in Spanish. [4]

		Masculine	**Feminine**
regularly marked	*-o / -a*	malo	mala
		simpático	simpática
invariable	*-e*	inteligente	inteligente
		verde	verde
	-consonant	joven	joven
		azul	azul
	-a	perfeccionista	perfeccionista
		belga	belga
only feminine marked	*gentilic adjectives*	español	española
		alemán	alemana

The majority of adjectives in Spanish end in *–o* or *–a* and are regularly marked for gender (Harris, 1991). Most of the exceptions to the regularly-marked adjectives have invariable forms. Invariable adjectives end in *–e* (*inteligente*, 'intelligent) or a consonant (*joven*, 'young'), with a small number

[4] Plural adjective forms are not considered here given that this research does not address plural inflection.

constituting an exception to those ending in *–a* (*perfeccionista*, 'perfectionist') that are regularly marked for gender. The remaining exceptions are what Harris (1991) labels 'gentilic' adjectives, or adjectives of national, geographical, or ethnic reference. Gentilic adjectives have an unmarked masculine form (*español-Ø*, 'Spanish$_M$') with a regularly-marked feminine form (*española*, 'Spanish$_F$').

2.3 French

French also has a binary gender system in which nouns have either a masculine or feminine gender value. In terms of distribution of the gender values, in French there are somewhat more masculine nouns (61%) than feminine ones (39%) (Tucker, Lambert & Rigault, 1977). Masculine is considered to be the default gender (Corbett, 1991) and therefore the gender feature can be formalized as [±feminine], similar to Spanish.

2.3.1 Gender assignment in French

Nominal gender marking in French can be accounted for with relatively complex gender assignment rules based on both phonological and morphological information (Tucker, Lambert & Rigault, 1977; Corbett, 1991). Unlike Spanish, phonological gender marking in French is quite opaque and assignment rules based on phonological word endings vary significantly in scope and reliability, to the extent that some word endings provide no information about gender at all (Desrochers, 1986; Surridge, 1993; Ayoun, 2010). Table 2.8 outlines phonological gender assignment rules with at least 60% reliability (per Tucker, Lambert & Rigault (1977) and Lyster (2006)). There are 24 rules that meet this criterion, 13 of which indicate masculine nouns and 11 that indicate feminine ones. Masculine nouns reliably (>80%) appear with word final /œ̃/, /ɑ̃/, /ɛ̃/, /o/, /ø/, /ʒ/, /m/, /ɛ/, /f/, /u/, and /a/; somewhat less reliable (70-79%) indicators of

masculine gender are endings /r/ and /y/ (Tucker, Lambert & Rigault, 1977; Lyster, 2006). There are only two phonological rules with 80% or higher reliability for feminine nouns: /z/ and /i/, and in the case of /i/ Tucker, Lambert and Rigault (1977) and Lyster (2006) diverge significantly regarding its reliability (83% versus 68%, respectively). The remaining 7 phonological assignment rules – endings /t/, /ɔ̃/, /n/, /v/, /j/, /ʃ/, /p/, /d/, and /s/ – are generally less than 70% reliable, though the reliability ratings vary significantly between Tucker, Lambert and Rigault (1977) and Lyster (2006) for all endings except /ɔ̃/ and /j/.

Table 2.8. Phonological gender assignment rules in French.

Word Ending	**Gender**	**Reliability**[5]		**Example**
		Tucker, Lambert & Rigault (1977)	Lyster (2006)	
/œ̃/	masculine	100%	---	le parfum
/ɑ̃/	masculine	99%	99%	le roman
/ɛ̃/	masculine	99%	98%	le matin
/o/	masculine	97%	93%	le bureau
/ø/	masculine	97%	88%	le jeu
/ʒ/	masculine	94%	87%	le fromage
/m/	masculine	92%	80%	le problème
/ɛ/	masculine	89%	93%	le billet
/f/	masculine	89%	82%	le tarif
/u/	masculine	88%	87%	le cou
/a/	masculine	83%	85%	le repas
/r/	masculine	77%	63%	le verre
/y/	masculine	72%	63%	le début
/z/	feminine	90%	97%	la phrase
/i/	feminine	83%	68%	la mélodie
/t/	feminine	---	79%	la porte
/ɔ̃/	feminine	70%	71%	la boisson
/n/	feminine	69%	82%	la semaine

[5] Reliability of the phonological assignment rules for indicating the gender of the nouns varies between the two studies due to differences in the size and source of the sample and slight methodological differences.

/v/	feminine	69%	78%	la fève
/j/	feminine	68%	65%	la famille
/ʃ/	feminine	66%	90%	la cloche
/p/	feminine	---	64%	la tulipe
/d/	feminine	62%	86%	la demande
/s/	feminine	62%	79%	la glace

The remaining phonological word endings in French are unreliable (<60%) indicators of gender. Word endings /k/ and /e/ indicate masculine slightly more often than feminine, while /ɲ/is biased towards feminine nouns. Endings /l/, /b/, and /g/ are curious cases, with Tucker, Lambert and Rigault (1977) and Lyster (2006) arguing that these endings favour opposite genders. Tucker, Lambert and Rigault (1977) maintain that /l/ indicates feminine nouns with a reliability of 58%, while this ending is predominantly masculine (54%) for Lyster (2006). On the other hand, for /b/ and /g/, Tucker, Lambert and Rigault (1977) suggest that these are masculine noun endings (65% and 73%, respectively) while Lyster (2006) maintains these are indicative of feminine nouns (54% and 61%, respectively). Whether /l/, /b/, and /g/ more reliably indicate masculine or feminine gender is not of consequence to this research as these word endings cannot be considered reliable indicators of gender regardless of which gender they are predominately associated with.

The morphological gender assignment rules are more reliable than the phonological ones and often apply without exception (Surridge, 1993; Lyster, 2006). Table 2.9 outlines the assignment rules based on morphological information with at least an 80% rate of reliability (Tucker, Lambert & Rigault, 1977; Desrochers, 1986; Surridge, 1993, 1996).

Table 2.9. Morphological gender assignment rules in French.

Suffix		**Gender**	**Example**
orthographic	*phonological*		
-age	/aʒ/	masculine	l'apprentissage
-ème	/ɛm/	masculine	le poème
-ètre	/ɛtr/	masculine	le mètre
-ier	/je/	masculine	le pommier
-if	/if/	masculine	le rosbif
-ment	/mɑ̃/	masculine	le vêtement
-oir	/war/	masculine	le comptoir
-sme	/sm/	masculine	l'objectivisme
-ton	/tɔ̃/	masculine	le bâton
-ade	/ad/	feminine	la parade
-aille	/aj/	feminine	la bataille
-aine	/ɛn/	feminine	la semaine
-aison	/ɛzɔ̃/	feminine	la maison
-ance -ence	/ɑ̃s/	feminine	la naissance l'évidence
-ande	/ɑ̃d/	feminine	la demande
-ase	/az/	feminine	la phrase
-asse	/as/	feminine	la terasse
-ation -ition -ution -ssion -tion	/sjɔ̃/	feminine	l'admiration la supposition la traduction la permission l'exécution
-erie	/ɛri/	feminine	la boulangerie
-esse	/ɛs/	feminine	la politesse
-ette	/ɛt/	feminine	la cigarette
-eur	/œr/	feminine	la grandeur
-euse	/øz/	feminine	la couveuse
-ille	/ij/	feminine	la lentille
-ine	/in/	feminine	la vitamine
-ise	/iz/	feminine	l'église
-ite	/it/	feminine	la marguerite
-ive	/iv/	feminine	la lessive
-ose	/oz/	feminine	la diagnose
-té	/te/	feminine	la liberté
-ude	/yd/	feminine	l'habitude
-ure	/yr/	feminine	la coiffure

Word endings *-ton* /tɔ̃/, *-eur* /œr/, and *–ure* /yr/ represent exceptions to the phonological gender assignment rules. While /t/ and /ɔ̃/ are more likely to indicate feminine nouns, *–ton* (ie. *le bâton*) is a morphological word ending reliably linked to masculine nouns. On the other hand, phonological ending /r/ is more likely to indicate masculine nouns, though *-eur* (ie. *la grandeur*) and *–ure* (ie. *la coiffure*) are feminine noun endings. Morphological endings *–ier* /je/ and *–té* /te/ are good examples of the unreliability of phonological ending /e/ in terms of indicating gender. Ending *–ier* is typical of masculine nouns (ie. *le pommier*) and, in contrast, *–té* is typical of feminine nouns (ie. *la liberté*).

There is also a small set of epicene nouns in French (Lyster, 2006) that includes nouns like *livre*, which is a book as a masculine noun (*le livre*), but a pound (British currency or unit of mass) as a feminine noun (*la livre*), as well as nouns ending in *–iste* and *–aire*, such as *le/la journaliste* ('journalist') and *le/la bibliothécaire* ('librarian').

2.3.2 Gender agreement in French

Gender is marked on determiners, adjectives, and pronouns in French. In parallel with Spanish, gender is also marked outside of nominal agreement in French (ie. past participles and subject pronouns), though such marking will not be considered here. Unlike Spanish, in French the mapping between gender and marking is complex and frequently irregular (or conditioned by the context).

In French, though all the determiners are marked for gender, only the singular determiners have unique forms (Table 2.10). The definite and indefinite determiners constitute a good example of irregular or conditional gender marking in French: masculine is unmarked on the definite and indefinite determiners, while feminine is marked with *–a* on the definite determiner but *–e* on the

indefinite one. The plural form is the same for both genders for the definite (*les*) and indefinite (*des*) determiners. The definite singular determiner is also unmarked for gender when it takes the form *l'*, which is required for phonological reasons with nouns with an initial vowel or silent '*h*'.

Table 2.10. Determiner forms in French.

		Masculine	**Feminine**
definite	singular	le / l'	la / l'
	plural	les	
indefinite	singular	un	une
	plural	des	

Like determiners, French demonstrative pronouns only distinguish masculine and feminine in the singular form (Table 2.11). The masculine form is unmarked and the feminine form is marked with *–e*.

Table 2.11. Demonstrative pronoun forms in French.

		Masculine	**Feminine**
this/these	singular	ce	cette
	plural	ces	

Much like Spanish, French possessive pronouns are selectively marked for gender. While in Spanish only 1st and 2nd person plural possessive pronouns are marked for gender, the opposite is true in French: only the singular possessive pronouns are marked (Table 2.12). Gender is marked on the singular possessive pronouns much like the definite determiners: no marking for masculine forms, *-a* for feminine forms, and no unique form for gender in the plural. Plural possessive pronouns (1st, 2nd, and 3rd person plural) do not distinguish gender in the singular (one possessed object) or the plural (the multiple possessed objects).

Table 2.12. Possessive pronoun forms in French.

		Masculine	Feminine
1st person singular	singular	mon	ma
	plural	mes	
2nd person singular	singular	ton	ta
	plural	tes	
3rd person singular	singular	son	sa
	plural	ses	
1st person plural	singular	notre	
	plural	nos	
2nd person plural	singular	votre	
	plural	vos	
3rd person plural	singular	leur	
	plural	leurs	

In French, the only interrogative pronoun marked for gender is *quel* ('which'), which marks gender similarly to the indefinite determiners ($quel_{MSg}$, $quelle_{FSg}$, $quels_{MPl}$, $quelles_{FPl}$).

French adjectives are also marked for the gender of the noun with which they agree (Table 2.13).

Table 2.13. Adjective forms in French. [6]

	Masculine	Feminine
-ø/-e	grand	grande
-e	moderne	moderne
-er/-ère	léger	légère
-f/-ve	neuf	neuve
-x/-se	heureux	heureuse
-eur/-euse	voleur	voleuse

As a general rule the feminine adjective form is marked with *–e* (L'Huillier, 1999), though there are often other changes to the masculine, or default, form of the adjective that must be made for the feminine form. Table 2.13 outlines the most frequent masculine and feminine adjective forms (Heminway, 2008). Adjectives ending in *–e* in the masculine form are invariable in the feminine form.

[6] Plural adjective forms are not considered here given that this research does not address plural inflection.

2.4 German

Unlike French and Spanish, German has a ternary gender system which is comprised of masculine, feminine, and neuter gender values. In German, approximately 50% of nouns are masculine, 30% feminine and 20% are neuter (Bauch, 1971). The presence of the third gender value, neuter, makes the default gender in German not as clear as in Spanish or French. Steinmetz (2006) has proposed that the default gender hierarchy in German is *masculine* > *feminine* > *neuter* on the basis of historical shifts in the gender system. Under this account masculine is the default gender and neuter the most marked. González-Vilbazo (2005) has formalized German gender as [±feminine], like Spanish and French, given that masculine is also the default in German, and [±masculine], to allow for the distinction between masculine and neuter. Under this formalization, masculine is [-feminine] [+masculine], feminine [+feminine] [-masculine], and neuter [-feminine] [-masculine].

2.4.1 Gender assignment in German

It is generally agreed that gender assignment in German is a complex interplay of morphological and phonological rules that are limited in scope and often have numerous exceptions (Corbett, 1991; Zubin & Köpcke, 1984). These gender assignment rules are significantly more complex than those for either Spanish or French. A further complication to gender assignment in German is the fact that compounding is highly productive and this has resulted in at least 68% of the lexicon consisting of morphologically complex nouns (Zubin & Köpcke, 1984). In the case of complex nouns, the Last Member Principle (Zubin & Köpcke, 1984) states that it is the final element (which may be a noun or a suffix) which determines the gender (ie. *die Windmühle*$_F$, comprised of initial noun *Wind*$_M$ and final noun *Mühle*$_F$).

Table 2.14 (adapted from Hager, 2014, p.78-79) illustrates the phonological gender assignment rules with at least a 60% rate of reliability as per Köpcke (1982), Köpcke & Zubin (1983), Mills (1986), and Müller (1990). In these rules, *C* represents any consonant (it must be present unless it appears in brackets, *(C)*, in which case it is optional); *V* is any vowel; *X* is any word-initial phoneme; and *Y* any word-final phoneme. The rules are divided into four types: general phonological structure rules, word-final rules, word-medial rules, and word-initial rules. Both the word-medial and the word-initial rules only apply to monosyllabic nouns.

Table 2.14. Phonological gender assignment rules in German.

Phonological Rule	**Gender**	**Reliability**	**Example**	**#**
	structural rules			
X diphthong C	masculine/neuter	92%	das Bein	1
	word-final rules			
X /ʃ/	masculine	80%	der Tisch	2
XX nasal (C)(C)	masculine	75%	der Fund	3
X C /s/	masculine	75%	der Kranz	4
X /l/ C	masculine	68%	der Pilz	5
X /r/ stop (C)	masculine	66%	der Herd	6
{[u:], [y:]} - /r/	feminine	93%	die Kur	7
/ə/	feminine	90%	die Tanne	8
X - {/f/, /ç/, /x/} - /t/	feminine	66%	die Macht	9
[ɛt]	neuter	95%	das Fett	10
/i:r/	neuter	60%	das Tier	11
X - {/s/, /ʃ/} - /t/	masculine/feminine	94%	die Pest	12
X /l/	masculine/neuter	94%	der Ball/das Seil	13
	word-medial rules (monosyllabic words only)			
X V (+long) Y	masculine/neuter	86%	der Flur/das Los	14
	word-initial rules (monosyllabic words only)			
/kn/	masculine	93%	der Knopf	15
{/tr/, /dr/} - Y	masculine	89%	der Druck	16

/ʃ/ C Y	masculine	86%	der Stuhl	17
/d/ Y	masculine/neuter	97%	der Dunst	18
/r/ Y	masculine/neuter	94%	der Rost	19
{/gr/, /kr/} - Y	masculine/neuter	93%	der Greis	20
/t/ Y	masculine/neuter	92%	das Tor	21

adapted from Hager (2014), p.78-79

It is relevant to note that rules 1, 12, 13, 14, 18, 19, 20, and 21 represent nouns of two possible gender values[7]. The majority of the rules that apply to only one gender value apply to masculine nouns (8 rules), with relatively few applying to feminine (3 rules) or neuter (2 rules) nouns.

The morphological gender assignment rules apply more straight-forwardly than the phonological rules. Table 2.15 (adapted from Hager, 2014, p.76-77) outlines the affixes that can reliably indicate the gender of the noun according to Heidolph et al. (1981), Hoeppner (1980), Ivanova (1973), Wegener (1995a; 1995b), and Köpcke and Zubin (1984).

Table 2.15. Morphological gender assignment rules in German.

Affix	**Gender**	**Example**
prefix		
be-	masculine	der Beginn
ver-	masculine	der Verbrauch
ge-	neuter	das Gebell
suffix		
-ant	masculine	der Gratulant
-el	masculine	der Hebel
-er	masculine	der Geber
-(i)ent	masculine	der Patient
-ig	masculine	der König
-ling	masculine	der Fremdling
-rich	masculine	der Enterich
-ei	feminine	die Bücherei
-heit	feminine	die Kindheit
-in	feminine	die Köchin
-keit	feminine	die Freundlichkeit
-schaft	feminine	die Freundschaft

[7] Since German has three gender values rather than two, rules that apply to only two of the three gender values do provide some information regarding the distribution of gender in German.

-tät	feminine	die Originalität
-ung	feminine	die Abbildung
-chen	neuter	das Pflänzchen
-lein	neuter	das Entlein
-nis	neuter	das Geheimnis
-sal	neuter	das Schicksal
-tum	neuter	das Altertum

adapted from Hager (2014), p.76-77

It is difficult to directly compare the information provided by the phonological and morphological rules given that only 12 of the 21 phonological rules apply to word endings and a quarter of these end in an unspecified consonant. According to the morphological rules, nouns with the prefix *be-* or *ver-* are reliably masculine, while nouns beginning in *ge-* tend to be neuter. With respect to suffixes, *-ant, -el, -er, -(i)ent, -ig, -ling*, and *–rich* indicate masculine nouns, with words ending in *–ei, -heit, -in, -keit, -schaft, -tät*, and *–ung* being reliably feminine, and words ending in *–chen, -lein, -nis, -sal*, and *–tum* being reliably neuter. There are no morphological rules that apply to nouns of more than one gender value.

2.4.2 Gender agreement in German

In German, as in Spanish and French, gender is marked on determiners, adjectives, and pronouns. In contrast to Spanish and French, however, German also marks case on nouns, determiners, adjectives, and pronouns, and has declension classes for nouns and adjectives, all of which contribute an additional level of complexity to the German gender system.

Case marking on nouns, determiners, adjectives, and pronouns in German, in combination with the declension classes for nouns and adjectives, means that there is a one-to-many mapping of gender onto inflection which is further complicated by syncretism in inflection between gender values, particularly in the plural (ie. determiner form *die* can be a feminine singular definite determiner, or a plural definite determiner for any gender).

There are eight noun declension classes in German (Alexiadou & Müller, 2008) which specify gender marking for nominative, accusative, dative, and genitive cases in both singular and plural. Given the complexity of gender marking in German, plural nominal inflection will not be considered here since it is not relevant to this research which only addresses singular nouns. Tables 2.16 and 2.17 illustrate the inflection for singular nouns for each declension class (Alexiadou & Müller, 2008).

Table 2.16. Singular nominal inflection for masculine and neuter nouns in German.

	Class I masc, neut nouns	**Class II** masc nouns	**Class III** masc, neut nouns	**Class IV** masc, neut nouns	**Class V** masc nouns
nominative	-Ø	-Ø	-Ø	-Ø	-Ø
accusative	-Ø	-Ø	-Ø	-Ø	-(e)n
dative	-Ø	-Ø	-Ø	-Ø	-(e)n
genitive	-(e)s	-(e)s	-(e)s	-(e)s	-(e)n

Table 2.17. Singular nominal inflection for feminine nouns in German.

	Class VI fem nouns	**Class VII** fem nouns	**Class VIII** fem nouns
nominative	-Ø	-Ø	-Ø
accusative	-Ø	-Ø	-Ø
dative	-Ø	-Ø	-Ø
genitive	-Ø	-Ø	-Ø

For singular German nouns, masculine nouns can have no inflection (*-Ø*) or be inflected with *–(e)s* (genitive case, classes I-IV), or *-(e)n* (accusative, dative and genitive cases, class V). Neuter nouns have two possible inflections: null (*-Ø*) or *–(e)s* (genitive case, classes I, III and IV). Feminine nouns have the simplest nominal inflection paradigm in the singular, as there is no inflection for any of the feminine noun declension classes. It is clear from the syncretism in inflection between masculine, feminine, and neuter nouns that nominal declension in German is no indicator of noun gender (Alexiadou & Müller, 2008).

Definite and indefinite determiners are all marked for gender and case but often do not have unique forms (Tables 2.18 and 2.19). Definite determiners (Table 2.18) only have six unique forms (*der, die, das, den, des, dem*) for the 16 combinations of gender and case and thus display significant syncretism. Furthermore, only one of these forms, *das*, can only be linked to a single gender (neuter). All other determiner forms can represent various genders in different cases and/or number. Like French, German plural definite determiners do not have unique forms for each gender, but, unlike French, the plural forms are not unique to plural determiners as they can also be feminine (*die, der*) or masculine (*der, den*) singular determiner forms.

Table 2.18. Definite determiner forms in German.

	masculine	**feminine**	**neuter**	**plural**
nominative	der	die	das	die
accusative	den	die	das	die
dative	dem	der	dem	den
genitive	des	der	des	der

Indefinite determiners (Table 2.19) also have relatively few unique forms, however the lack of a plural indefinite determiner in German makes the overlap in the indefinite determiner forms less complex than the definite determiners. In fact, there are three indefinite determiners that can only correspond to a single gender: *einen* (masculine), *eine* (feminine), and *einer* (feminine). Since *eine* and *einer* are the only feminine indefinite determiner forms in German, and both are unique to that gender, feminine gender marking in indefinite determiners is significantly more straight-forward than gender marking for masculine or neuter. The indefinite pronoun (*kein*) case and gender marking paradigm is the same as that of the indefinite determiners except that the unmarked form is *kein* ('none') rather than *ein* ('a/an').

Table 2.19. Indefinite determiner forms in German.

	masculine	feminine	neuter
nominative	ein	eine	ein
accusative	einen	eine	ein
dative	einem	einer	einem
genitive	eines	einer	eines

Demonstrative pronouns are also marked for gender and case in German (Table 2.20). Demonstratives are similar to definite determiners with respect to the lack of unique forms (only six out of 16 combinations of case and gender), but unlike the determiners, there is no form that corresponds to only one gender. Plural forms are not marked for gender and overlap with the singular forms for feminine (*diese, dieser*), and masculine (*dieser, diesen*).

Table 2.20. Demonstrative pronoun forms in German.

	masculine	feminine	neuter	plural
nominative	dieser	diese	dieses	diese
accusative	diesen	diese	dieses	diese
dative	diesem	dieser	diesem	diesen
genitive	dieses	dieser	dieses	dieser

German possessive pronouns are all marked for gender and case. Given the complexity of the gender marking paradigm in German, unmarked forms for each person will be presented separately from the inflection for case and gender, which is the same for all person forms (Tables 2.21 and 2.22). As illustrated in Table 2.21, all the unmarked possessive forms are unique, with the exception of 3rd person singular and plural which overlap for plural and female singular possessors (*ihr*).

Table 2.21. Unmarked possessive pronoun forms in German.

	Unmarked form
1st person singular	mein
2nd person singular	dein
3rd person singular	
male possessor	sein
female possessor	ihr
1st person plural	unser
2nd person plural	euer
3rd person plural	ihr

The gender and case marking paradigm for possessive pronouns is the same as the paradigm for indefinite determiners, with the addition of plural (Table 2.22). As with definite determiners and demonstratives, the plural inflection does not mark gender, only case, and overlaps with feminine (*-e, -er*) and masculine (*-en*) singular affixes.

Table 2.22. Possessive pronoun inflection paradigm in German.

	masculine	**feminine**	**neuter**	**plural**
nominative	-Ø	-e	-Ø	-e
accusative	-en	-e	-Ø	-e
dative	-em	-er	-em	-en
genitive	-es	-er	-es	-er

Like French, the only German interrogative pronoun marked for gender is *welcher* ('which'), which is marked for case and gender according to the same paradigm as the demonstrative pronouns (Table 2.20).

In German, only attributive adjectives (prenominal) agree with the noun and predicative and attributive adjectives (postnominal) are not inflected for either gender or case. There are three declension classes for adjectives (strong, mixed, and weak), the use of which depends on the syntactic context of the attributive adjective (Stocker, 2012).[8] The strong declension paradigm (Table 2.23) is used when no determiner appears before the noun (Stocker, 2012).

Table 2.23. Strong adjectival declensions in German.

	masculine	**feminine**	**neuter**
nominative	-er	-e	-es
accusative	-en	-e	-es
dative	-em	-er	-em
genitive	-en	-er	-en

The mixed declension paradigm (Table 2.24) applies when the adjective follows an indefinite determiner (*ein*) or pronoun (*kein*) or a possessive pronoun (Stocker, 2012). Note that there is

[8] I will not consider plural adjectival inflection as it is not relevant to this research.

significantly more syncretism in the mixed declensions (particularly in the dative and genitive cases) than there is in the strong declensions.

Table 2.24. Mixed adjectival declensions in German.

	masculine	feminine	neuter
nominative	-er	-e	-es
accusative	-en	-e	-es
dative	-en	-en	-en
genitive	-en	-en	-en

The weak declension paradigm (Table 2.25) is used when the adjective follows the definite determiner (Stocker, 2012). This paradigm has the fewest unique forms, distinguishing only *–e* and *–en*.

Table 2.25. Weak adjectival declensions in German.

	masculine	feminine	neuter
nominative	-e	-e	-e
accusative	-en	-e	-e
dative	-en	-en	-en
genitive	-en	-en	-en

Table 2.26 provides examples of adjectives marked with inflection from each declension class in nominative case. One example for each declension class (strong: 'new N'; mixed: 'a new N'; weak: 'the new N') is provided for masculine (*Tisch*, 'table'), feminine (*Tür*, 'door'), and neuter nouns (*Bett*, 'bed').

Table 2.26. Examples of adjective declensions in nominative case.

	masculine *Tisch*	**feminine** *Tür*	**neuter** *Bett*
strong	neu**er** Tisch	neu**e** Tür	neu**es** Bett
mixed	ein neu**er** Tisch	eine neu**e** Tür	ein neu**es** Bett
weak	der neu**e** Tisch	die neu**e** Tür	das neu**e** Bett

As illustrated in Table 2.26, the adjectival declension classes vary in the degree to which they provide unambiguous gender information. Weak declensions do not distinguish masculine,

feminine or neuter in nominative case, and in fact, of the remaining cases, only distinguish masculine from feminine and neuter in accusative case. Mixed declensions provide much more gender information, clearly marking masculine, feminine and neuter in nominative case, though it is relevant to note that in dative and accusative case none of the gender values are clearly distinguished. Strong declensions are the most informative with respect to gender, distinguishing all genders in nominative and accusative case and distinguishing masculine and neuter from feminine in the dative and genitive cases.

2.5 Summary

In 2.2, 2.3 and 2.4 I have described the characteristics and realization of the gender feature in the Spanish, French and German (respectively). Table 2.27 offers a summary of the characteristics most relevant to the present study.

Table 2.27. Summary of the gender feature in Spanish, French and German.

Language	**Gender values**	**Formalization**	**Default value**	**Most marked value**	**Marking on N**	**Agreement**
Spanish	masculine feminine	[±feminine]	masc	fem	transparent; *-o* = masc, *-a* = fem	D, Adj, Pro; often clear relationship between inflection and gender value
French	masculine feminine	[±feminine]	masc	fem	opaque	D, Adj, Pro; complex and frequently irregular mapping between inflection and gender value
German	masculine feminine neuter	[±masculine] [±feminine]	masc	neut	very opaque; complicated by noun declension classes	D, Adj, Pro; complex relationship between inflection and gender value

	that interacts with case; syncretism in inflection

The most important difference between Spanish, French and German is that while Spanish and French display two gender values (masculine and feminine), German has three (masculine, feminine and neuter). In spite of this difference, masculine is proposed to be the default value in all three languages, with feminine the most marked in Spanish and French and neuter the most marked in German. With respect to the transparency of gender marking on the noun, Spanish gender marking is very transparent, with *–o* corresponding to masculine and *–a* corresponding almost as reliably to feminine. Unlike Spanish, gender marking in French and German is quite opaque. In French the correspondence between gender value and noun ending is largely unclear due to the number and relatively limited scope of the gender assignment rules needed to account for the distribution of gender. Gender marking on the noun in German is extremely opaque with many small-scope gender assignment rules which are further complicated by numerous exceptions and noun declension classes. While gender agreement is marked on determiners, adjectives and pronouns in all three languages, the relationship between gender value and inflection differs across languages. Spanish is again the simplest as there is often a one-to-one mapping between gender value and inflection. French is more complex due to the frequently irregular (or conditional) realization of gender through agreement. Finally, German is the most complex as there is a one-to-many mapping of gender onto inflection that also interacts with case. Furthermore, there is a high degree of syncretism in inflection between gender values in German.

3. Grammatical Gender Systems in the Bilingual Mental Lexicon

In this chapter I consider the representation of the formal feature of grammatical gender from psycholinguistic and theoretical perspectives. From existing psycholinguistic research I draw on models of lexical access in spoken word production and word recognition, while the theoretical background provides a syntactic analysis of grammatical gender as illustrated in code-switching within the Determiner Phrase (DP). Based on this evidence I formulate the research questions and hypotheses.

3.1 Representational models

The level of representation of grammatical gender and the point at which gender information becomes available and is selected in lexical access is a matter of debate in spoken word production and visual word recognition.

3.1.1 Spoken word production

The most influential models of lexical access in spoken word production (ie. Levelt, Roelofs & Meyer, 1999; Levelt, 1993; Roelofs, 1992, 1997; Dell et al, 1997; Caramazza, 1997) converge on the notion that lexical access consists of two steps, the mapping of semantic information onto an abstract representation of the lexical unit and the mapping of the lexical unit onto phonological information (Dell, Nozari & Oppenheim, 2014), many other aspects of lexical access, including how activation flows between the steps and when selection takes place, remains unclear.

According to the *WEAVER*++ model (Levelt, Roelofs & Meyer, 1999; Levelt, 1993; Roelofs, 1992, 1997) gender is stored lexically, as part of the lemma (or syntactic word) level. In this model, there are three strata: the conceptual stratum which contains the lexical concepts; the lemma stratum which includes lemmas as well the syntactic properties of words (such as grammatical gender);

and the form stratum, encompassing morphemes and the corresponding phonemes (Levelt, Roelofs & Meyer, 1999). *WEAVER++* (Figure 3.1) is also feedforward, such that activation only spreads top-to-bottom and there is no feedback between the strata. In its initial formulation, this model was strictly modular, with no activation of word form information until the lemma has been selected (for instance), however Roelofs (2008) has since modified the model to allow for a limited amount of cascading activation through the strata.

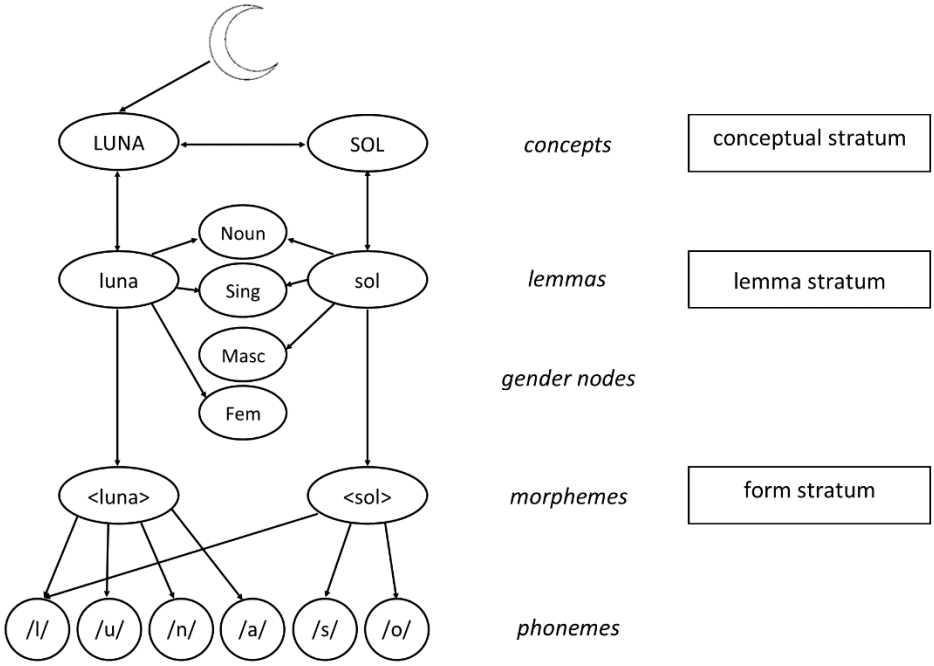


Figure 3.1. *The WEAVER++ (Levelt, Roelofs & Meyer, 1999; Levelt, 1993; Roelofs, 1992, 1997) model of spoken language production (adapted from Roelofs, 2008).*

The *independent network model* (Caramazza, 1997) proposes a modification to *WEAVER++* such that the selection of the syntactic features of a word is formally independent of lemma selection (Figure 3.2). In this model, the semantic, syntactic and lexeme (lexical form) information is represented as independent networks that are connected (Caramazza, 1997). This model also postulates modality-specific lexical forms: orthographic lexemes and phonological lexemes. Orthographic lexemes are only activated and selected in contexts requiring written production

while phonological lexemes are only relevant for verbal production. With regard to grammatical gender, the network containing the syntactic information is further broken down into several subnetworks, including a subnetwork of gender nodes. Like *WEAVER++*, activation in the *independent network model* is feedforward, though unlike *WEAVER++*, the direct links between the lexical-semantic network and the lexical-syntactic and phonological lexeme networks allow for the independent and simultaneous spread of activation (Caramazza, 1997).

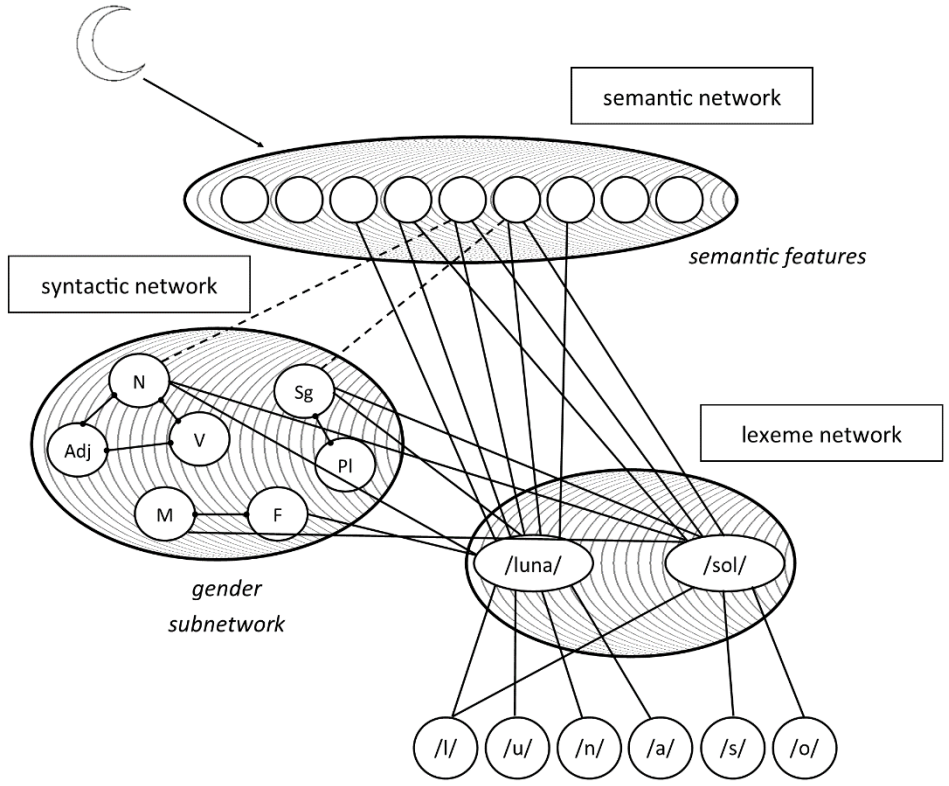


Figure 3.2. *The* independent network model *(Caramazza, 1997) of spoken language production.*

Under the *interactive two-step model* (Dell et al, 1997) – as in the *WEAVER++* model – grammatical gender information is also represented at the lemma level. The *interactive two-step model* (Figure 3.3) also has three layers: the semantic layer, the lemma layer, and the phoneme layer. Unlike *WEAVER++*, however, activation spreads interactively and thus information from the phoneme layer can influence the selection process at the semantic layer (bottom-up activation), just like

information from the semantic layer influences the selection of phonemic information (top-down activation).

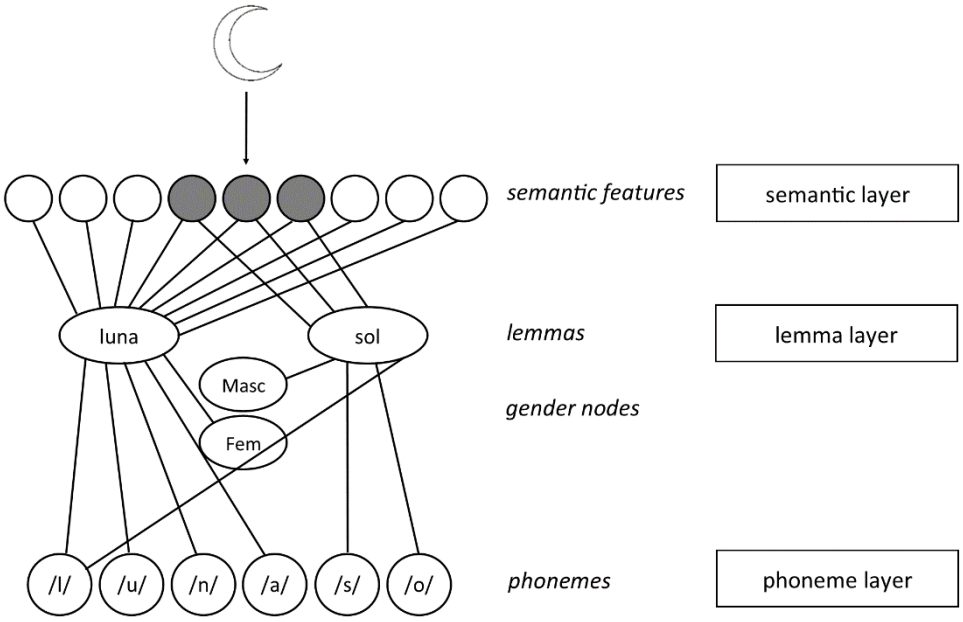


Figure 3.3. *The* interactive two-step model *(Dell et al, 1997) of spoken language production.*

Though all of these models postulate that lexical access is a competitive process, they differ in their assumptions of how lexical selection is achieved. Both *WEAVER*++ (Levelt, Roelofs & Meyer, 1999; Levelt, 1993; Roelofs, 1992, 1997) and the *interactive two-step model* (Dell et al, 1997) assume that each node has an activation value which is determined by the amount of activation it receives but also the amount of decay that occurs should the spread of activation decrease or cease. Ultimately, the node with the highest activation value is selected. Similarly, in the *independent network model* (Caramazza, 1997), the node with the highest activation value is selected, however in contrast to these models, some of the links between nodes are inhibitory such that lower levels of activation are attributable to either decay or negative activation.

The debate regarding the representation of the formal gender feature is evident in the models of language production. While *WEAVER*++ (Levelt, Roelofs & Meyer, 1999; Levelt, 1993; Roelofs, 1992, 1997) and the *interactive two-step model* (Dell et al, 1997) maintain that gender is represented as a feature of the lemma, or syntactic word, in the *independent network model* (Caramazza, 1997) gender is a member of the network of syntactic features that is independent of syntactic word form information. In addition to the lack of clarity regarding the representation of gender, there are also conflicting hypotheses regarding both the selection of gender and the point at which gender information becomes available.

WEAVER++ (Levelt, Roelofs & Meyer, 1999; Levelt, 1993; Roelofs, 1992, 1997) makes a clear distinction between activation and selection. In terms of grammatical gender, this distinction is manifest in the following way: the activation of gender nodes is an automatic consequence of the spread of activation from the conceptual stratum to lemmas, however, a gender node is only selected when gender information is required to compute agreement. Gender information, therefore, is selected in DP and NP production but not when only a bare noun is required (ie. la_{Dfem} $luna_{Nfem}$ or $luna_{Nfem}$ $roja_{Adjfem}$ versus $luna_{Nfem}$).

The *independent network model* (Caramazza, 1997) makes significantly different assumptions regarding the activation and selection of grammatical gender. In this model, gender nodes do not receive activation from the lexical-semantic network and thus are only activated upon selection of a modality-specific (orthographic or phonological) lexeme. Selection of the gender node is assumed to be the automatic result of lexeme selection, and is a non-competitive process since the subnetwork of gender nodes is connected via inhibitory links.

Since the inhibitory links between gender nodes in the *independent network model* do not allow for competitive selection, Miozzo and Caramazza (1999) proposed that competition between the

gender values occurs in the determiner selection process (in other words, at the level of response production). Under this account, dubbed the *determiner selection interference hypothesis* by Schiller and Caramazza (2003), it is determiner selection rather than gender node selection that is the competitive process. The consequences of this account of lexical access differ cross-linguistically, according to whether there is a direct mapping between each gender value and its corresponding determiner (as in nominative case in German) or whether some gender values are mapped onto multiple determiner forms (as with feminine nouns in Spanish). In languages such as German, only gender node selection is required to select the determiner form and thus determiner selection can occur relatively early in lexical access (at the lemma or lexeme level). Languages such as Spanish, however, require the phonological form information of the noun in order to select the determiner form as feminine nouns must select *el* (rather than default *la*) when the noun onset consists of the tonic vowel '*a*'. Since detailed phonological information is only available later in lexical access, determiner selection in languages such as Spanish is delayed in comparison to languages such as German and therefore Spanish can be referred to as a late-determiner selection language while German is an early-determiner selection language.

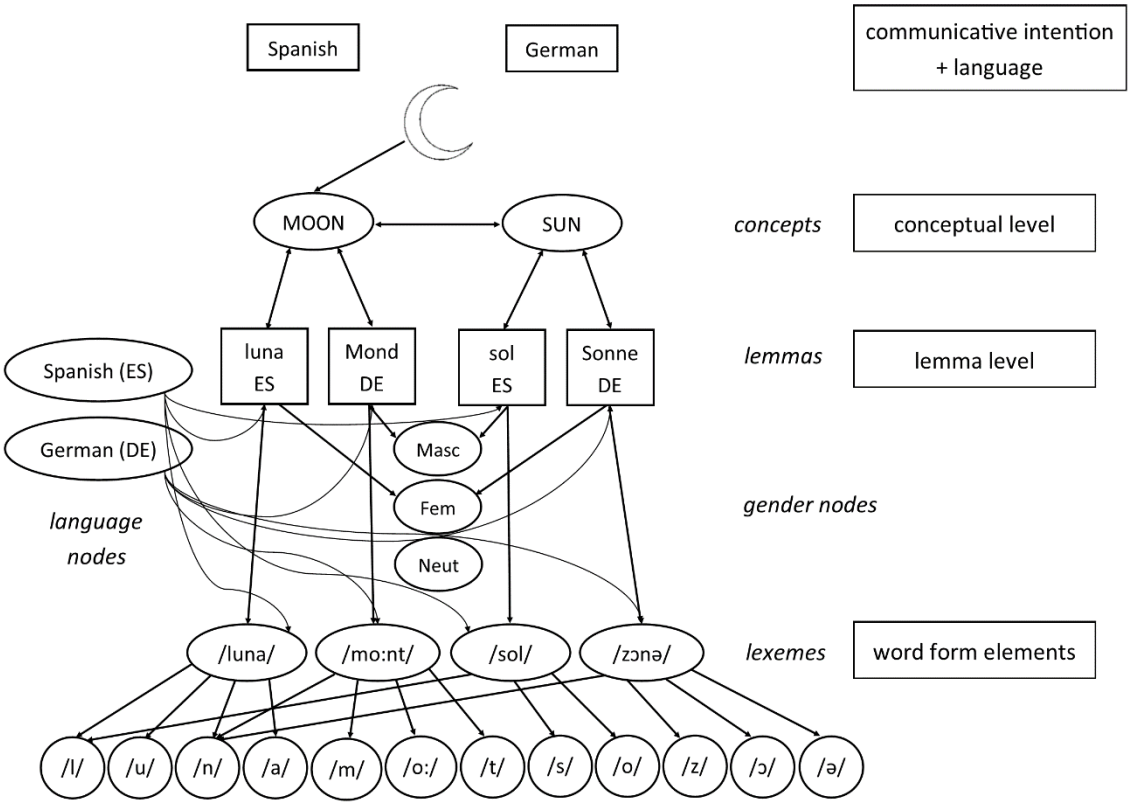


Figure 3.4. *The* multilingual processing model *(De Bot, 2004) of spoken language production.*

In bilingual language production, De Bot (2004) proposed a bilingual extension of the 1993 conceptualization of Levelt's *speaking model* (the basis for *WEAVER*++). Like *WEAVER*++, Levelt's 1993 model includes three basic levels of information: conceptual features, syntactic procedures and word form elements (De Bot, 2004). De Bot (2004) extends this model to bilinguals and multilinguals through the addition of language nodes and target language information to communicative intention (Figure 3.4). In this *multilingual processing model*, the information at each level is represented as language-specific subsets. In order to control the language produced, target language information is communicated to the concept level of the word production process as well as the language nodes and then target language information flows to the subsequent levels from both the lexical concepts and from the language node. While the subsets of information at each level are language-specific, some subsets overlap between languages and therefore, in spite

of the target language information, overlapping subsets (such as shared phonological forms) can activate the non-target language(s). As with *WEAVER++*, syntactic information, such as grammatical gender, is represented at the lemma level, in this case, as part of the syntactic procedures node. This implies that there are gender nodes in the syntactic procedures store for each of the gender values present in all of the bilingual's languages, and that these nodes are specified for the relevant language.

To summarize these models of spoken word production, the key features of each model (including gender information) is outlined in Table 3.1.

Table 3.1. Summary of monolingual and bilingual models of spoken word production.

Model	**Representation of information**	**Type of activation**	**Level of gender information**
WEAVER++	three strata: *conceptual* (lexical concepts), *lemma* (syntactic word & features), *form* (morphemes & phonemes)	top-down	gender nodes linked to lemmas
independent network model	three networks: *semantic* (semantic features), *syntactic* (syntactic features), *lexeme* (orthographic & phonological forms)	simultaneous spread between networks; some links are inhibitory	gender node subnetwork within syntactic network
interactive two-step model	three layers: *semantic* (semantic features), *lemma* (syntactic word & features), *phoneme* (phonemes)	top-down & bottom-up	gender nodes linked to lemmas
multilingual processing model	three levels: *conceptual* (concept features), *lemma* (syntactic word & features), *word form* (morphemes & phonemes) + *language nodes* & *communicative intention mechanism*	top-down	gender nodes linked to syntactic procedures node at lemma level

All models assume that there are three distinct representations for semantic, syntactic, and word form information, though the nature of the links between the representations and how activation

flows between them is a point of contention. *WEAVER++*, the *interactive two-step model*, and the *multilingual processing model* assume that semantic, syntactic, and word form information is represented as levels in a hierarchy such that no direct links exist between the first (semantic information) and third (word form information) levels, while under the *independent network model* there are links between all information types since they are grouped into interconnected networks rather than part of a hierarchy. With respect to activation, *WEAVER++* and the *multilingual processing model* posit that the spread of activation is primarily top-down, in contrast to the *independent network model* and the *interactive two-step model* in which activation is not restricted and can either spread simultaneously (in the case the *independent network model*) or bottom-up in addition to top-down (in the *interactive two-step model*). In terms of gender, while all the models maintain that gender information is represented as nodes at the syntactic level, in *WEAVER++*, the *interactive two-step model*, and the *multilingual processing model* these nodes are linked to the syntactic word form (lemma), while in the *independent network model* gender information is independent of the syntactic word form.

3.1.2 Visual word recognition

Word production and word recognition differ fundamentally in that while the input in production is predominantly top-down, starting with the abstract concept to be expressed and ending with the specification of the phonemes in the target word, in recognition the input is necessarily bottom-up as initially-available phoneme/grapheme information is used to build up to the more abstract representations. Word recognition occurs once activation at the lexical level reaches the recognition threshold and syntactic and semantic information becomes available at this point (De Groot, 2013). This implies that grammatical gender information is available only

upon recognition of the word, in contrast to word production in which gender information is available significantly earlier in the process.

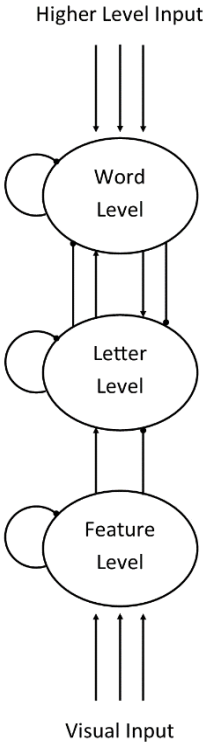


Figure 3.5. *The* interactive activation model *(McClelland & Rumelhart, 1981) of written word recognition (adapted from McClelland & Rumelhart, 1981).*

One of the most influential models, the *interactive activation model* (McClelland & Rumelhart, 1981; Rumelhard & McClelland, 1982), is a connectionist model whose architecture has served as a base for numerous subsequent models (Gomez, 2012). In the *interactive activation model* (Figure 3.5) there are three levels of processing, visual features, letters, and words, as well as some higher processes that provide top-down input to the word level (McClelland & Rumelhart, 1981). This model assumes parallel processing, both in the sense that more than one letter is processed simultaneously and with regard to the fact that processing occurs on multiple levels at the same time (McClelland & Rumelhart, 1981). As its name implies, the *interactive activation model* also

posits that activation is interactive such that processing is bottom-up (input from visual features perceived) and top-down (input from processing above the word level). Activation in this model can be either positive or negative, with inhibitory connections within each level decreasing the activation of incompatible nodes.

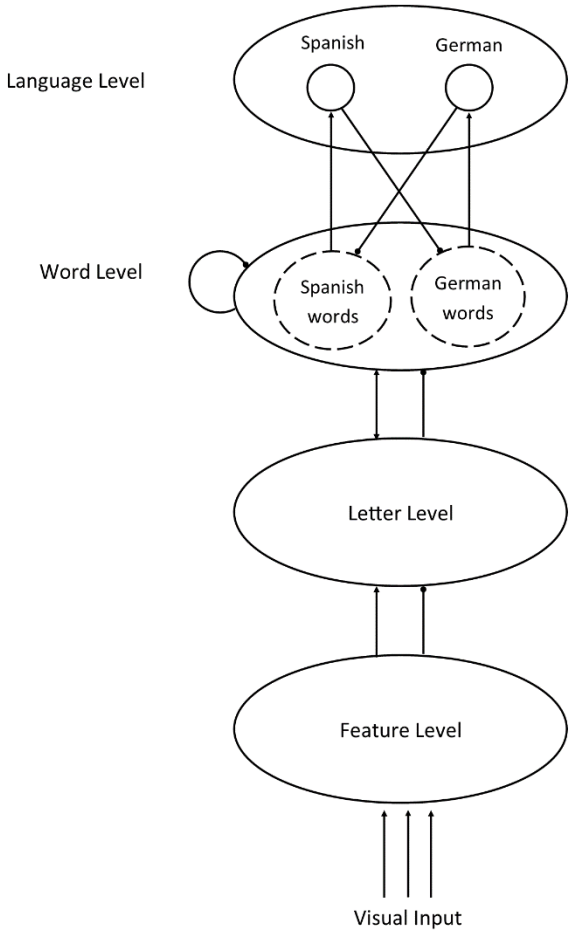


Figure 3.6. *The* BIA *model (Dijkstra & Van Heuven, 1998) of written word recognition (adapted from Dijkstra & Van Heuven, 2002).*

In bilingual visual word recognition, one of the earliest and most widely-cited models is the *bilingual interactive activation model* (*BIA*) (Dijkstra & Van Heuven, 1998) and its extension, *BIA+* (Dijkstra & Van Heuven, 2002). The *BIA* model (Figure 3.6) takes its fundamental architecture from the *interactive activation model* (McClelland & Rumelhart, 1981; Rumelhard & McClelland, 1982), making the same basic assumptions and adding a language level containing language

nodes for each of the bilingual's languages (Thomas & Van Heuven, 2005). This model assumes an L1-L2 integrated lexicon in which activation is non-selective and therefore visual features and letters activate word candidates in both languages. Like the *interactive activation model*, there is lateral inhibition at the word level such that cross-linguistic candidates inhibit each other and inhibition also occurs at the language level since the model allows for top-down as well as bottom-up processing (Thomas & Van Heuven, 2005). In the *BIA* model, language nodes are both representational and functional. Representationally, they provide language tags which serve to label the language to which each word belongs. On a functional level, language nodes facilitate word recognition through the inhibition of words in the non-target language as a result of activation of the target-language node.

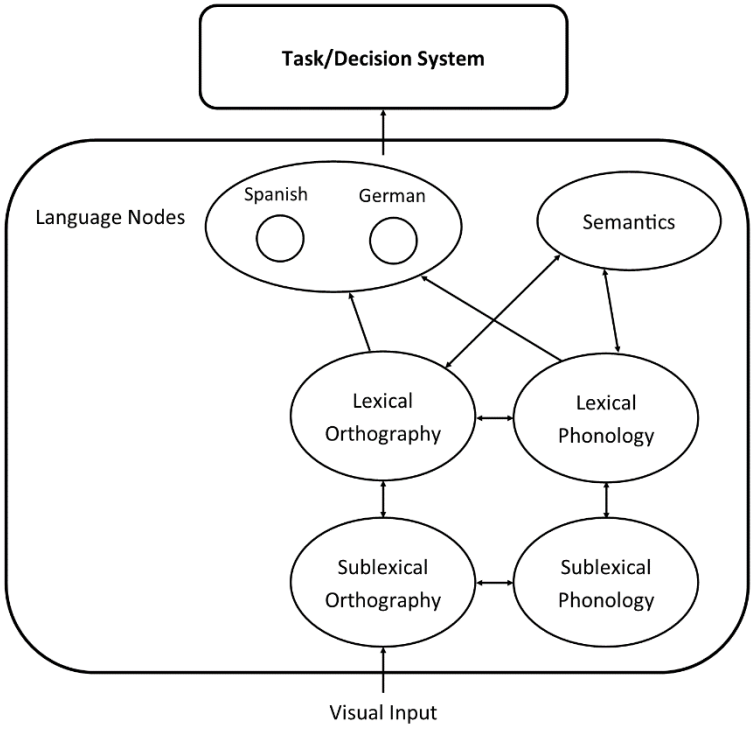


Figure 3.7. *The* BIA+ *model (Dijkstra & Van Heuven, 2002) of written word recognition (adapted from Dijkstra & Van Heuven, 2002).*

The *BIA*+ model (Dijkstra & Van Heuven, 2002) is an extended version of the *BIA* model that adds phonological and semantic representations as well as a language-external control mechanism to account for non-linguistic context effects in bilingual word recognition (Figure 3.7). In this extended model, sublexical orthographic (visual features) and lexical orthographic (letters) representations activate associated phonological and semantic information (Dijkstra & Van Heuven, 2002), as well as word candidates, rather than just simply word candidates (as in the original model). Furthermore, in the *BIA*+ model, languages nodes are reduced to their representational purpose and their activation is an indicator of the general level of activation in the lexicon. The functional role of these nodes under the *BIA* model as well as the non-linguistic context effects are absorbed into a task/decision system which interacts with the linguistic process of word recognition. This system encompasses the impact of instruction, task requirements, and other participant variables (Dijkstra & Van Heuven, 2002).

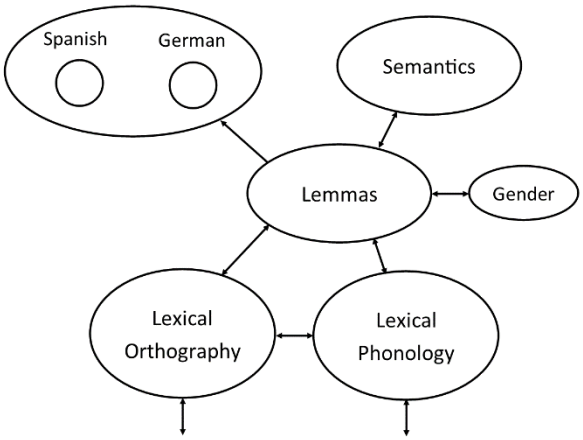


Figure 3.8. *The representation of gender in the* BIA+ *model (Dijkstra & Van Heuven, 2002).*

Neither the *BIA* nor the *BIA*+ models specifically include a representation for syntactic word information (lemmas) or grammatical gender information, however, Dijkstra and Van Heuven (2002) mention that lemma representations would fit into the *BIA*+ model between the word level and the semantic information and that the language nodes would then be connected to this lemma

level. Assuming that features such as gender are attached to the lemma representation, this implies that both gender and language information would be represented as nodes connected to the lemma level (Figure 3.8).

In sum, unlike with spoken word production, the most prominent models of visual word recognition build on each other and thus make similar assumptions. The *interactive activation model* posits that there are three levels of processing – visual features, letters, and words – and that processing of multiple letters and at various levels occurs in parallel. The *BIA* and *BIA+* models are bilingual adaptations of the *interactive activation model*, taking the same basic architecture and adding language nodes (*BIA* and *BIA+*) as well as a language-external control mechanism (*BIA+* only). Similar to the majority of the models of spoken word production, gender information in the *BIA+* model is assumed to be represented as nodes connected to the lemma level.

3.1.3 Bilingual lexical access

There is currently much debate with respect to the representation of the L2 and the interaction between the L1 and the L2 in the bilingual mental lexicon. While some essential aspects of bilingual lexical access are more generally assumed, like the fact that each of the bilingual's languages compete for selection in lexical access (non-selectivity of language activation; De Groot & Nas, 1991; Costa et al. 2000; Vigliocco et al. 2002; Gollan & Acenas, 2004; Salamoura & Williams, 2007; Lemhöfer, Spalek & Schriefers, 2008; among many others) and the fact that the bilingual's languages have a shared representation (language-integrated nature of the bilingual lexicon; ie. Kroll & Stewart, 1994; Green, 1998; Kroll & Tokowicz, 2005), other aspects such as whether access to the L2 must be mediated by the L1 and how the representation and interaction of the L1 and

the L2 change over the course of the L2 acquisition process remain unclear due to the conflicting models proposed and the divergent results in previous work.

As the fields of psycho- and neurolinguistics are continuously offering new evidence of the nature of the bilingual mental lexicon, there are currently no comprehensive models of lexical access, and many of the original models need to be updated in keeping with recent evidence. In order to have a starting point for considering grammatical gender in the bilingual mental lexicon, based on the bilingual models presented in 3.1.1 and 3.1.2, I will assume that the bilingual mental lexicon integrates L1 and L2 representations and that lexical access is non-selective. With respect to grammatical gender, I will assume that formal features are represented as nodes attached to the to the lexical word forms, following previous studies investigating the representation of L1 and L2 gender (i.e. Paolieri et al, 2010b; Morales, Paolieri & Bajo, 2011; Bordag & Pechmann, 2007, 2008; Salamoura & Williams, 2007; Lemhöfer, Spalek & Schriefers, 2008).

3.1.4 Grammatical gender in bilinguals

Bilingual models of word production and recognition have largely ignored the representation of grammatical gender information. Assuming that grammatical gender is represented as a node at the lemma level still leaves the question of the representation and interaction of L1 and L2 gender information unanswered. Along the same lines as debates in other areas of bilingual lexical access, there are two logical possibilities: first, that gender information in the L1 and the L2 has a shared representation, as has been suggested for the conceptual system (i.e. De Groot, 1992); or second, that L1 and L2 gender information is language-specific, as was originally posited for activation in lexical access (i.e. Kroll & Stewart, 1994).

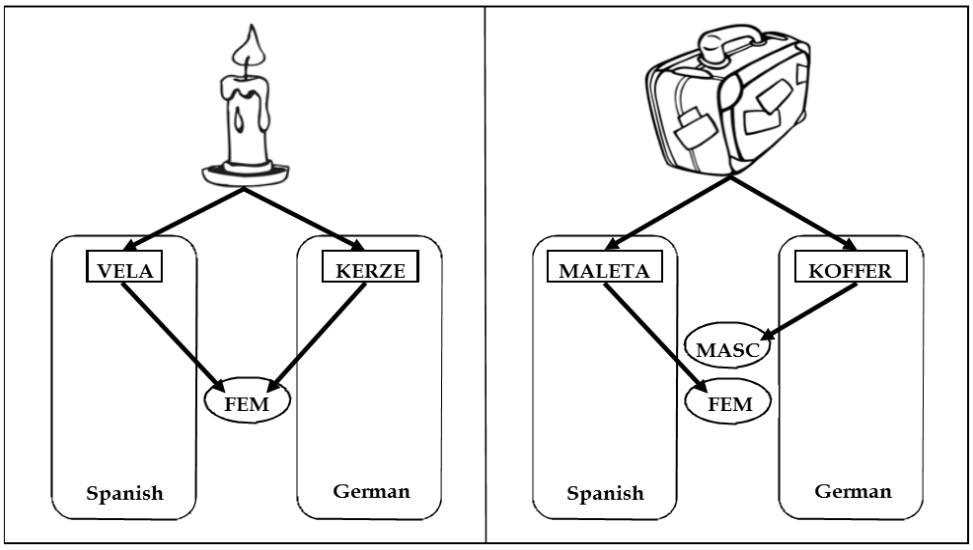


Figure 3.9. *The* gender-integrated representation hypothesis *(Salamoura & Williams, 2007) for L1-L2 gender congruent nouns (left) and L1-L2 gender incongruent nouns (right) (adapted from Costa et al, 2003).*

The *gender-integrated representation hypothesis* (Salamoura & Williams, 2007) adopts the former assumption, namely, that the representation of the L1 and L2 gender information is shared. Under this proposal, 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. Thus, in the case of nouns that have the same gender in the L1 and the L2, the L2 word receives additional activation from the shared gender node activated by both the L1 and L2 words and this increased activation of the same shared gender node facilitates the L2 response. In the case of nouns of different genders in the L1 and the L2, however, the shared gender nodes inhibit the response as the L1 and L2 words activate different gender nodes which then compete for selection and interfere with the response (Figure 3.9).

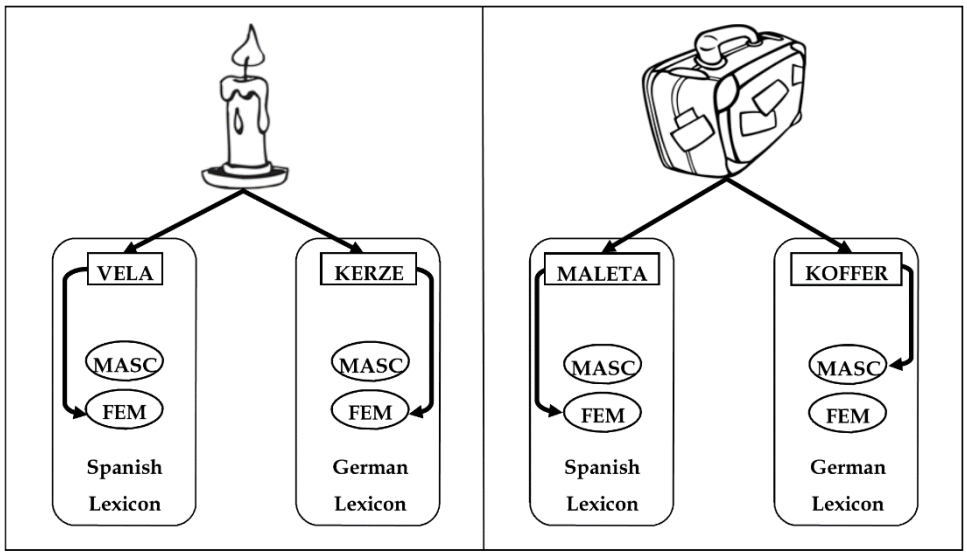


Figure 3.10. *The* gender-autonomous representation hypothesis *(Costa et al, 2003) for L1-L2 gender congruent nouns (left) and L1-L2 gender incongruent nouns (right) (adapted from Costa et al, 2003).*

The *gender-autonomous representation hypothesis* (Costa et al, 2003), on the other hand, assumes 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 3.10). No facilitation or interference due to the activation of L1 gender nodes would be expected in L2 naming if the L1 and L2 gender systems are entirely independent.

3.2 Previous research from a psycholinguistic perspective

Evidence regarding the representation of grammatical gender in the mental lexicon was first offered by Schriefers in his 1993 study of monolinguals. In this study, native Dutch speakers performed two L1 picture-word interference tasks in which they were shown picture stimuli presented with a written distractor word. In this paradigm, participants are asked to name the picture while ignoring the distractor word, which is manipulated in relation to the noun represented by the picture. This picture-word interference task had been used to investigate the effect of semantic and phonological relatedness between the stimulus (picture) and the distractor,

and, in a similar fashion, Schriefers (1993) extended this to grammatical gender by using distractors and stimuli of the same gender (gender-congruent condition) and of different genders (gender-incongruent condition) in Dutch (Figure 3.11). In the first task, 18 L1 Dutch speakers were asked to name the pictures using NPs consisting of D + a colour Adj + N (each picture was coloured). The results revealed that RTs were significantly faster (56ms) for gender-congruent picture-distractor pairs than for gender-incongruent ones. In the second task, another group of 18 L1 Dutch speakers performed the same task but in this case they were asked to name the pictures using NPs without a D (colour Adj + N only). The results again showed that gender-congruent picture-distractor pairs were named significantly faster (30ms) than gender-incongruent pairs, though the effect was smaller in determiner-less NP naming than with full NP naming in the previous task.

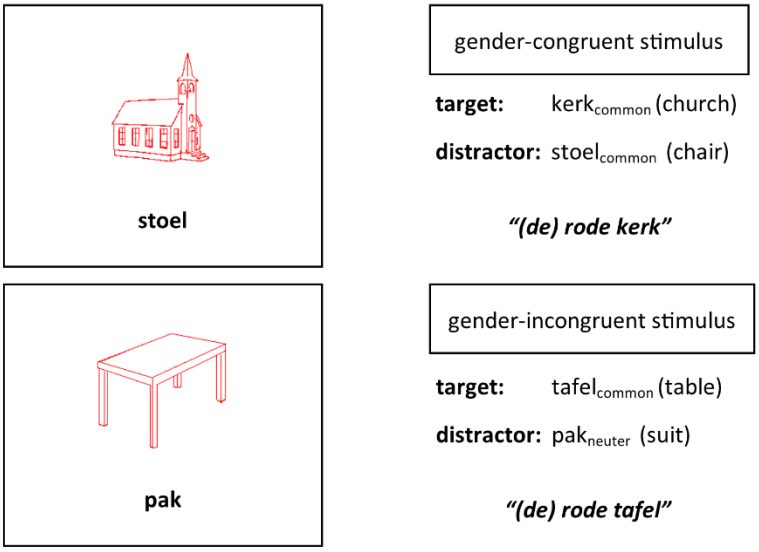


Figure 3.11. *Sample stimuli from Schriefers (1993).*

Schriefers (1993) labelled the effect of the within-language gender congruency manipulations the *gender congruency effect*, and since this initial study, the effect of gender congruency has been investigated in monolingual studies in multiple languages, primarily using a picture-word

interference paradigm. More recently, gender congruency has been investigated in bilinguals through the extension of the picture-word interference paradigm (to one in which gender congruency is manipulated between L1 and L2 translation equivalent nouns rather than between the stimuli and distractor nouns) and the addition of bilingual paradigms such as translation tasks in order to examine the effect of gender congruency between the L1 and the L2. In 3.2.1 I will first outline the evidence from monolingual studies that is relevant to the study of gender in bilinguals and in 3.2.2, 3.2.3 and 3.2.4 I detail the findings in bilinguals with different linguistic profiles.

3.2.1 Monolinguals

Many studies have examined the representation of grammatical gender in monolinguals and the results diverge significantly, even for similar tasks with the same naming requirements within the same language. A summary of the findings is presented in Table 3.2.

Studies of L1 Italian speakers have shown no gender congruency effect in NP and DP production (Miozzo & Caramazza, 1999; Cubelli et al, 2005), but the findings are mixed for bare N production. Like with NP and DP production, Miozzo & Caramazza (1999) found no effect of gender congruency in N naming, but other results indicate that pictures are named more quickly when presented with gender-incongruent distractors than gender-congruent ones (Cubelli et al, 2005; Paolieri et al, 2010a; 2011).

In L1 French speakers, a gender congruency effect in the opposite direction (namely, congruent distractors led to faster naming that incongruent distractors) was found in N naming (Alario et al, 2008). DP naming, however, has shown either a congruency effect in the same direction as N naming (Alario et al, 2008) or no gender congruency effect at all (Alario & Caramazza, 2002).

Results with native Spanish speakers vary even more than those of Italian and French native speakers. Like the Italian speakers, the gender congruency effect found in bare N production shows that L1 Spanish speakers named pictures more quickly in the presence of a gender-incongruent distractor word (Paolieri et al, 2010a). Interestingly, DP naming has shown a gender congruency effect in the opposite direction (Alario et al, 2008) or no effect at all (Costa et al, 1999).

Table 3.2. Summary of gender results in monolingual studies.

Study	Language	Task	N/DP/NP	Gender congruency
Miozzo & Caramazza (1999)	Italian	L1 picture-word interference task	NP (D+N+Adj)	no effect
Miozzo & Caramazza (1999)	Italian	L1 picture-word interference task	DP	no effect
Cubelli et al (2005)	Italian	L1 picture-word interference task	DP	no effect
Miozzo & Caramazza (1999)	Italian	L1 picture-word interference task	N	no effect
Cubelli et al (2005)	Italian	L1 picture-word interference task	N	incongruent < congruent
Paolieri et al (2010a)	Italian	L1 picture-word interference task	N	incongruent < congruent
Paolieri et al (2011)	Italian	L1 picture-word interference task	N	incongruent < congruent
Alario & Caramazza (2002)	French	L1 picture-word interference task	DP	no effect
Alario et al (2008)	French	L1 picture-word interference task	DP	congruent < incongruent
Alario et al (2008)	French	L1 picture-word interference task	N	congruent < incongruent
Costa et al (1999)	Catalan	L1 picture-word interference task	DP	no effect
Costa et al (1999)	Spanish	L1 picture-word interference task	DP	no effect
Alario et al (2008)	Spanish	L1 picture-word interference task	DP	congruent < incongruent
Paolieri et al (2010a)	Spanish	L1 picture-word interference task	N	incongruent < congruent
Schriefers (1993)	Dutch	L1 picture-word interference task	NP (D+Adj+N)	congruent < incongruent
Schiller & Caramazza (2003)	Dutch	L1 picture-word interference task	NP (D+Adj+N)	congruent < incongruent

Schriefers (1993)	Dutch	L1 picture-word interference task	NP (Adj+N)	congruent < incongruent
Schiller & Caramazza (2003)	Dutch	L1 picture-word interference task	NP (Adj+N)	no effect
van Berkum (1997)	Dutch	L1 picture-naming task + N/gender prime	NP (Adj+N)	no effect
van Berkum (1997)	Dutch	L1 picture-word interference task	DP	congruent < incongruent
La Heij et al (1998)	Dutch	L1 picture-word interference task	DP	congruent < incongruent
Schiller & Caramazza (2003)	Dutch	L1 picture-word interference task	DP	congruent < incongruent
La Heij et al (1998)	Dutch	L1 picture-word interference task	N	no effect
Starreveld & La Heij (2004)	Dutch	L1 picture-word interference task	N	no effect
Starreveld & La Heij (2004)	Dutch	L1 picture-word interference task	D	congruent < incongruent
Schriefers & Teruel (2000)	German	L1 picture-word interference task	NP (D+Adj+N)	congruent < incongruent
Schiller & Caramazza (2003)	German	L1 picture-word interference task	NP (D+Adj+N)	congruent < incongruent
Schiller & Caramazza (2003)	German	L1 picture-word interference task	NP (Adj+N)	no effect
Schriefers & Teruel (2000)	German	L1 picture-word interference task	DP	congruent < incongruent
Schiller & Caramazza (2003)	German	L1 picture-word interference task	DP	congruent < incongruent
Alario et al (2008)	German	L1 picture-word interference task	DP	congruent < incongruent
Plemmenou, Bard & Branigan (2002)	Greek	L1 picture-naming task + N prime	Adj	congruent < incongruent

Studies of L1 Dutch speakers have been slightly more consistent, reporting that bare N naming revealed no effect of gender congruency (La Heij et al, 1998; Starreveld & La Heij, 2004) while in D and DP naming gender-congruent distractors led to faster naming (Starreveld & La Heij, 2004; van Berkum, 1997; La Heij et al, 1998; Schiller & Caramazza, 2003). NP production offered mixed results, indicating either a gender congruency effect in the same direction as in D and DP naming

(Schiefers, 1993; Schiller & Caramazza, 2003) or no effect of congruency (van Berkum, 1997; Schiller & Caramazza, 2003).

Results from German native speakers are similar to those of the Dutch speakers. Pictures were named faster in the presence of a gender-congruent distractor word in DP naming (Schriefers & Teruel, 2000; Schiller & Caramazza, 2003; Alario et al, 2008) as well as NP naming (Schiller & Caramazza, 2003; Schriefers & Teruel, 2000), though one study also reported no gender congruency effects in NP naming (Schiller & Caramazza, 2003).

There is limited evidence available regarding the gender representation in L1 Catalan and L1 Greek speakers, however, the studies we do have suggest that there is no effect of gender congruency in DP naming in Catalan (Costa et al, 1999) and that gender congruent primes lead to faster picture naming in Adj production in Greek (Plemmenou, Bard & Branigan, 2002).

Taken together, all of these findings do not clearly support any of the hypotheses regarding the selection of gender and the point at which gender information becomes available in spoken word production. The effect of gender congruency in bare N production in Italian, French, Spanish (Cubelli et al, 2005; Paolieri et al, 2010a; 2011; Alario et al, 2008) offers clear evidence against the *WEAVER*++ model's assumption that gender is only selected in contexts that require agreement to be computed, however, bare N production in Dutch does offer some support for this assumption (La Heij et al, 1998; Starreveld & La Heij, 2004). The evidence is similarly mixed for Miozzo and Caramazza's *determiner selection interference hypothesis* (1999) which posits that it is determiner forms, rather than gender feature nodes, that compete for selection in spoken word production. The lack of evidence of a gender congruency effect in NP/DP naming in Italian (Miozzo & Caramazza, 1999; Cubelli et al, 2005) and Catalan (Costa et al, 1999) lends support to the *determiner selection interference hypothesis* in that determiner selection in these languages

depends on the availability of phonological information and thus the relatively late selection of the determiner form nullifies competition effects. However, determiner selection in French and Spanish also requires phonological information yet several studies have reported an effect of gender congruency in DP naming (Alario et al, 2008). Furthermore, under this hypothesis, gender congruency effects should be found in NP naming in languages such as Dutch and German since the determiner can be selected as soon as gender information is available (much earlier than phonological information in spoken word production) and yet there is some evidence of a lack of gender congruency effect in these contexts (van Berkum, 1997; Schiller & Caramazza, 2003). The lack of clear support for either of these hypotheses does not allow for any predictions to be made with respect to the selection and availability of gender information in bilingual word production and thus I will not assume a specific hypothesis in this research.

3.2.2 Bilinguals: binary gender languages

Though the findings regarding the representation of grammatical gender in bilinguals are also mixed, the pattern of results is somewhat clearer than those with monolinguals. Table 3.3 summarizes all of the previous findings with bilinguals.

With respect to bilingual speakers of languages with two gender values, Costa et al. (2003) investigated the representation of grammatical gender in Spanish-Catalan and Italian-French bilinguals living in Spain and Switzerland, respectively. Both experiments consisted of L2 picture-naming tasks in which participants were asked to produce a DP to name the pictures which were manipulated according to the gender congruency between the L1 and the L2. 24 highly-proficient L1 Spanish-L2 Catalan and 24 highly-proficient L1 Catalan-L2 Spanish bilinguals participated in the first experiment, which revealed significantly faster RTs for gender congruent nouns than gender incongruent ones (23 ms and 24 ms, respectively), however since

this effect was also found in an L1 Spanish control group, the authors concluded that this effect cannot be accounted for in terms of L1-L2 gender congruency. 10 highly-proficient L1 Italian-L2 French bilinguals participated in the following experiment. Like the first experiment, RTs were significantly faster for gender congruent nouns (19 ms), however these results were discarded due to a similar effect found in an L1 French control group.

Paolieri et al. (2010b) and Morales, Paolieri and Bajo (2011) examined the representation of gender in Italian-Spanish bilinguals living in Spain. In Paolieri et al (2010b), 12 advanced L1 Italian-L2 Spanish bilinguals participated in a series of three experiments. In the first experiment, participants completed an L2 picture-naming task in which participants were asked to name the pictures (manipulated according to gender congruency) using either a bare N or a DP. RTs in the first experiment revealed significantly faster naming for gender congruent than gender incongruent nouns (34ms faster in N naming; 44 ms faster in DP naming). In the following experiment, participants again completed an L2 picture-naming task, though they were asked to only produce bare Ns. The results again showed a significant effect of gender congruency, with congruent nouns being named 40ms faster than incongruent ones. The final experiment consisted of an L2 translation task in which participants were asked to translate written L1 nouns by orally producing the bare L2 noun or L2 DP. Gender congruency between the L1 and the L2 nouns was manipulated and the RTs indicated the gender manipulation had a significant effect on naming, with L1-L2 gender congruent nouns translated 62ms faster with bare Ns and 97ms faster with DPs than L1-L2 gender incongruent nouns.

In Morales, Paolieri and Bajo (2011), 32 L1 Italian-L2 Spanish bilinguals with an advanced level of proficiency in Spanish performed an L2 picture-naming task in which they named pictures

manipulated by L1-L2 gender congruency using bare nouns. The RTs revealed that gender congruent pictures were named 20ms faster than gender incongruent ones.

3.2.3 Bilinguals: ternary gender languages

In terms of bilingual speakers of languages with three gender values, Bordag (2004) and Bordag and Pechmann (2007, 2008) investigated the representation of grammatical gender in Czech-German bilinguals living in Germany. In Bordag (2004), participants performed two L2 picture-naming tasks. In the first task, 18 intermediate-advanced L1 German-L2 Czech bilinguals named pictures manipulated by gender congruency in the L2 with fillers named in the L1. The naming response consisted of either a bare noun or an NP comprised of *mal-*, 'small' or *vel-*, 'big' (according to the size of picture relative to a control copy of the picture in the same display) and the noun. RTs were faster for gender congruent nouns than gender incongruent ones in both N naming (74ms) and NP naming (61ms). The second task was the same as the first task, though in this case it was completed by bilinguals with the opposite linguistic profile: L1 Czech-L2 German bilinguals. The RTs patterned the same as the results from the first task: congruent pictures were named 104ms faster than incongruent ones in N naming, and 79ms in NP naming.

In Bordag and Pechmann (2007), 18 L1 Czech-L2 German bilinguals with an intermediate-low advanced proficiency in the L2 performed a series of L2 picture-naming tasks. Like the tasks in Bordag (2004), the first experiment consisted of pictures manipulated according to L1-L2 gender congruency and included L1 fillers. Pictures were named using either a bare noun or an NP (*klein*, 'small' or *groß*, 'big' + N). Following the results from the other tasks, the RTs in this first experiment showed a significant effect of gender congruency, with congruent pictures named 102ms and 132ms faster than incongruent ones in N and NP naming, respectively. The second experiment consisted of the same task as the first experiment, except that the L1 fillers were

excluded. Again, RTs were significantly faster for congruent nouns in both naming conditions (N: 70ms, NP: 67ms). The third experiment was based on the second experiment, with the addition of manipulations according to the transparency of the gender marking on the noun. Though the gender congruency effect was smaller in the third experiment, RTs still showed that congruent nouns were named 30ms or 35ms faster in the N and NP naming conditions, respectively.

In Bordag and Pechmann (2008), Czech-German bilinguals performed a series of L2 translation tasks. In the first task, 18 high intermediate-advanced L1 Czech-L2 German bilinguals orally translated written bare nouns manipulated according to gender congruency between the L1 and the L2 from the L1 into the L2, with some filler nouns translated from the L2 to the L1. Participants produced either a bare N or an NP consisting of *klein*, 'small' or *groß*, 'big' and a noun (depending on the size of the dot presented with the stimulus word). Unlike the L2 picture-naming tasks in Bordag (2004) and Bordag and Pechmann (2007), there was no significant effect of gender congruency in the RTs. In the second task, 18 L1 Czech-L2 German bilinguals (high intermediate-advanced proficiency in the L2) performed the same translation task as before, except that the L2-to-L1 fillers were excluded and the transparency of the gender marking on the stimuli was also considered. No effect of gender congruency was revealed in the RTs for the second task, following the results from the first one. In the final task, stimuli to be translated into the L2 using an NP were presented as written L1 NPs, rather than bare Ns as in the previous two tasks. RTs again showed no effect of gender congruency between the L1 and the L2.

Salamoura (2007) and Salamoura and Williams (2007) examined the gender systems in Greek-German bilinguals living in Greece. In Salamoura (2007), 26 L1 Greek-L2 German bilinguals with an advanced level of proficiency in German performed an L2 grammaticality judgment task and

an L2 picture-word interference task. In the grammaticality judgment task, each L2 stimulus was primed with a semantically-unrelated L1 stimulus to form L1 prime-L2 target trial pairs that were either gender congruent (the gender of the L1 word prime was the same as the gender of the subsequently presented L2 noun) or gender incongruent (the L1 word prime and the L2 target differed in gender). Each stimulus consisted of a grammatical or an ungrammatical DP in either Greek (prime) or German (target). RTs showed a gender congruency effect, with responses for grammatical DPs averaging 51 ms faster for gender congruent prime-target pairs than gender incongruent prime-target pairs. In the L2 picture-word interference task, each picture stimulus was presented with a written Greek distractor word and participants produced a DP to name the picture in German while ignoring the Greek word. As with the grammaticality judgment task, gender between the target noun (represented by the picture) and the distractor noun was manipulated to form gender congruent and gender incongruent conditions and the target (L2) and the distractor (L1) were semantically-unrelated. Participants orally named the gender congruent target-distractor stimuli 45 ms faster than the gender incongruent ones, again indicating an effect of gender congruency between the L1 and the L2.

In Salamoura and Williams (2007), 18 L1 Greek-L2 German bilinguals with an advanced level of L2 proficiency completed an L2 translation task. Participants translated written L1 nouns orally, producing the bare L2 noun or an NP consisting of *klein*, 'small' or *groß*, 'big' (according to the size of the stimulus word) and the noun. Gender congruency between the L1 noun and the L2 translation equivalent were manipulated to form a gender congruent and a gender incongruent condition. While translation latencies in bare noun translation were not significantly affected by L1-L2 gender congruency, in NP translation, gender congruent nouns were translated 80 ms

faster than gender incongruent ones, thus showing a robust gender congruency effect, but only when gender agreement had to be computed between the noun and the adjective.

3.2.4 Bilinguals: languages with different gender values

To the best of my knowledge, only two previous studies have investigated the representation of grammatical gender in bilinguals whose languages differ in number of gender values. Lemhöfer, Spalek and Schriefers (2008) investigated grammatical gender in German-Dutch bilinguals living in the Netherlands through a series of comprehension (lexical decision task) and production experiments (naming tasks). In the L2 lexical decision task, 20 highly-proficient L1 German-L2 Dutch bilinguals were presented with DPs in Dutch, half of which contained nonwords and the other half contained nouns in Dutch that were either gender congruent or incongruent with German (common gender Dutch words were considered congruent if they were either masculine or feminine in German). The determiner appeared on the screen before the noun appeared (such that the full DP was displayed when the participant had to make a decision), and thus the determiner served as a gender prime for the noun. There was no significant effect of gender congruency in the RTs, however there was a trend towards gender congruent stimuli being recognized faster than gender incongruent stimuli. In the L2 picture-naming task, 16 L1 German-L2 Dutch bilinguals with an advanced level of Dutch named pictures manipulated according to L1-L2 gender congruency using either a bare noun or a DP. Similar to the results in the lexical decision task, there was no significant effect of gender congruency in the RTs, however, there was a significant effect of gender in the DP error rates (21% for congruent nouns vs 36% for incongruent ones). In the final experiment, an L2 noun gender training session was added prior to the same L2 picture-naming task as the previous experiment. 22 L1 German-L2 Dutch bilinguals with the same linguistic profile as the previous experiments were trained on the gender

of each of the target nouns through the gender-marked definite determiner prior to performing the picture-naming task. Unlike the previous experiments, the effect of gender congruency was significant for both bare noun and DP naming, with gender congruent nouns being named faster than incongruent nouns by an average of 50ms and 65ms, respectively.

Costa et al. (2003) examined grammatical gender as evidenced in the production of Croatian-Italian bilinguals. In this study, 10 highly-proficient L1 Croatian-L2 Italian bilinguals performed a series of picture-naming tasks. In the first task, participants named pictures in the L2 using DPs. The pictures were manipulated by L1-L2 gender congruency, though neuter nouns were excluded in order to avoid the gender value only present in Croatian. RTs revealed no effect of gender congruency. The second task was the same as the first except that time pressure was applied to the L2 naming by asking participants to respond before the beep. Again there was no significant effect of gender congruency. In the final task, filler pictures to be named in the L1 were added to the L2 picture-naming task. The response requirements were also changed: participants were asked to produce NPs consisting of D + *mio/mia* ('my') + N in the L2 (Italian) and *moj/moja* ('my') + N in the L1 (Croatian). There was no effect of gender congruency on the RTs.

3.2.5 Summary of bilingual research

Existing bilingual research (Table 3.3) offers significant evidence of an effect of L1-L2 gender congruency on the RTs in all response conditions (NP, DP and N) across a variety of experimental paradigms and with multiple language pairings. All of the previous research in bilingual speakers of languages with binary gender systems has shown that responses for gender congruent nouns are faster than responses for gender incongruent nouns (Paolieri et al, 2010b and Morales, Paolieri & Bajo, 2011 for Italian-Spanish; Costa et al, 2003 for Spanish-Catalan; Costa

et al, 2003 for Italian-French[9]). While there is some evidence showing no gender congruency effect in bilingual speakers of languages with ternary gender systems (Bordag & Pechmann, 2008 for Czech-German), the majority of the studies again show faster responses for gender congruent nouns (Bordag, 2004 and Bordag & Pechmann, 2007 for German-Czech; Salamoura, 2007 and Salamoura & Williams, 2007 for Greek-German).

Table 3.3. Summary of gender results in bilingual studies.

Study	Languages	Task	N/DP/NP	L1-L2 gender congruency
Paolieri et al (2010b)	Italian-Spanish	L2 picture-naming task	DP N	congruent < incongruent
Paolieri et al (2010b)	Italian-Spanish	L2 translation task	DP N	congruent < incongruent
Paolieri et al (2010b)	Italian-Spanish	L2 picture-naming task	N	congruent < incongruent
Morales, Paolieri & Bajo (2011)	Italian-Spanish	L2 picture-naming task	N	congruent < incongruent
Costa et al (2003)	Spanish-Catalan	L2 picture-naming task	DP	congruent < incongruent
Costa et al (2003)	Italian-French	L2 picture-naming task	DP	congruent < incongruent
Bordag (2004)	German-Czech	L2 picture-naming task + L1 fillers	NP N	congruent < incongruent
Bordag (2004)	Czech-German	L2 picture-naming task + L1 fillers	NP N	congruent < incongruent
Bordag & Pechmann (2007)	Czech-German	L2 picture-naming task + L1 fillers	NP N	congruent < incongruent
Bordag & Pechmann (2007)	Czech-German	L2 picture-naming task	NP N	congruent < incongruent
Bordag & Pechmann (2008)	Czech-German	L2 translation task + L1 fillers	NP N	no effect
Bordag & Pechmann (2008)	Czech-German	L2 translation task	NP N	no effect
Bordag & Pechmann (2008)	Czech-German	L2 translation task (Ns + NPs translated)	NP N	no effect
Salamoura & Williams (2007)	Greek-German	L2 translation task	NP	congruent < incongruent

[9] While L1-L2 gender congruent nouns were named/translated faster than gender incongruent nouns by Spanish-Catalan and Italian-French bilinguals in Costa et al (2003), these findings should not be taken as a clear indication of a gender congruency effect given that the same effect was also found in the control group and thus these effects could also have arisen from flaws in the experimental design.

Salamoura (2007)	Greek-German	L2 grammaticality judgment task	DP	congruent < incongruent
Salamoura (2007)	Greek-German	L2 picture-word interference task	DP	congruent < incongruent
Lemhöfer, Spalek & Schriefers (2008)	German-Dutch	L2 lexical decision task	DP	congruent < incongruent
Lemhöfer, Spalek & Schriefers (2008)	German-Dutch	L2 picture-naming task	DP N	congruent < incongruent
Lemhöfer, Spalek & Schriefers (2008)	German-Dutch	L2 picture-naming task + noun gender training	DP N	congruent < incongruent
Costa et al (2003)	Croatian-Italian	L2 picture-naming task	DP	no effect
Costa et al (2003)	Croatian-Italian	speeded L2 picture-naming task	DP	no effect
Costa et al (2003)	Croatian-Italian	L2 picture-naming task + L1 fillers	DP	no effect

The data are more mixed for bilinguals whose languages differ in number of gender values. While the same effect of gender congruency found in bilingual speakers of languages with binary and ternary gender systems was also found in German-Dutch bilinguals (Lemhöfer, Spalek & Schriefers, 2008), no effect of gender is reported for Croatian-Italian bilinguals (Costa et al, 2003). In the context of the present research it is important to note that neither the results from German-Dutch nor Croatian-Italian bilinguals can be considered relevant to Spanish-German and French-German bilinguals without some caveats. With respect to German and Dutch, these languages are closely related Germanic languages, with Old Dutch having the same ternary gender system as modern German (masculine and feminine are collapsed into common gender in modern Dutch). For this reason, the gender systems in this language pair cannot be considered to be asymmetric in the same way as unrelated languages such as Spanish/French and German. While Croatian-Italian bilinguals are also speakers of two unrelated languages, Costa et al (2003) did

not include Croatian neuter nouns in their series of experiments and therefore their results do not provide a complete picture of the representation of asymmetric gender systems.

Evidence of an effect of gender congruency between the L1 and the L2 supports the *gender-integrated representation hypothesis* (Salamoura & Williams, 2007) according to which the L1 and L2 gender systems are represented as a single set of shared gender nodes. No gender congruency effect, on the other hand, is in line with the *gender-autonomous representation hypothesis* (Costa et al, 2003) which asserts that the L1 and the L2 gender systems are entirely independent and thus gender nodes are language-specific.

3.3 Gender in code-switching

Code-switching is the alternation between two languages in the same utterance (MacSwan, 2013). There are two general types of code-switching: *intersentential code-switching*, or language alternation between sentences (Example 3.1), and *intrasentential code-switching* in which the alternation occurs within the same sentence (Example 3.2).

(3.1) Gestern war es schön. *Quería llevar al niño al parque, pero tuve que trabajar.*
Yesterday was it nice. Wanted-1ps take a-the boy to-the park, but had-1ps that work
'Yesterday it was nice out. I wanted to take the boy to the park, but I had to work.'

(3.2) Ich hoffe, dass er bald kommt, denn *aquí estamos hartos de esperar.*
I hope-1ps that he soon comes, because here are-2pp fed up of wait
'I hope that he comes soon because we are fed up with waiting here.'

(González Vilbazo, 2005: 83)

While both types of code-switching represent an area of interest in fields such as sociolinguistics, research from a theoretical standpoint has primarily focused on intrasentential code-switching.

In this study, I will focus on a type of intrasentential code-switching: code-switches within the DP (Example 3.3).

(3.3) Das *libro*
the_{Nt} book_{M}

El Buch
the_{M} book_{Nt}

Code-switching within the DP has been the focus of a significant body of linguistic research. In studies on bilingualism and language acquisition researchers have examined the use of gender in code-switched DPs by child and adult L2 as well as balanced bilingual speakers of languages with and without a formal gender feature.

3.4 Previous research from a theoretical perspective

Research on code-switched DPs involving two languages with formal gender has focused almost exclusively on simultaneous bilingual children, examining French-German, Italian-German, Spanish-German and Italian-French code-switches. Radford et al (2007) investigated the use of gender in four 2L1 French-German bilingual children, Céline, Ivar, Annika and Pascal, all of whom lived in Germany and communicated in French with one parent and in German with the other. Naturalistic data from Céline (Kupisch, 2001 & 2004; Kupisch, Müller & Cantone, 2002) were examined from age 2;0 to 3;6 and Ivar, Annika and Pascal (Köppe, 1994) from age 1;10 to 5;1 (Ivar), age 1;6 to 4;2 (Annika) and age 1;5 to 2;11 (Pascal). The children were shown to produce both German D-French N and French D-German N code-switches. In general, the code-switches tended to show gender agreement between the D and the N in the switch (switched N, henceforth), though for Ns that bear a different gender value in French and German, the children

often marked the D for the gender of the translation equivalent N rather than the switched N (Table 3.4). In the case of French D-German N switches in which the N is neuter in German, however, Radford et al (2007) argue that the use of masculine as a default strategy is the most likely account of many of the code-switched DPs involving neuter German Ns due to the fact that Céline also showed a tendency to produce German-only DPs in which the masculine D appears with a neuter N.

Table 3.4. Examples of code-switched DPs for Ns of different genders in French and German (Radford et al, 2007).

DP	Translation (N)	French N	German N	Child
die$_F$ train$_M$	train	train$_M$	Lokomotive$_F$	Céline
ein$_{M/Nt}$ montagne$_F$	mountain	montagne$_F$	Berg$_M$	Céline
ein$_{M/Nt}$ livre$_M$	book	livre$_M$	Buch$_{Nt}$	Ivar
ein$_{M/Nt}$ lune$_F$	moon	lune$_F$	Mond$_M$	Ivar
ein$_{M/Nt}$ avion$_M$	airplane	avion$_M$	Flugzeug$_{Nt}$	Pascal
ein$_{M/Nt}$ ceinture$_F$	belt	ceinture$_F$	Gürtel$_M$	Annika
une$_F$ Sattel$_M$	saddle	selle$_F$	Sattel$_M$	Céline
le$_M$ Kanne$_F$	pot	pot$_M$	Kanne$_F$	Céline
le$_M$ Kopfkissen$_{Nt}$	pillow	oreiller$_M$	Kopfkissen$_{Nt}$	Céline

Cantone and Müller (2008) examined gender agreement in code-switched DPs produced by four 2L1 Italian-German bilingual children (Carlotta, Lukas, Jan, Aurelio) living in Germany who each had one L1 Italian and one L1 German parent. Code-switched DPs were taken from naturalistic data from all children from age 1;8 to 5;0 (examples appear in Table 3.5).

Table 3.5. Examples of code-switched DPs for Ns of different genders in Italian and German (Cantone & Müller, 2008).

DP	Translation (N)	Italian N	German N	Child
eine$_F$ sole$_M$	sun	sole$_M$	Sonne$_F$	Aurelio
eine$_F$ pentola$_F$	pot	pentola$_F$	Topf$_M$	Carlotta
ein$_{M/Nt}$ pannocchie$_F$	ear of corn	pannocchie$_F$	Maiskolben$_M$	Aurelio
il$_M$ Stuhl$_M$	chair	sedia$_F$	Stuhl$_M$	Carlotta
una$_F$ Smetterling$_M$	butterfly	farfalla$_F$	Smetterling$_M$	Aurelio
una$_F$ Blume$_F$	flower	fiore$_M$	Blume$_F$	Aurelio

i$_{M}$ Blumen$_{F}$	flowers	fiori$_{M}$	Blumen$_{F}$	Jan
della$_{F}$ Wasser$_{Nt}$	water	acqua$_{F}$	Wasser$_{Nt}$	Aurelio

While there are examples of DPs in which the D agrees with the translation equivalent N, there are significantly more tokens of DPs in which the D agrees with the switched N (as in *il Stuhl*, where the Italian D is marked for masculine to agree with the German N, in spite of the fact that the equivalent N in Italian is feminine). The data presented in Table 3.6 offer strong evidence in favour of gender agreement between both of the elements in the code-switched DP as the dominant gender use strategy in Italian-German bilinguals.

Table 3.6. Total production of code-switched DPs with Ns of different genders in Italian and German (Cantone & Müller, 2008).

Child	D agrees with switched N	D agrees with translation equivalent N
Carlotta	23 (100%)	0 (0%)
Lukas	49 (89%)	6 (11%)
Jan	25 (83%)	5 (17%)
Aurelio	28 (68%)	13 (32%)
Total	**125 (84%)**	**24 (16%)**

Eichler, Hager and Müller (2012) investigated code-switched DPs in six 2L1 French-German, one 2L1 Spanish-German, seven 2L1 Italian-German and two 2L1 French-Italian child bilinguals. All of the children communicated with one parent in one of their languages and with the other parent in the other language, and all but five lived in Germany (two French-German and one French-Italian child lived in France; one Italian-German and one French-Italian child lived in Italy). The naturalistic data show that 77% of code-switched DPs in which the N bears a different gender value in each of the bilinguals' languages contain a D marked for the gender of the switched N rather than the gender of the translation equivalent N (311 vs 94).

Table 3.7. Total production of code-switched DPs involving neuter German Ns (Eichler, Hager & Müller, 2012).

Code-switched DP	Gender of translation equivalent N	Total
$\mathbf{D_M + N_{Nt}}$	masculine	147
$\mathbf{D_M + N_{Nt}}$	feminine	51
$\mathbf{D_F + N_{Nt}}$	masculine	1
$\mathbf{D_F + N_{Nt}}$	feminine	9

With respect to code-switches involving an additional gender value present in only one of the languages (namely, the neuter value in German that does not exist in French, Spanish or Italian), the data suggest the dominant strategy is the use of masculine agreement (Table 3.7). While it could be argued that $D_M + N_{Nt}$ and $D_F + N_{Nt}$ code-switches in which the gender of the translation equivalent noun matches the gender marking on the D, the fact that there were also 51 instances of $D_M + N_{Nt}$ code-switched DPs in which the translation equivalent N is feminine strongly suggests the use of masculine as a default.

Though there is currently no published research on the production of code-switched DPs by child L2 speakers of two languages with formal gender, Eichler, Hager and Müller (2012) reference data suggesting that a cL2 may demonstrate a preference for agreement between the D and the translation equivalent N over gender agreement with the switched N.

There is very limited available evidence on the use of gender in code-switched DPs for adult speakers of two languages with formal gender. The only study I am aware of is González-Vilbazo's (2005) data on Esplugisch. Using questionnaire data from adult Spanish-German simultaneous bilingual informants, González-Vilbazo (2005) showed that, much like the majority of the child bilinguals, the adult speakers predominantly prefer code-switched DPs in which the D is marked for the gender of the switched N. The data clearly show this for Spanish D-German N DPs, though this preference is not as clear in German D-Spanish N DPs. For feminine Spanish

Ns, the German D seems to consistently be feminine, however there are significant occurrences of the neuter D in switches involving masculine Spanish Ns (though more than half of the Ds are marked for masculine).

3.5 Code-switching analyses

Two formal proposals have been elaborated to account for bilinguals' use of gender in code-switching: the *double-feature valuation mechanism* (Liceras et al, 2008) for Spanish-English DPs and the *gender congruency algorithm* (González Vilbazo, 2005) for Spanish-German DPs.

The *double-feature valuation mechanism* (Liceras et al, 2008) is a formalization of the 'analogical criterion' (Otheguy & Lapidus, 2005) which states that Spanish-dominant Spanish-English bilinguals will produce Spanish D-English N code-switched DPs in which the D is marked for the gender of the Spanish translation equivalent noun (rather than the English noun that is switched). Extending Pesetsky and Torrego's (2001) proposal that nominative case is a Tense feature on D and agreement a D feature on Tense, Liceras et al. (2008) assume that in Spanish DPs, gender (GEN) is an N feature on D and gender agreement (Φ) is a D feature on N. As its name would imply, under the *double-feature valuation mechanism* (Liceras et al, 2008) there are two features that must be valued: the uninterpretable GEN feature on the D (uGEN) needs to be valued on the inherent lexical GEN feature on the N and the uninterpretable Φ feature on the N (uΦ) must be valued on the interpretable Φ feature on the D (Figure 3.12).

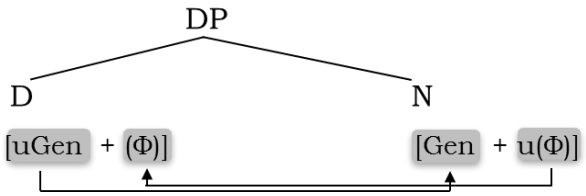


Figure 3.12. *The* double-feature valuation mechanism *(Liceras et al, 2008).*

In code-switched DPs, the valuation of these features must still take place. This is the case in the context of Spanish-English DPs, despite the fact that nouns of languages without grammatical gender (such as English) bear neither the gender feature nor the uninterpretable agreement feature. To allow for the feature valuation, in code-switched DPs involving a Spanish D and an English N, the English N subsumes the features of the Spanish translation equivalent, allowing for the proper valuation of the features (Figure 3.13).

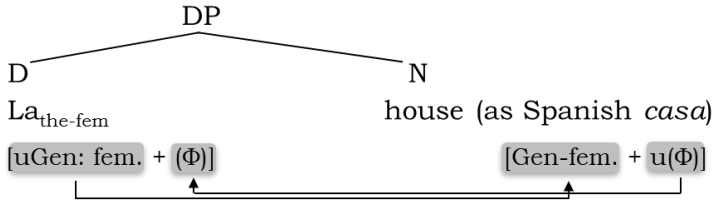


Figure 3.13. *The* double-feature valuation mechanism *(Liceras et al, 2008) account of Spanish-English DPs.*

The *double-feature valuation mechanism* (Liceras et al, 2008) was originally proposed to account for Spanish-English code-switched DPs, but the same mechanism can be extended to code-switches between two languages that both have a formal gender feature. In code-switched DPs in which both languages bear the gender feature (ie. Spanish-German), the uninterpretable GEN feature on the D (uGEN) is valued on the GEN feature on the translation equivalent N and the uninterpretable Φ feature on the translation equivalent N (uΦ) is valued on the interpretable Φ feature on the D (Figures 3.14 & 3.15). Figure 3.14 illustrates the code-switched DPs predicted by the *double-feature valuation mechanism* for Spanish D-German N DPs involving nouns that are masculine in German but feminine in Spanish (left) and neuter in German but masculine in Spanish (right). As per the mechanism, in each case the D is marked for the gender of the equivalent Spanish noun, in spite of the fact that the gender of the switched German noun differs.

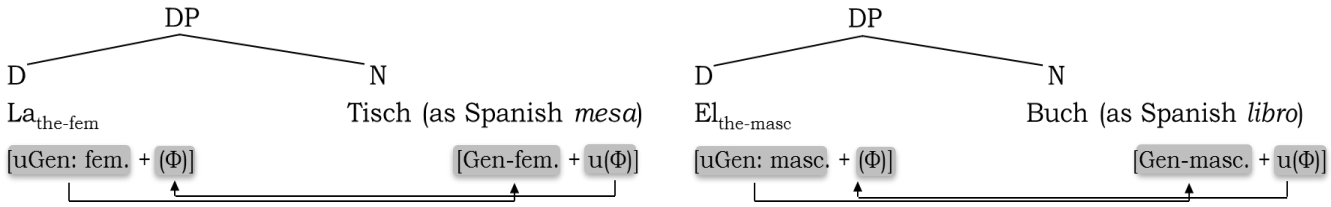


Figure 3.14. *Spanish D-German N code-switched DPs for gender-incongruent (left; 'the table') and neuter nouns (right; 'the book').*

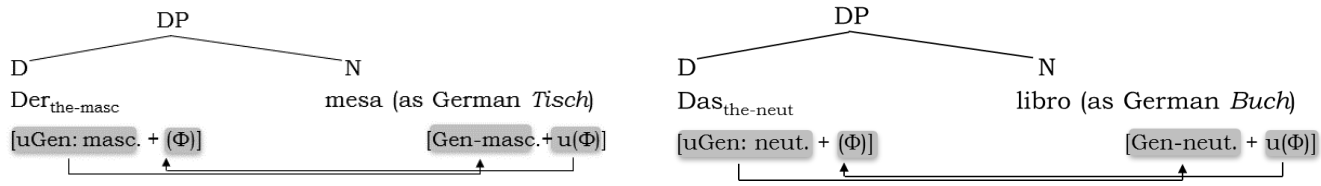


Figure 3.15. *German D-Spanish N code-switched DPs for gender-incongruent (left; 'the table') and neuter nouns (right; 'the book').*

Figure 3.15 shows the code-switches predicted for German D-Spanish N DPs using the same noun pairs as in Figure 3.14 except that the Spanish noun is switched rather than the German one. In this case the D is marked for the gender of the German translation equivalent noun. According to the *double-feature valuation mechanism*, masculine, feminine and neuter are not gender features in and of themselves but rather values of the feature 'gender', and thus the fact that Spanish and German differ in number of gender values does not impose any limitations on the number of viable Spanish-German code-switched DPs. All DPs predicted by the mechanism are shown with examples in Table 3.8.

Table 3.8. Code-switched Spanish-German DP predicted by the *double-feature valuation mechanism*.

Spanish D-German N	**German D-Spanish N**	**Translation**	**Spanish**		**German**	
el$_M$ Flur$_M$	der$_M$ pasillo$_M$	*the hallway*	pasillo	M	Flur	M
la$_F$ puerta$_F$	die$_F$ Tür$_F$	*the door*	puerta	F	Tür	F
el$_M$ Post$_F$	die$_F$ correo$_M$	*the mail*	correo	M	Post	F
la$_F$ Tisch$_M$	der$_M$ mesa$_F$	*the table*	mesa	F	Tisch	M
el$_M$ Buch$_{Nt}$	das$_{Nt}$ libro$_M$	*the book*	libro	M	Buch	Nt
la$_F$ Bett$_{Nt}$	das$_{Nt}$ cama$_F$	*the bed*	cama	F	Bett	Nt

The *gender congruency algorithm* (González Vilbazo, 2005) has been developed to account for code-switched Spanish-German DPs, specifically those produced by speakers of Esplugisch, a mix of Spanish and German spoken in the Deutsche Schule of Barcelona community. Under this proposal, Spanish has one gender feature, [±feminine], and thus the masculine gender value is represented as [-fem] and the feminine gender value as [+fem]. German, unlike Spanish, has the feature [±masculine] in addition to [±feminine] in order to distinguish the masculine gender value ([+masc][-fem]) from the neuter gender value ([-masc][-fem])[10]. The *gender congruency algorithm* (González Vilbazo, 2005) consists of five steps. Initially, the N enters the derivation bearing its inherent gender information from the lexicon (Step I) which consists of the features [±masculine] [±feminine] if the N is in German or simply [±feminine] if the N is in Spanish (Step II). Subsequently, an unspecified D from the other language enters the derivation (Step III). This abstract, unspecified D is then attributed the gender information from the N, with the constraint that any features on the N that do not exist in the language of the D are ignored and do not transfer (namely, the [±masculine] feature in German that is not present in Spanish) and, similarly, that the D must not bear any features that the N does not also have (Step IV). Finally, the D is specified by the gender features transferred from the N (Step V) (González Vilbazo, 2005: 169).

This algorithm applies straightforwardly to all Spanish D-German N code-switches (including masculine, feminine and neuter nouns in German). Figure 3.16 shows an example of the algorithm's account of the code-switch *el Fenster*$_{\text{the window}}$, consisting of the masculine Spanish D *el* and the neuter German N *Fenster*. In the first two steps, gender information consisting of the

[10] Alternatively it has been proposed that German only has [±feminine] (ie. Kramer, 2015) and that neuter is unmarked for gender (masc=[-fem]; fem=[+fem]; neut=Ø). Since this research aims to test the *gender congruency algorithm*, in which it is held that German has two gender features, this alternate account for the gender features in German will not be considered here.

gender features [-fem] and [-masc] comes from the lexicon with the German noun. In Step IV, the previously unspecified Spanish D form receives only the gender feature [-fem] from the German noun as under this account the feature [±masc] does not exist in Spanish and therefore [-masc] is ignored in the derivation. The final step specifies the Spanish determiner as *el*, the masculine form, in accordance with the feature [-fem] transferred from the German noun.

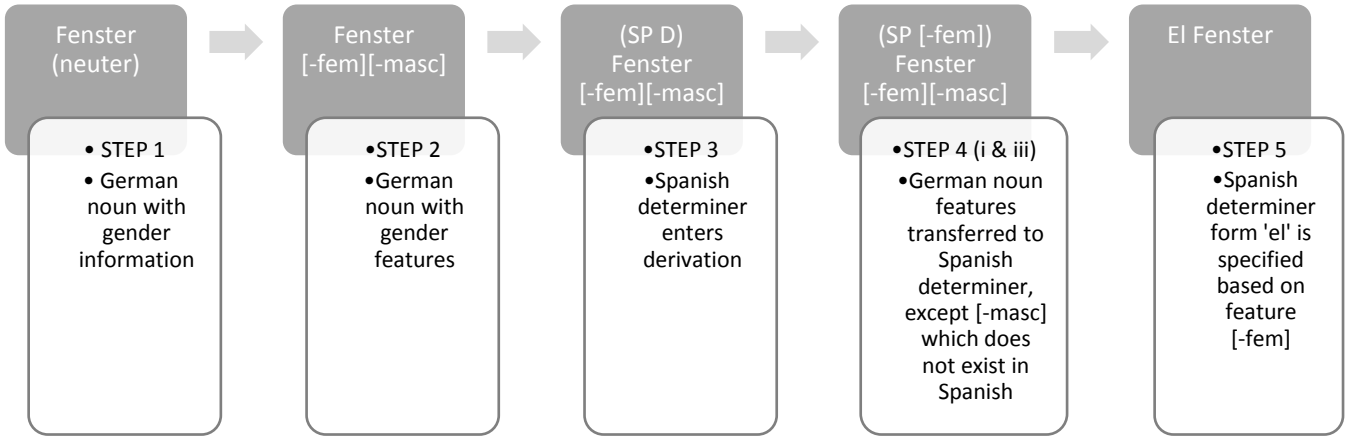


Figure 3.16. *An algorithm account of a code-switched DP with a Spanish D and a German neuter N.*

German D-Spanish N code-switches involving masculine Spanish Ns are more problematic. In these cases, transfer of the feature [-fem] from the Spanish masculine N makes it unclear whether the German masculine or neuter D form should be specified as both definite determiners are [-fem].

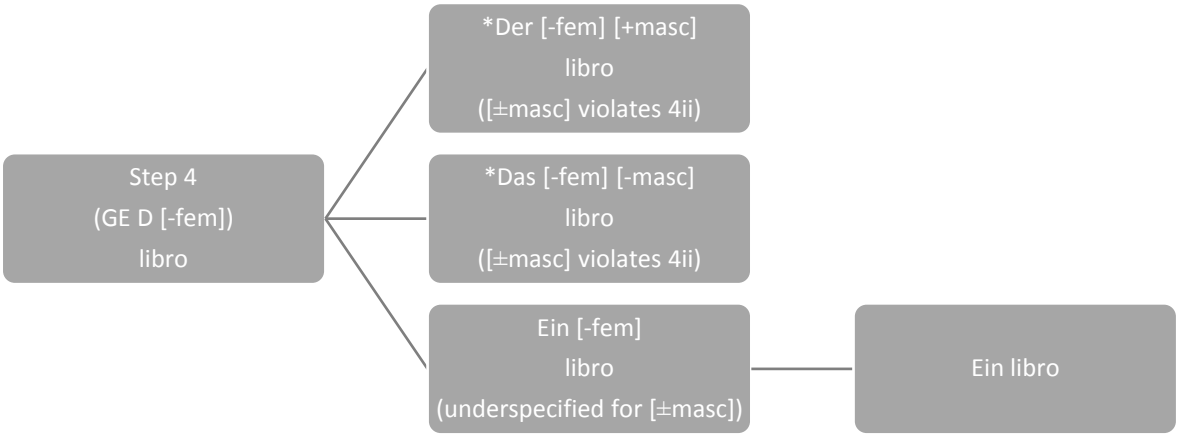


Figure 3.17. *An algorithm account of a German D and a Spanish masculine N.*

Figure 3.17 highlights Step IV, the problematic area for German D-Spanish N (masc) switches. In this example, the Spanish *libro*$_{\text{book}}$ carries masculine gender information and the feature [-fem] from the lexicon. The German D cannot be specified as the masculine definite form or the neuter definite form as though they are both [-fem] they also carry the feature [±masc] which does not exist in Spanish and is therefore uninterpretable in this code-switched DP. According to the algorithm, the indefinite determiner, *ein*, would then be chosen as it carries only the feature [-fem] given that it is syncretic for both masculine and neuter. The code-switched DP *Ein libro* is not ungrammatical given that the German determiner is underspecified for [±masc], and thus not only does it not carry any gender features not present in Spanish but it is also syncretic for masculine and neuter, leaving no issues around the fact that both masculine and neuter are [-fem].

The *gender congruency algorithm* can also be described from a Distributed Morphology perspective. The assumption that German has two gender features (which has been posited by authors such as Hamann, (2010) and Nevins (2011) in addition to González Vilbazo (2005)), presents an issue

for Spanish-German code-switched DPs since Spanish only bears one gender feature. According to the Subset Principle (Halle, 1997), Insertion of the Vocabulary Item (in other words, the phonological realization of the abstract morphemes) cannot take place if the Vocabulary Item bears features not present in the morpheme. Thus, the fact that German bears the feature [±masculine] that is not present in Spanish would prevent Spanish-German DPs from being realized. In spite of this feature clash, Spanish-German code-switches are produced in bilingual speech, a fact which can be accounted for through Impoverishment. Impoverishment is the deletion of one or more features in a specific context, and in this case, the deletion of the German feature [±masculine] occurs when the D or the N in the code-switched DP is specified for Spanish (due to its lack of the feature [±masculine]). The Impoverishment of the gender feature in German is the fundamental assumption in the *gender congruency algorithm*. Figure 3.18 illustrates a Distributed Morphology account for the Spanish-German DP '*el Fenster*' shown in Figure 3.16.

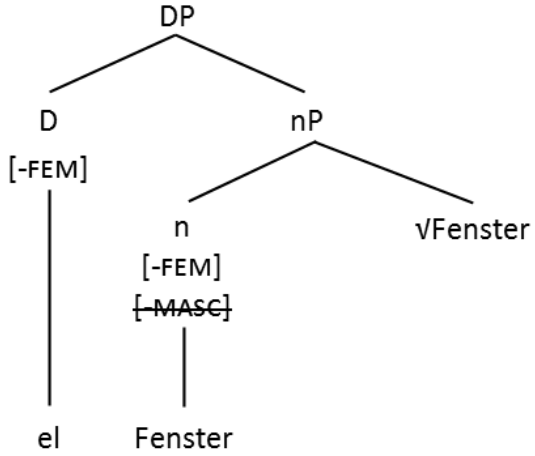


Figure 3.18. *Distributed Morphology account of* 'el Fenster'.

In Figure 3.18, German feature [-masc] has been deleted due to the fact that the D is specified for Spanish. The German noun *Fenster*$_{Nt}$ now only bears the feature [-fem] which matches the features on the D and therefore there is no violation of the Subset Principle. Figure 3.19 illustrates the same Impoverishment of the German gender features in the German-Spanish DP '*die ventana*'. Similar

to Figure 3.18, in Figure 3.19, the [-masc] feature on the D is deleted to avoid the gender feature clash between Spanish and German.

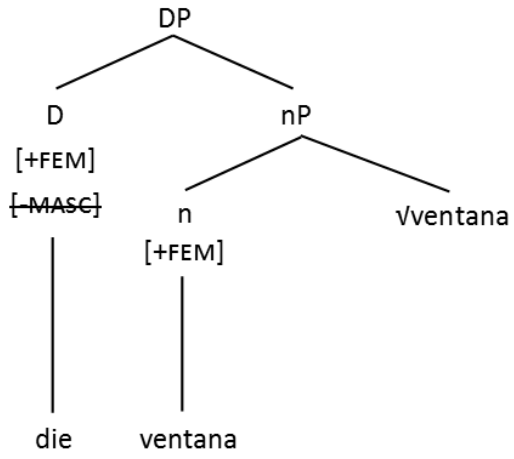


Figure 3.19. *Distributed Morphology account of* 'die ventana'.

This type of feature Impoverishment can account for the viability of Spanish-German code-switches involving all Spanish and German nouns with the exception of Spanish masculine nouns (as outlined in Step 4 in the *gender congruency algorithm*). A Distributed Morphology account of the *gender congruency algorithm* cannot explain why the indefinite German D '*ein*' should be preferred over the definite German Ds '*der*' and '*das*' given that, to the best of my knowledge, there is no principle in Distributed Morphology that would account for a preference for indefinite over definite Ds.

Both the *double-feature valuation mechanism* (Liceras et al, 2008) and the *gender congruency algorithm* (González Vilbazo, 2005) can be linked to the psycholinguistic hypotheses regarding the representation of grammatical gender in the bilingual mental lexicon. The *double-feature valuation mechanism* posits that agreement within the code-switched DP is realized between the D and the translation equivalent noun, and thus assumes that both L1 and L2 gender information must be

available to the bilingual upon retrieval of the switched N. In order for the values of both the L1 and L2 nouns to be available the bilinguals' gender system must have an integrated representation. The *gender congruency algorithm*, in contrast, predicts that the D in the switched DP is marked for the gender of the switched N, without any effect expected from the gender of the translation equivalent N. While this does not exclude the possibility that both L1 and L2 gender information is available to the bilinguals (and just not made use of), it could be considered consistent with the hypothesis that the L1 and the L2 have an independent representation of gender.

Previous research (outlined in 3.4) has not provided clear evidence for either the *double-feature valuation mechanism* (Liceras et al, 2008) or the *gender congruency algorithm* (González Vilbazo, 2005), though the data do support each of these proposals to some extent. The fact that in Radford et al's (2007) study the 2L1 French-German bilingual children tended to produce DPs in which the D was marked for the gender of the translation equivalent N (when the N bore different gender values in each language) is evidence of the analogical criterion and thus supports the *double-feature valuation mechanism* (Liceras et al, 2008). Contrary to Radford et al (2007), in Cantone and Müller (2008), Eichler, Hager and Müller (2012) and González Vilbazo (2005), 2L1 Italian-German, 2L1 French-German, 2L1 Spanish-German and 2L1 French-Italian bilinguals produced significantly more DPs in which the D was marked for the gender of the switched N. Leaving aside the issue of German D-Spanish N code-switches involving masculine Spanish Ns, the evidence of agreement between the D and the switched N supports the *gender congruency algorithm* (González Vilbazo, 2005).

3.6 Research questions and hypotheses

In order to address the limitations of previous research and to further inform the representation of asymmetric gender systems in the bilingual mental lexicon, in this study I propose the research questions and corresponding hypotheses outlined below.

Research Question I: Do asymmetric gender systems in the mind of the bilingual have an L1-L2 shared representation or are the L1 and L2 representations independent?

Hypothesis I: Asymmetric gender systems have a shared representation.

Given the significant body of evidence (Bordag, 2004; Bordag & Pechmann, 2007; Salamoura, 2007; Salamoura & Williams, 2007; Lemhöfer, Spalek & Schriefers, 2008; Paolieri et al, 2010b; Morales, Paolieri & Bajo, 2011) in support of the *gender-integrated representation hypothesis* (Salamoura & Williams, 2007), it was hypothesized that the L1 and L2 gender systems are represented as shared gender nodes in L1 Spanish-L2 German and L1 French-L2 German bilinguals. This would be evident in the presence of a gender congruency effect in which RTs are faster for L1-L2 gender congruent nouns than L1-L2 gender incongruent ones.

Research Question II: Does the gender value not present in both of the bilinguals' languages (neuter in this study) have a separate representation from the values shared by both the L1 and the L2?

Hypothesis II: The asymmetric gender value is represented as an L2-specific gender node in the L1-L2 shared gender system.

Like the gender values common to both the L1 and the L2, it is hypothesized that neuter is represented as a gender node in the L1-L2 shared gender system. However, the nature of the

representation of the neuter gender node will not be the same as that of the masculine and feminine gender nodes since the neuter node is only linked to L2 words. The unique status of the neuter gender node is expected to be evident in slower RTs for neuter nouns (relative to L1-L2 incongruent nouns which are mismatched for masculine and feminine, the gender values present in both of the bilinguals' languages) due to the complexity added by the additional gender value present only in the L2.

Research Question III: What L2 gender strategy do bilingual speakers of two languages with formal gender features use?

Hypothesis III: Bilingual speakers of two languages with grammatical gender will primarily transfer the gender value of the L1 noun into the L2 (L1 transfer).

This hypothesis is in line with previous research on L2 acquisition that has shown pervasive effects of L1 transfer in the use of grammatical gender in the L2 for L1 speakers of languages with grammatical gender. This finding is not surprising given the significant body of evidence in favour of a shared representation for the L1 and L2 grammatical gender systems. Transfer of the gender of the equivalent L1 noun in L2 gender errors has been found with various languages, across proficiency levels and in different types of data (Granfeldt, 2000; Sabourin & Haverkort, 2003; Sabourin, Stowe & de Haan, 2006; Sabourin & Stowe, 2008).

Research Question IV: Do L1 Spanish-L2 German and L1 German-L2 Spanish bilinguals prefer Spanish-German code-switched DPs in which the D is marked for the gender of the translation equivalent N or the switched N?

Hypothesis IV: Both L1 Spanish-L2 German and L1 German-L2 Spanish bilinguals will prefer code-switched DPs in which the D is marked for the translation equivalent N.

It is hypothesized that both speaker groups will prefer switched DPs in which the determiner is marked for the gender of the translation equivalent of the translation equivalent noun. While the only available evidence for Spanish-German code-switched DPs shows that both children (Eichler et al, 2012) and adults (González Vilbazo, 2005) prefer and produce determiners marked for the gender of the noun in the switch, the participants in each of these studies were balanced bilinguals (2L1), unlike the participants in this study who are clearly L1 dominant. It is due to this important difference in linguistic profiles between these participant groups that my hypothesis is that both L1 Spanish-L2 German and L1 German-L2 Spanish speakers will prefer DPs in which the D is marked for the translation equivalent N, as has been previously shown for unbalanced Spanish-dominant Spanish-English bilinguals (ie. Liceras et al, 2008).

4. The Study: The Representation and Processing of Gender Systems

In this chapter I report the findings from two psycholinguistic experiments designed to contribute new data to the debate regarding the representation of L1 and L2 gender systems and also to offer new insight into this representation when the L1 and the L2 have asymmetric gender systems. In addition to this psycholinguistic lexical access perspective on the gender feature in the bilingual mental lexicon, I also examine the type of errors in L2 Determiner Phrase (DP) production and processing to approach gender in the L2 from an acquisition perspective, showing how the representation of asymmetric gender systems is reflected in strategies of L2 gender use.

To investigate both the representation and use of L2 gender information, I designed an L2 picture-naming task and an L2 DP grammaticality judgment task. The L2 picture-naming task has been widely used in previous research on the representation of L1 and L2 grammatical gender systems (Paolieri et al, 2010b; Morales, Paolieri & Bajo, 2011; Costa et al, 2003; Bordag, 2004; Bordag & Pechmann, 2007; Lemhöfer, Spalek & Schriefers, 2008) and thus offers data that can be directly compared with the existing evidence. To the best of my knowledge, the representation of gender systems has not been examined in the same manner using word recognition (though Salamoura (2007) did use an L2 judgment task with a priming paradigm), so for the most part the use of the L2 DP grammaticality judgment task is a novel approach to the representational debates. However, like the L2 picture-naming task, this task provides reaction time (RT) data which can be examined with respect to the gender congruency of the L1 and L2 nouns (in keeping with the production data from previous research, ie. Paolieri et al, 2010b; Lemhöfer, Spalek & Schriefers, 2008) and also allows possible L2 gender use strategies to be targeted more directly than in an error analysis. For these reasons this task is well-suited to the purposes of this study.

4.1 L2 picture-naming task

The first experiment I carried out to investigate the representation of grammatical gender systems in the bilingual mental lexicon was an L2 picture-naming task. In this task, L1 Spanish-L2 German bilinguals were asked to name pictures in German by producing either a bare noun or a DP (definite D + N). Using RT and error rate data, I examined two psycholinguistic proposals, the *gender integrated representation hypothesis* (Salamoura & Williams, 2007) and the *gender autonomous representation hypothesis* (Costa et al, 2003), as well as the nature of the representation of neuter, the gender value not present in the bilinguals' L1.

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 value activate the same gender node. L1 and L2 words of different gender values activate different nodes; however, the nodes are still common to both languages (Figure 4.1).

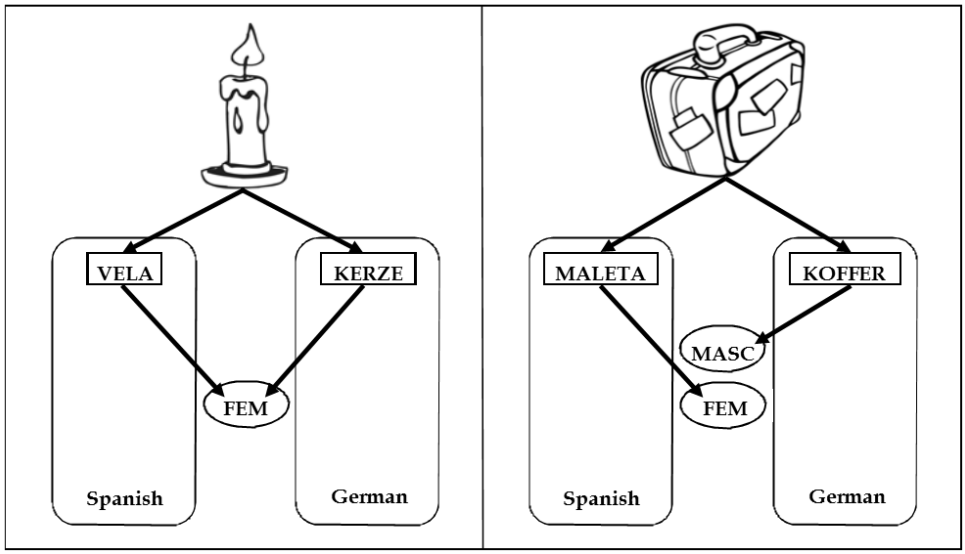


Figure 4.1. *The* gender integrated representation hypothesis *for L1-L2 gender congruent nouns (left) and L1-L2 gender incongruent nouns (right) (adapted from Costa et al, 2003).*

In contrast, the *gender autonomous representation hypothesis* (Costa et al. 2003) maintains that the L1 and L2 gender systems have independent representations 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 4.2).

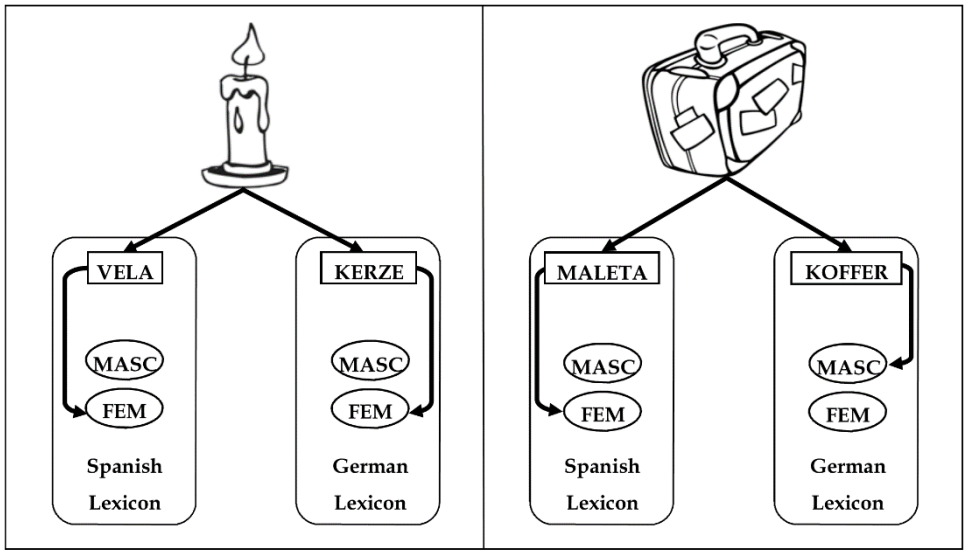


Figure 4.2. *The* gender autonomous representation hypothesis *for L1-L2 gender congruent nouns (left) and L1-L2 gender incongruent nouns (right) (adapted from Costa et al, 2003).*

The two L2 gender representation hypotheses make opposite predictions (Table 4.1). According to the *gender integrated representation hypothesis*, RTs for nouns of the same gender value in the L1 and the L2 (masculine-masculine or feminine-feminine nouns) will be significantly faster than RTs for nouns of different gender values due to the facilitation effect that results when both the L1 and the L2 activate the same, shared gender node. The increased level of activation of the target gender node in addition to the lack of competition from the other shared gender node not activated by either the L1 or the L2 word allow for the fastest selection of the gender information, resulting in the fastest response. RTs for nouns of different gender values in the L1 and the L2 (masculine-feminine or feminine-masculine nouns) will be significantly slower than RTs for L1-L2 gender congruent nouns due to the interference created by the activation of one shared gender node by the L1 and a different, but shared, gender node in the L2. The activation of two gender nodes requires additional time to resolve the conflict in the selection of the gender node and thus results in a slower response.

Table 4.1. Predictions for both psycholinguistic proposals.

Gender congruency of L1 and L2 nouns	**Examples of L1-L2 nouns**	**Gender integrated**	**Gender autonomous**
gender congruent	masculine-masculine; feminine-feminine	fastest RTs due to facilitation effect of same L1 and L2 gender	no effect on RTs
gender incongruent	masculine-feminine; feminine-masculine	slower RTs than gender congruent nouns due to interference between L1 and L2 genders	no effect on RTs
L2 nouns whose gender value has no L1 equivalent	masculine-neuter; feminine-neuter	slower RTs than gender congruent nouns due to interference between L1 and L2 genders	no effect on RTs

Contrary to the predictions of the *gender integrated representation hypothesis*, the *gender autonomous representation hypothesis* predicts no effect of gender congruency between the L1 and L2 nouns on the RTs. Under this hypothesis the L1 and the L2 gender systems have a separate representation and therefore activation of the gender value of the L1 word would neither create facilitation nor interference in the selection of the gender value of the L2 word. Neither of these hypotheses makes predictions for L2 nouns that bear a gender value not present in the L1 (L2 neuter nouns that are masculine or feminine in the L1), however, it is clear that the *gender autonomous representation hypothesis* would still predict no effect of asymmetric gender incongruency on RTs since the number of gender values in the L1 and the L2 would not alter the language-specific representation for L1 and L2 gender that is posited under this proposal. Though the *gender integrated representation hypothesis* does not make any predictions specific to L2 neuter nouns, since nouns that bear a gender value not present in the L1 are also by definition gender incongruent, it is predicted that RTs would be significantly slower than those for the nouns of the same gender value in the L1 and the L2 (as predicted for masculine-feminine or feminine-masculine incongruent nouns). Whether the RTs would be expected to differ between the two types of incongruency (incongruency between gender values present in both languages or incongruency involving the L2 value not present in the L1) cannot be extrapolated from the current formulation of the *gender integrated representation hypothesis*.

Existing bilingual research offers substantial evidence in favour of the *gender integrated representation hypothesis* in all response conditions (NP, DP and N) across a variety of experimental paradigms and with multiple language pairings. Previous research has shown that RTs for gender congruent nouns are faster than RTs for gender incongruent nouns in Italian-Spanish bilinguals (Paolieri et al, 2010b; Morales, Paolieri & Bajo, 2011), Spanish-Catalan bilinguals (Costa et al,

2003), Italian-French bilinguals (Costa et al, 2003), German-Czech bilinguals (Bordag, 2004; Bordag & Pechmann, 2007), and Greek-German bilinguals (Salamoura, 2007; Salamoura & Williams, 2007). There is minimal evidence supporting the *gender autonomous representation hypothesis* in Czech-German bilinguals (Bordag & Pechmann, 2008). Only two studies that I am aware of have addressed the representation of asymmetric gender systems, and these have provided support for both proposals. An effect of gender congruency has been reported for German-Dutch bilinguals (Lemhöfer, Spalek & Schriefers, 2008), supporting an integrated gender representation, however, for Croatian-Italian bilinguals (Costa et al, 2003) the lack of gender congruency effect suggests an independent representation. In the context of the present research it is important to note that neither the results from German-Dutch nor Croatian-Italian bilinguals can be considered relevant to Spanish-German bilinguals without some caveats. With respect to German and Dutch, these languages are closely related Germanic languages, with Old Dutch having the same ternary gender system as modern German (masculine and feminine are collapsed into common gender in modern Dutch). For this reason, the gender systems in this language pair cannot be considered to be asymmetric in the same way as unrelated languages such as Spanish and German. While Croatian-Italian bilinguals are also speakers of two unrelated languages, Costa et al (2003) did not include Croatian neuter nouns in their series of experiments and therefore their results do not provide a complete picture of the representation of asymmetric gender systems.

Two main research questions are addressed in this experiment. These research questions and the hypotheses are outlined below:

Research Question I: Do asymmetric gender systems in the mind of the bilingual have an L1-L2 shared representation or are the L1 and L2 representations independent?

Hypothesis I: Asymmetric gender systems have a shared representation.

Given the significant body of evidence (Bordag, 2004; Bordag & Pechmann, 2007; Salamoura, 2007; Salamoura & Williams, 2007; Lemhöfer, Spalek & Schriefers, 2008; Paolieri et al, 2010b; Morales, Paolieri & Bajo, 2011) in support of the *gender integrated representation hypothesis*, it was hypothesized that the L1 and L2 gender systems of L1 Spanish-L2 German bilinguals are represented as shared gender nodes. This would be evident in the presence of a gender congruency effect in which RTs are faster for L1-L2 gender congruent nouns than L1-L2 gender incongruent ones.

Research Question II: Does the gender value not present in both of the bilinguals' languages (neuter in this study) have a different representation from the values shared by both the L1 and the L2?

Hypothesis II: The asymmetric gender value is represented as an L2-specific gender node in the L1-L2 shared gender system.

Like the gender values common to both the L1 and the L2, it is hypothesized that neuter is represented as a gender node in the L1-L2 shared gender system. However, the nature of the representation of the neuter gender node will not be the same as that of the masculine and feminine gender nodes since the neuter node is only linked to L2 words. The unique status of the neuter gender node is expected to be evident in slower RTs for neuter nouns (relative to L1-L2 incongruent nouns which are mismatched for masculine and feminine, the gender values present in both of the bilinguals' languages) due to the complexity added by the additional gender value present only in the L2.

4.1.1 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 30-question written grammar test of the Goethe-Institut (2010), was 53.7% (SD=3.5). Less than half (47%) of participants reported to have taken some French courses in secondary school, however none reported actively using French in their daily lives at the time of testing.[11] 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 experiment. All control group participants reported to have taken language courses (including English, Latin, and some Romance languages) in secondary school and university, however only English was used regularly. All participants had normal or corrected-to-normal vision.[12]

4.1.2 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 (all stimuli are included in Appendix A).

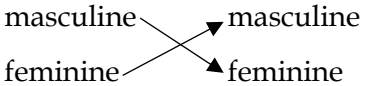
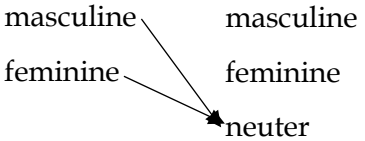
Grammatical gender congruency between the Spanish and German nouns was manipulated to create three main conditions: gender congruent nouns, gender incongruent nouns, and L2 neuter

[11] Furthermore, only 6 stimuli bore a different gender value in French than in Spanish (*assiette*$_F$-*plato*$_M$; *brosse*$_F$-*cepillo*$_M$; *oignon*$_M$-*cebolla*$_F$; *tapis*$_M$-*alfombra*$_F$; *robe*$_F$-*vestido*$_M$; *lit*$_M$-*cama*$_F$), and these stimuli are distributed evenly between the gender congruency conditions.

[12] 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.

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. The difference between these two types of gender incongruency between the L1 and the L2 is shown in Table 4.2.

Table 4.2. Sample target nouns illustrating the two types of gender incongruency.

Gender incongruency subcondition	**L2 target noun (German)**	**L1 equivalent noun (Spanish)**	**L1 gender**	**L2 gender**	**Type of incongruency between L1 and L2**
L1 masculine – L2 feminine	Tastatur (*keyboard*)	teclado	masc	fem	
L1 feminine – L2 masculine	Tisch (*table*)	mesa	fem	masc	
L1 masculine – L2 neuter	Buch (*book*)	libro	masc	neut	
L1 feminine – L2 neuter	Fenster (*window*)	ventana	fem	neut	

The first two rows illustrate masculine-feminine mismatches, in which the conflict is between two gender values present in both languages. The last two rows show mismatches involving neuter that create conflict between the L1 gender values and a gender value that only exists in the L2 (neuter).

Nouns were matched as closely as possible for frequency in German and Spanish using *CELEX* (Baayen, Piepenbrock & Van Rijn, 1995) and *LEXESP* (Sebastian & Martí, 2000), respectively. Noun frequency (Table 4.3) did not differ significantly by congruency condition ($F(2,110)=1.714$, $p=.185$) or by language ($F(1,110)=.032$, $p=.858$).

Table 4.3. Mean log frequency by language and noun gender congruency condition.

	congruent nouns	**incongruent nouns**	**L2 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.

Word ending was also taken into consideration for the Spanish nouns, and only nouns marked canonically for gender 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 the gender value of the noun from the word form in German given the significant exceptions in the theories on gender distribution based on phonological and morphological regularities. No cognates between Spanish and German were included due to the previously found facilitation effect in RTs for cognates over translation equivalent nouns that do not overlap in form.

4.1.3 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 (Figure 4.3).

bare noun: "*Schuh*"

DP: "*der Schuh*"

Figure 4.3. *Sample stimulus in each naming condition.*

Both the bare noun and DP naming conditions were included given that there is some evidence in monolingual studies using the picture-word interference paradigm that the presence of a gender congruency effect may vary by language typology and according to whether or not gender information is required to select the correct determiner form. While there has been no influence of naming condition reported in many of the previous bilingual studies (Paolieri et al, 2010b; Lemhöfer, Spalek & Schriefers, 2008; Bordag, 2004; Bordag & Pechmann, 2007, 2008), both naming conditions were included in this experiment in order to ensure that potential gender congruency effects elicited by the stimuli were not masked by competition at other levels of spoken word production (ie. the selection of the phonological word form), preventing the target effects from being detected in the data.

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 (Figure 4.4). 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*$_{N}$).

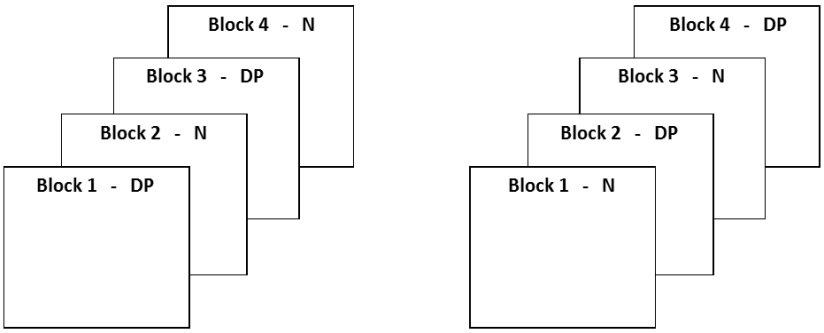


Figure 4.4. *Naming conditions by block for lists 1 & 2 (left) and lists 3 & 4 (right).*

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 (identical to the type of trials in the task itself) prior to the start of the naming task to familiarize the participants with the task.

4.1.4 Procedure

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 (no gender information was provided). 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 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 in order to eliminate the effect of the monitor's refresh rate from the data. Most computer monitors have a refresh rate of 60 Hz, which means that there is an average of 16 ms between when the software records that the stimulus is being presented and when it actually appears on the screen. These novel technique allowed for this delay to bypassed, resulting in RTs that only reflect participant naming times.

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 RTs, 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 L1 Spanish-L2 German bilinguals were asked to indicate the corresponding definite determiner and noun (DP) for each picture stimulus 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 gender values). The bilinguals also took a German proficiency test and all participants completed a language background questionnaire.

4.1.5 Results

4.1.5.1 Data

Audio files were normalized and denoised using a band pass filter (20 Hz to 20 kHz) and a custom program calculated the RTs 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 L1 names not assumed in the experimental design 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).

4.1.5.2 Analyses

Repeated-measures analyses of variance (ANOVAs) were run on RTs as well as error rates, and on participant and items means (F_1 and F_2 statistics, respectively). The factors were Congruency (congruent versus incongruent versus L2 neuter), Phrase Type (bare noun versus DP) and Native Language (L1 Spanish versus 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. As a measure of effect size, partial eta squared (η_p^2) is reported.

4.1.5.3 Reaction times

Mean RTs for the L1 Spanish-L2 German and the L1 German groups are presented in Table 4.4 and illustrated in Figure 4.5.

Table 4.4. Mean RTs (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)
L2 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 congruency effects (p< .05) are marked *.

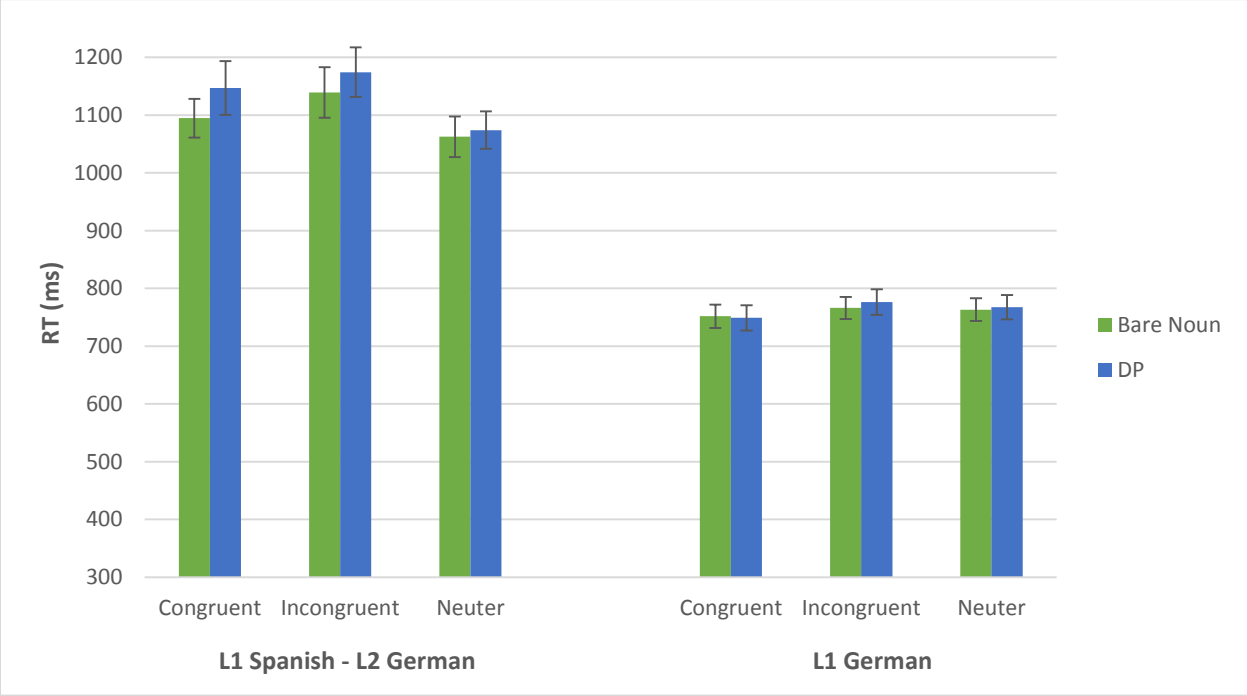


Figure 4.5. *L1 Spanish-L2 German and L1 German mean RTs.*
(Error bars represent the standard error of the mean)

The results of the ANOVAs on RTs showed a main effect of Native Language ($F_1(1,40)=101.968$, $p<.001$, $\eta_p^2=.718$; $F_2(1,57)=599.39$, $p<.001$, $\eta_p^2=.913$), indicating that in general the L1 German

speakers responded significantly faster than the L1 Spanish-L2 German bilinguals. Congruency was also significant by participants ($F_1(2,39)=8.946$, p=.001, $\eta_p^2=.314$) but not by items ($F_2(2,57)=2.038$, p=.140)[13]. This effect was further qualified by the interaction between Congruency and Native Language ($F_1(2,39)=7.542$, p=.002, $\eta_p^2=.279$; $F_2(2,57)=3.145$, p=.051, $\eta_p^2=.099$) which was significant for the L1 Spanish-L2 German bilinguals ($F_1(2,39)=14.395$, p<.001, $\eta_p^2=.425$) but not the L1 German speakers ($F_1(2,39)=1.143$, p=.329), illustrating that only the bilinguals' RTs differed significantly according to the gender congruency conditions. Pairwise comparisons revealed that the L1 Spanish-L2 German bilinguals responded significantly faster (p<.001) to congruent nouns than incongruent ones (bare N: 1095ms vs 1139ms; DP: 1147ms vs 1174ms). Interestingly, the bilinguals also responded significantly faster (p<.001) to L2 neuter nouns than incongruent ones (bare N: 1063ms vs 1139ms; DP: 1074ms vs 1174ms).[14] There was no significant effect of Phrase Type ($F_1(1,40)=3.599$, p=.065; $F_2(1,57)=.705$, p=.404), which indicates that RTs did not differ significantly between naming conditions for either the L1 Spanish-L2 German bilinguals or the L1 German speakers.

4.1.5.4 Error rates

Mean errors rates are presented in Table 4.4. The results of the ANOVAs run on the error rates showed that Native Language was significant ($F_1(1,40)=148.986$, p<.001, $\eta_p^2=.788$; $F_2(1,57)=128.334$, p<.001, $\eta_p^2=.692$), indicating that the L1 German speakers made significantly fewer naming errors than the L1 German-L2 Spanish bilinguals. There was also a main effect of Congruency, which was significant by participants ($F_1(2,39)=7.696$, p=.002, $\eta_p^2=.283$) but not by

[13] The lack of effect in the analysis by items is likely attributable to the fact that in this ANOVA Congruency is a between-items factor which is a more difficult effect to detect.

[14] There was no significant difference between RTs for congruent and L2 neuter nouns (p=.994).

items ($F_2(2,57)=.945$, p=.395). This effect interacted significantly with Native Language ($F_1(2,39)=6.707$, p=.003, $\eta_p^2=.256$; $F_2(2,57)=2.357$, p=.104), and revealed that, like with RTs, Congruency was significant in the bilinguals ($F_1(2,39)=11.170$, p<.001, $\eta_p^2=.364$) but not in the L1 German speakers ($F_1(2,39)=11.170$, p=.267). Pairwise comparisons revealed that the L1 Spanish-L2 German bilinguals made significantly (p<.001) fewer errors with congruent than incongruent nouns (DP: 28.4% vs 43.6%). In keeping with RT results, it is also interesting that the bilinguals made significantly fewer errors (p=.003) with L2 neuter nouns than incongruent ones (DP: 28.3% vs 43.6%).[15] There was no significant effect of Phrase Type ($F_1(1,40)=1.681$, p=.202; $F_2(1,57)=.710$, p=.403).

4.1.6 Discussion

The results show that gender congruency between the L1 and L2 nouns significantly affects RTs, an effect which is significant in both bare noun and DP production. The faster RTs 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, 2010b; Morales, Paolieri & Bajo, 2011; Lemhöfer, Spalek & Schriefers, 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

[15] There was no significant difference between error rates for congruent and L2 neuter nouns (p=.062).

inhibit the response as the L1 and L2 words activate different gender nodes which then compete for selection, interfering in the production of the target noun (Figure 4.6).

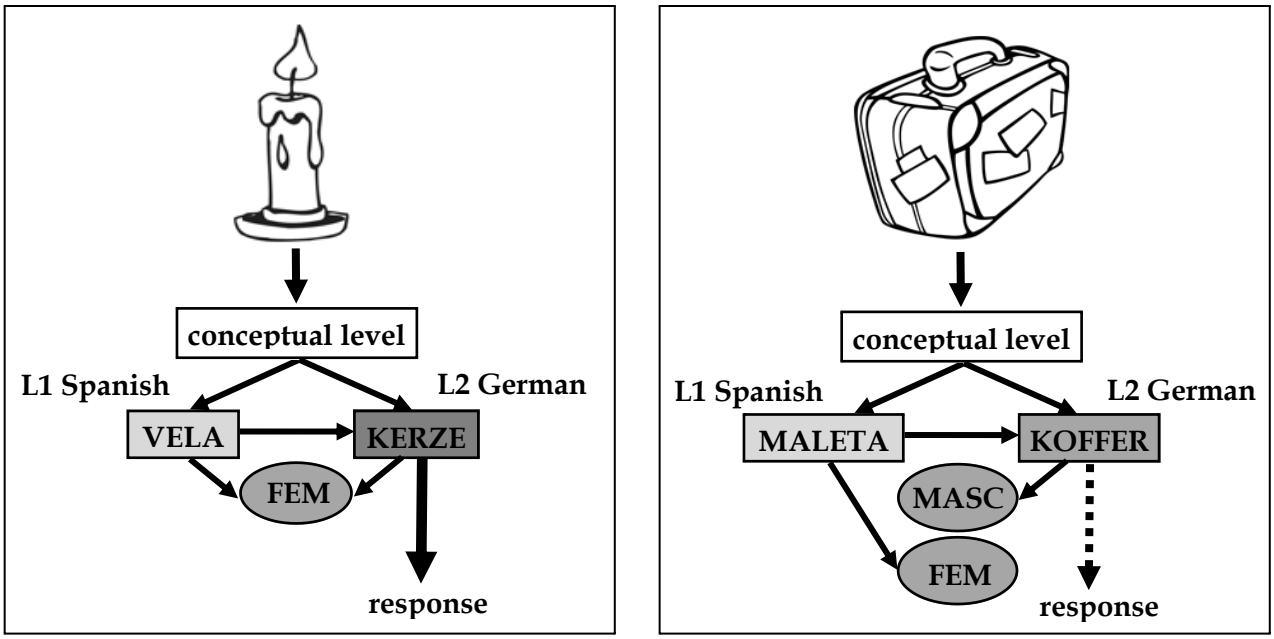


Figure 4.6. *Activation scheme for gender congruent (left) and gender incongruent (right) nouns, according to the gender integrated representation hypothesis (adapted from Paolieri et al, 2010b).*

With regard to neuter, the RTs were significantly faster for L2 neuter nouns than L1-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 L2 neuter conditions are, by definition, L1-L2 gender incongruent; the important distinction being that neuter is a gender value present only in the L2. Both faster RTs and lower error rates for neuter nouns suggest that the gender node without equivalent in the L1 is encoded differently from the gender nodes that are linked to both the L1 and the L2. While all the gender nodes are part of the same shared gender system, the L2-specific neuter gender node is not subject to interference from the activation of the masculine and feminine gender nodes. Figure 4.7 shows the activation scheme for L2 neuter nouns. In the example, the concept of a house activates both the L1 noun *casa*, which activates the feminine

gender node, and the target L2 noun *Haus*, which activates the neuter gender node. The activation of the feminine gender node by the L1 noun creates minimal interference in the production of the L2 target noun given that the gender value of the L2 noun is present only in the target language and therefore the target gender node is selected more quickly than in the case of gender incongruent nouns involving mismatches between gender values present in both the L1 and the L2.

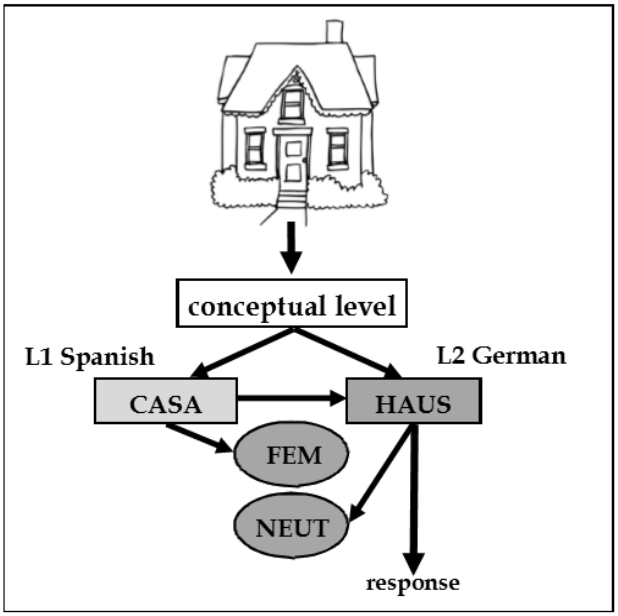


Figure 4.7. *Activation scheme for L2 neuter nouns.*

4.1.7 Conclusion

This experiment has shown that gender congruency between nouns in the L1 and L2 affects spoken word production, even for L1 Spanish-L2 German bilinguals whose languages differ in number of gender values. Faster responses in an L2 picture-naming task for L1-L2 gender congruent nouns than for gender incongruent ones show that gender values 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 value in German, was of particular interest in this experiment. Interestingly, L2 neuter nouns were named significantly faster than L1-L2 gender incongruent ones, illustrating that 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 gender values in the L1 and the L2 are not all subject to the same levels of interference: gender values 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.

4.2 L2 picture-naming task: error analysis

In order to examine the gender feature in the L2 in the context of language acquisition I carried out an error analysis on the data from the L2 picture-naming task. This analysis offers a window into the bilinguals' strategies in the use of gender in the L2 which informs the nature of the asymmetric gender representation (as illustrated in the RT analysis in 4.1) and the consequences it has on the bilinguals' L2 production. Examining L2 gender use through errors also allows the results of the present study to be situated in the previous findings on gender strategies in the L2 from the perspective of language acquisition.

In this analysis I examined the incorrect Ds produced in the L2 DPs in light of the L1-L2 gender congruency conditions to investigate the L2 gender use strategies employed by the L1 Spanish-L2 German bilinguals. Specifically, I address whether these bilinguals tend to transfer gender

information from their L1 or whether they opt for the overgeneralization of one gender value as a default strategy (typically masculine).

Previous research on L2 acquisition has shown pervasive effects of L1 transfer in the use of grammatical gender in the L2 for L1 speakers of languages with a gender feature. Transfer of the gender value of the equivalent L1 noun in L2 gender errors has been found with various languages, across proficiency levels and in different types of data (i.e. Granfeldt, 2000; Sabourin & Haverkort, 2003). A significant number of other studies have also examined gender use in NPs in L2 Spanish (Bruhn de Garavito & White, 2002; White et al., 2004; Franceschina, 2005), L2 French (Dewaele & Veronique, 2001; Foucart, 2008), L2 Dutch (Blom, Polišenská & Weerman, 2008), and L2 German (Ellis, Conradie & Huddlestone, 2012). However only White et al. (2004) and Foucart (2008) examined L2 gender production and processing in the context of the gender value of the translation equivalent noun in the L1. In production, White et al. (2004) found that L1 French-L2 Spanish bilinguals showed a lower rate of L2 gender accuracy, as well as a significantly higher tendency to not respond, when the L1 and the L2 nouns had opposite gender values. In processing, Foucart (2008) noted that L1 German-L2 French bilinguals had a longer gaze duration with noun-adjective agreement violations involving feminine L2 nouns that were masculine in the L1. Both of these findings illustrate a tendency for L1 speakers of languages with a gender feature to transfer the gender value of the L1 noun when the L2 noun bears a different gender value.

In L2 French, Dewaele & Veronique (2001) note that transfer between Dutch and French is unlikely due to the difference in the gender systems. While both languages have a two-value gender system, French gender values are 'masculine' and 'feminine' whereas the values are 'common' and 'neuter' in Dutch and therefore these authors attribute apparent transfer errors to

cognates. This raises the question of the extent to which L1 transfer can be expected to occur with different language pairings. Sabourin, Stowe and de Haan (2006) establish degrees of transfer, which they label *surface transfer* and *deep transfer*. In the context of the acquisition of the lexical gender of L2 nouns, s*urface transfer* is the transfer of the L1 gender values into the L2 (in other words, the direct transfer of the realization of the gender system in the L1). *Deep transfer*, on the other hand, is the transfer of the abstract gender feature from the L1 to the L2 (transfer of the category of gender regardless of whether the L1 and L2 gender systems are congruent or incongruent). In two studies of L1 German and L1 Romance (French/Italian/Spanish) advanced learners of L2 Dutch, Sabourin, Stowe and de Haan (2006) and Sabourin and Stowe (2008) found that the L1 German speakers consistently outperformed the L1 Romance speakers in grammaticality judgment tasks and gender decision tasks measuring accuracy in L2 DPs. These authors ascribe this difference between the L1 groups to the type of transfer that is possible between their respective L1s and the L2. For the L1 German-L2 Dutch group, both deep transfer and surface transfer are possible as both German and Dutch display the formal feature of gender (enabling deep transfer) and historically have had very similar gender systems (allowing for surface transfer of L1 gender values). For the L1 Romance group only deep transfer is possible as though French/Italian/Spanish and Dutch display two gender values, the Romance languages' gender values differ from those in Dutch. Along similar lines, Ellis, Conradie and Huddlestone (2012) found that L1 Italian low-intermediate learners of L2 German did not display evidence of the transfer of L1 gender values (surface transfer) in L2 picture-naming and sentence completion tasks.

Unlike L1 speakers of a language with grammatical gender, L1 speakers of languages without grammatical gender tend to overgeneralize the use of the masculine gender in the L2 as a default

strategy. There is a significant body of evidence from both spontaneous and experimental data of the use of masculine as a default in L2 Spanish by L1 English speakers (Franceschina, 2001; Schlig, 2003; Alarcón, 2011; White et al, 2004; Montrul, Foote & Perpiñán, 2008; McCarthy, 2007; Grüter, Lew-Williams & Fernald, 2012). With respect to the definition of 'default', it is worth noting that authors such as Tsimpli (2011) have observed that the *linguistic default*, or the least marked element from a formal perspective, does not necessarily correspond to the *learner default*, or the element overgeneralized by L2 speakers. While this seems clear in cases such as the interpretation and production of null and overt subjects (ie. Sorace et al, 2009), much of the previous research regarding the default in L2 gender use has shown the learner default to be the same as the linguistic default. In the case of L2 Spanish, L1 English speakers clearly overgeneralize only the masculine gender value, which is also the least marked value.[16]

In the context of this error analysis, the use of either an L1 transfer or a masculine as default strategy would be evident in the D produced in DPs with gender concord errors (Table 4.5). The use of masculine as a default involves the systematic production of erroneous masculine Ds (*der*), the only exception being L1 feminine-L2 masculine nouns in which masculine Ds are target and thus it is not clear what the expected default error would be in this condition. Transfer of the L1 gender value into the L2 makes opposite error predictions for L1 masculine and L1 feminine nouns (masculine Ds and feminine Ds, respectively). However, it is relevant to note that L1 transfer and masculine as default make the same predictions for L1 masculine-L2 feminine and L1 masculine-L2 neuter nouns and thus in these conditions it is not possible to tease these two strategies apart. Only L1 feminine-L2 neuter nouns provide definitive evidence of one strategy

[16] Note that there is some evidence of the overgeneralization of feminine in L2 German (ie. Hopp, 2013), though it does not seem to be a dominant default strategy.

or the other, as in this condition L1 transfer would predict the use of the feminine D (*die*) while masculine as default would predict the use of the masculine D. Since this is the only condition that clearly distinguishes between the L2 gender use strategies, it is especially relevant in this analysis.

Table 4.5. Determiner error expected in each gender incongruency condition by L2 gender use strategy.

Gender incongruency condition	**L1 transfer**	**masculine as default**
L1 masculine-L2 feminine	masculine	masculine
L1 feminine-L2 masculine	feminine	?
L1 masculine-L2 neuter	masculine	masculine
L1 feminine-L2 neuter	feminine	masculine

One main research question and a subquestion are addressed in this chapter. The research questions and the corresponding hypotheses are as follows:

Research Question III: What L2 gender strategy do bilingual speakers of two languages with formal gender features use?

Hypothesis III: Bilingual speakers of two languages with grammatical gender will primarily transfer the gender value of the L1 noun into the L2 (L1 transfer).

This hypothesis is in line with previous research on L2 acquisition that has shown pervasive effects of L1 transfer in the use of grammatical gender in the L2 for L1 speakers of languages with grammatical gender. This finding is not surprising given the significant body of evidence in favour of a shared representation for the L1 and L2 grammatical gender systems. Transfer of the gender of the equivalent L1 noun in L2 gender errors has been found with various languages, across proficiency levels and in different types of data (Granfeldt, 2000; Sabourin & Haverkort, 2003; Sabourin, Stowe & de Haan, 2006; Sabourin & Stowe, 2008).

Research Question IIIa: If transfer of the gender value from the L1 equivalent N is the dominant L2 gender use strategy, does the asymmetry between the Spanish and German gender values constrain the degree to which transfer is possible between the L1 and the L2?

Hypothesis IIIa: L1 Spanish-L2 German bilinguals will only display evidence of the transfer of the L1 gender values with L1 masculine-L2 feminine and L1 feminine-L2 masculine nouns; with nouns involving the L2-specific gender value (L1 masculine-L2 neuter and L1 feminine-L2 neuter) only transfer of the abstract L1 gender feature will be possible.

Though previous research with L1 Romance (French/Italian/Spanish)-L2 Dutch bilinguals has shown that the asymmetry in the Romance and Dutch gender systems prevents the transfer of the L1 gender values into the L2 (surface transfer; Sabourin, Stowe & de Haan, 2006; Sabourin & Stowe, 2008), it is expected the L1 Spanish-L2 German bilinguals will be able to transfer the L1 gender values into the L2 when the target L2 noun bears a gender value common to both the L1 and the L2 (masculine or feminine) and that the asymmetry between the Spanish and German gender systems will only inhibit surface transfer with L2 nouns that bear the asymmetric gender value (neuter). In the case of L2 neuter nouns, only transfer of the abstract L1 gender value (deep transfer) will be possible.

4.2.1 Method

The participants, materials, design and procedure were the same as those reported in 4.1.1, 4.1.2, 4.1.3 and 4.1.4.

4.2.2 Results

The analysis of the production errors in the L2 picture-naming task was carried out using confidence intervals. Confidence intervals are a measure of estimation, which though often overshadowed as an analysis technique by testing the significance of the null hypothesis (as illustrated in *p*-values), report the same results and thus constitute a legitimate analysis (Cumming, 2013, 2014; Masson & Loftus, 2003). The differences in the data are considered to be statistically significant if the 95% confidence intervals do not overlap. A confidence interval

analysis was used here due to the challenges the data posed to other analyses, namely, the asymmetric nature of the conditions and the uneven distribution of the data amongst the conditions given the impossibility of ensuring the same number of errors in each condition.

In the error analysis, only the gender incongruent and L2 neuter conditions will be considered as they are the only ones in which L1 transfer and masculine as default can be directly contrasted. Nouns within these conditions will be further broken down by gender subcondition (L1 masculine–L2 feminine and L1 feminine–L2 masculine nouns in the incongruent condition and L1 masculine–L2 neuter as well as L1 feminine–L2 neuter nouns in the L2 neuter condition) in order to examine the use of L2 gender in more detail.

4.2.2.1 Accuracy rates

The distribution of responses by determiner gender was calculated in the incongruent and L2 neuter conditions (Table 4.6). The distribution shows that, like the accuracy rates reported in the overall results, the proportion of correct determiner responses constitute the majority of the data in each of the gender subconditions (correct responses are indicated by grey shading). Elaborating on the accuracy information for the overall results (4.1.5), Table 4.6 shows that the proportion of correct responses also varies by gender subcondition. Between the gender incongruent subconditions, the accuracy is lowest for L1 masculine–L2 feminine nouns (50.5%), followed by L1 feminine–L2 masculine nouns (61.0%). In the L2 neuter subconditions, the accuracy is again lower for the L1 masculine nouns (64.2%) and the highest of all the conditions for the L1 feminine–L2 neuter nouns (74.3%).

Table 4.6. Distribution of responses by determiner gender.

Gender Subcondition		der (m)	die (f)	das (nt)
incongruent	L1 masculine – L2 feminine	35.0	50.5	14.5
	L1 feminine – L2 masculine	61.0	23.2	15.8
L2 neuter	L1 masculine – L2 neuter	25.4	10.4	64.2
	L1 feminine – L2 neuter	14.3	11.4	74.3

Note: Correct responses indicated by grey shading.

Given that German has a ternary gender system with three unique forms for singular determiners in nominative case (*der* is masculine, *die* feminine and *das* neuter), there is only one correct response but two erroneous possibilities in each subcondition. With respect to the errors produced, for L1 masculine–L2 feminine nouns significantly[17] more errors with the masculine determiner were produced (35.0%) than with the neuter determiner (14.5%) (Figure 4.8).

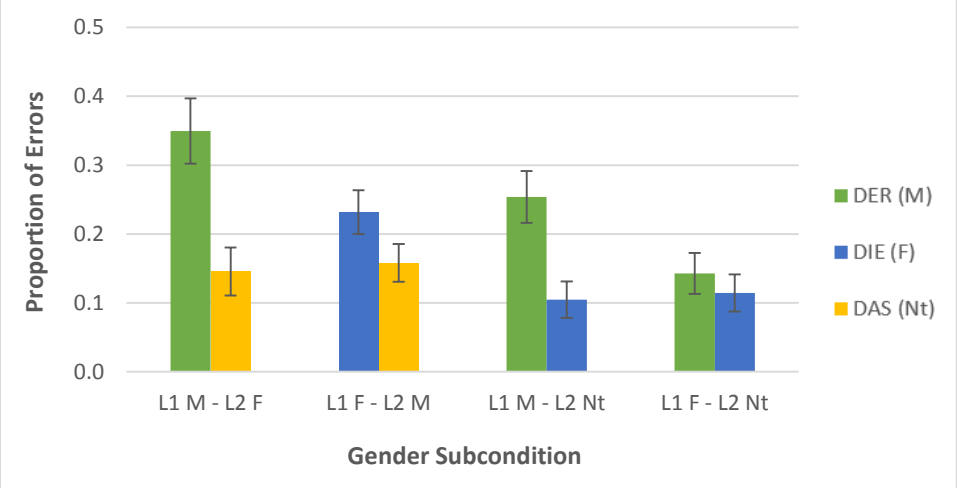


Figure 4.8. *Proportion of errors by determiner gender.*
(Error bars represent the standard error of the mean)

For L1 feminine–L2 masculine nouns, significantly more errors with the feminine determiner were produced (23.2%) than errors with neuter (15.8%). In terms of the L2 neuter subconditions,

[17] As determined by the lack of overlap in the confidence intervals (95%).

for both L1 masculine–L2 neuter and L1 feminine–L2 neuter nouns, more errors were produced with the masculine determiner (25.4% and 14.3%, respectively) than the feminine one (10.4% and 11.4%, respectively). This result was significant with the L1 masculine–L2 neuter nouns and it trended toward significance with L1 feminine–L2 neuter nouns[18].

4.2.2.2 Reaction times

The RTs were also calculated by determiner gender in the incongruent and L2 neuter conditions (Table 4.7).

Table 4.7. RTs (ms) by determiner gender.

Gender Subcondition		**der (m)**	**die (f)**	**das (nt)**
incongruent	L1 masculine – L2 feminine	1391	1183	1355
	L1 feminine – L2 masculine	1298	1231	1174
L2 neuter	L1 masculine – L2 neuter	1394	1500	1130
	L1 feminine – L2 neuter	1395	1194	1066

Note: Correct responses indicated by grey shading.

In the incongruent subconditions, there is no significant difference between the RTs for the correct responses with L1 masculine-L2 feminine and L1 feminine-L2 masculine nouns. The same applies to the L2 neuter subconditions, with the RTs for correct responses with all L2 neuter nouns being statistically the same. Thus, unlike with the accuracy rates, the RTs in the gender subconditions do not add any new information to the overall results.

[18] The non-significant result for L1 feminine-L2 neuter nouns can be attributed to the higher proportion of correct responses (and therefore fewer data points in the error analysis) with L1 feminine-L2 neuter nouns (74.3%) in comparison to L1 masculine-L2 neuter nouns (64.2%).

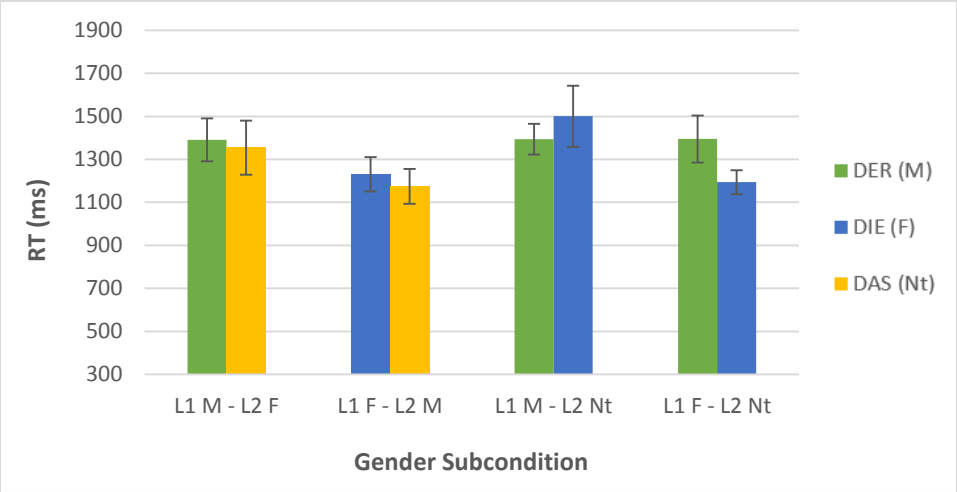


Figure 4.9. *RTs for errors by determiner gender.*
(Error bars represent the standard error of the mean)

With respect to the erroneous responses, there is no significant difference in the RTs by determiner gender for L1 masculine-L2 feminine nouns, L1 feminine-L2 masculine nouns, or L1 masculine-L2 neuter nouns. For L1 feminine-L2 neuter nouns, however, the RTs are significantly faster for errors with the feminine determiner (1194 ms) than for errors with the masculine one (1395 ms) (Figure 4.9).

4.2.3 Discussion

In order to interpret these results, it is pertinent to establish what all possible errors in each gender subcondition are likely to represent (Table 4.8) by building on the errors predicted according to each L2 gender use strategy (Table 4.5). For L1 masculine-L2 feminine nouns, errors with the masculine determiner could be either L1 transfer (given that the equivalent noun in Spanish is masculine) or the use of masculine as a default strategy (as has been shown primarily for native speakers of a language without grammatical gender). In this subcondition, errors with the neuter determiner are unclear given that there is no obvious connection to the L1 nor any evidence of overgeneralization in the use of neuter. With respect to L1 feminine-L2 masculine nouns, errors

with the feminine determiner would be instances of L1 transfer, with the errors with neuter again being unclear.

Table 4.8. Error types by determiner gender for each gender subcondition.

Gender Subcondition	der (m)	die (f)	das (nt)
L1 masculine – L2 feminine	L1 transfer/masculine as default	---	?
L1 feminine – L2 masculine	---	L1 transfer	?
L1 masculine – L2 neuter	L1 transfer/masculine as default	?	---
L1 feminine – L2 neuter	masculine as default	L1 transfer	---

Note: Target responses indicated by ---.

In terms of L1 masculine-L2 neuter nouns, errors with the masculine determiner could be L1 transfer or masculine as default, with feminine errors being difficult to interpret in this subcondition. Interestingly, for L1 feminine-L2 neuter nouns, all possible errors are interpretable. Errors with the feminine determiner would be L1 transfer and thus errors with the masculine determiner would be masculine as default. Since L1 transfer and masculine as default are confounded with L1 masculine-L2 feminine and L1 masculine-L2 neuter nouns, L1 feminine-L2 neuter nouns allow these L2 gender use strategies to be teased apart, providing valuable insight into the nature of the L1 Spanish-L2 German bilinguals' grammatical gender system.

In the accuracy rates there is evidence of both L1 transfer and masculine as default. For L1 masculine-L2 feminine nouns there were significantly more errors with the masculine determiner which could represent either L1 transfer or masculine as default. With L1 feminine-L2 masculine nouns, errors with the feminine determiner were significantly more frequent, indicating transfer of the gender value from the L1. In terms of L1 masculine-L2 neuter nouns, there were significantly more errors with the masculine determiner, which, as with the L1 masculine-L2 feminine nouns, could be either L1 transfer or masculine as default. With L1 feminine-L2 neuter

nouns, however, the predominance of errors with the masculine determiner is evidence in favour of masculine as default. The evidence of L2 gender use strategies from the accuracy rates is summarized in Table 4.9.

Table 4.9. L2 gender use strategy according to accuracy data.

Gender Subcondition	L2 gender strategy	Predominant errors
L1 masculine – L2 feminine	L1 transfer/masculine as default	masculine
L1 feminine – L2 masculine	L1 transfer	feminine
L1 masculine – L2 neuter	L1 transfer/masculine as default	masculine
L1 feminine – L2 neuter	masculine as default	masculine

As previously mentioned, whether masculine errors represent L1 transfer or masculine as default is unclear with L1 masculine-L2 feminine and L1 masculine–L2 neuter nouns. However, the fact that masculine errors are also predominant with L1 feminine-L2 neuter nouns, where masculine would clearly be the use of a masculine as default strategy, suggests that the error patterns with L1 masculine-L2 feminine and L1 masculine-L2 neuter nouns may be attributable to a default gender strategy as well.

Further evidence in support of masculine as default being the dominant L2 gender use strategy comes from the higher proportion of total errors with the masculine determiner than the feminine one. Figure 4.10 illustrates the proportion of errors with masculine and those with feminine. Both masculine and feminine determiners represent target responses in only one of the four subconditions (L1 feminine-L2 masculine and L1 masculine-L2 feminine, respectively) so the total possible errors with each determiner is equal (each determiner would be erroneous in three subconditions). In spite of this, 24.5% of the total errors involve the masculine determiner, while only 15.0% are with the feminine one. The predominance of masculine errors in the total error rate also suggests that the use of masculine as default is the dominant L2 gender use strategy for the L1 Spanish-L2 German bilinguals.

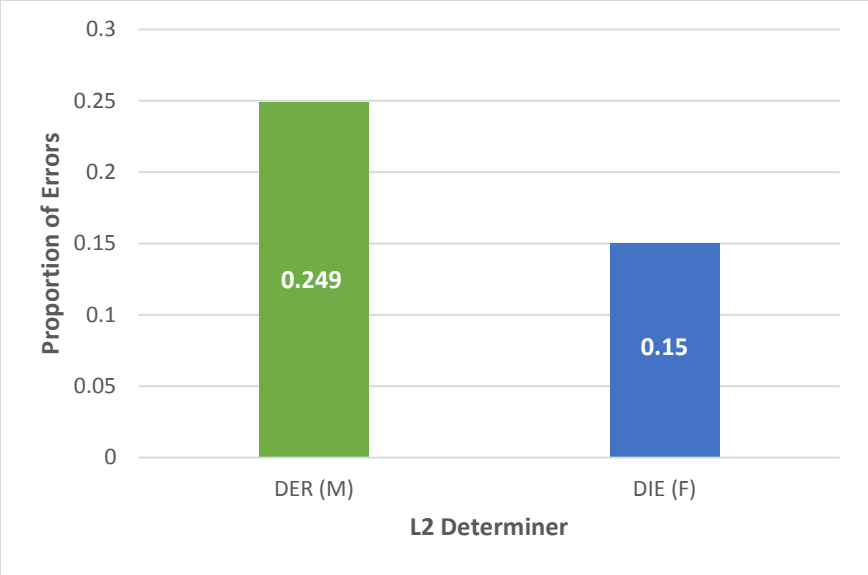


Figure 4.10. *Proportion of erroneous masculine and feminine determiners produced.*

Taking into account the RT results also offers additional evidence in favour of the pattern of results being attributable to the use of masculine as default. The RTs for errors involving masculine determiner do not differ significantly between subconditions, and, in fact, are remarkably similar (Figure 4.11). The almost identical RTs for masculine errors across the subconditions (in which masculine is an error and not a target response) suggests that the same underlying process (or gender use strategy) drives the pattern of results in each of the subconditions. Since masculine errors with L1 feminine-L2 neuter nouns are clearly due to the use of a masculine as default strategy, the RT results offer evidence in favour of the masculine errors in all subconditions being attributable to the use of masculine as default.

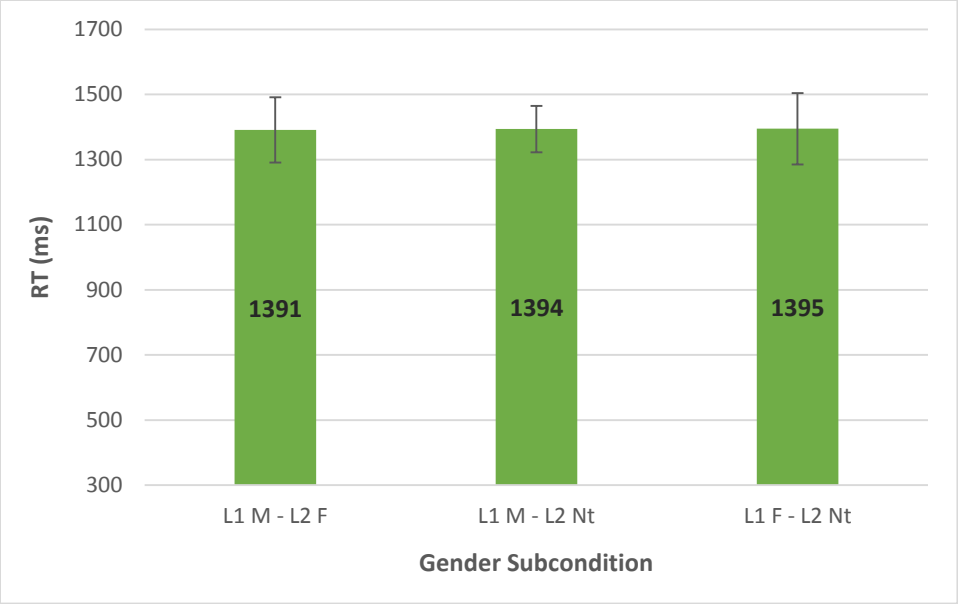


Figure 4.11. *RTs for masculine determiner errors.*
(Error bars represent the standard error of the mean)

The RT results also showed that the responses were significantly faster for errors with the feminine than the masculine determiner for L1 feminine-L2 neuter nouns (Figure 4.9). This result is of particular interest given that the evidence from the accuracy rates and the RTs for masculine errors seems to point to masculine as default as the dominant L2 gender use strategy. The fact that feminine errors are produced significantly faster than masculine errors in this subcondition suggests that the use of masculine as a default strategy over L1 transfer has a processing cost. If this is the case, it is interesting that the nature of these bilinguals' grammatical gender system results in the default being the dominant gender use strategy, in spite of the fact that it is apparently more effortful than L1 transfer.

Returning to the research questions regarding the dominant gender use strategy and the degree to which L1 transfer can occur in L1 Spanish-L2 German bilinguals, it seems that some amount of transfer is possible (the majority of errors were attributable to L1 transfer in only one of the four gender congruency subconditions), but that the dominant L2 gender use strategy is the

overgeneralization of masculine as a default (used in the remaining three subconditions). In the context of the present study, surface transfer would be evident in the transfer of the gender value of the L1 noun to the L2 noun (referred to as L1 transfer), while deep transfer would be manifest in other L2 gender strategies (possibly including the use of a default gender) since only the abstract formal feature of gender (not its values) is transferred from the L1 to the L2. Deep transfer from the L1 to the L2 is posited to be possible for all L1 speakers of languages that bear a formal gender feature (Sabourin, Stowe & de Haan, 2006), and this level of transfer does seem to take place in the L1 Spanish-L2 German bilinguals in that their dominant gender use strategy is not the transfer of the L1 gender values into the L2 (surface transfer) but rather an alternate strategy: the use of the masculine gender value as a default. In the case of these bilinguals, while the default is the dominant strategy, there is also some evidence of surface transfer in the erroneous use of the feminine determiner with L1 feminine-L2 masculine nouns.

The evidence of some degree of transfer of the L1 gender value to the L2 noun seems to go against previous results in L1 Romance-L2 Dutch (Sabourin, Stowe & de Haan, 2006) and L1 Italian-L2 German bilinguals (Ellis, Conradie & Huddlestone, 2012) which have suggested that no surface transfer is possible between languages with asymmetric gender systems. This difference may be accounted for in two ways: first, in terms of the different types of analyses carried out and second, with respect to the differences between the languages pairings examined. Both previous studies focused their analyses on the contrast in L2 gender use among different L1 speaker groups, drawing conclusions regarding the extent to which L1 transfer is possible based on between-group comparisons. In this errors analysis, I examined the use of gender in the L2 within the same group of bilinguals, comparing the types of errors made in light of the gender congruency

between the L1 and the L2. This within-group focused analysis may be more sensitive to the presence of gender use strategies that are not dominant (in this case, the use of L1 transfer in only one of the four subconditions).

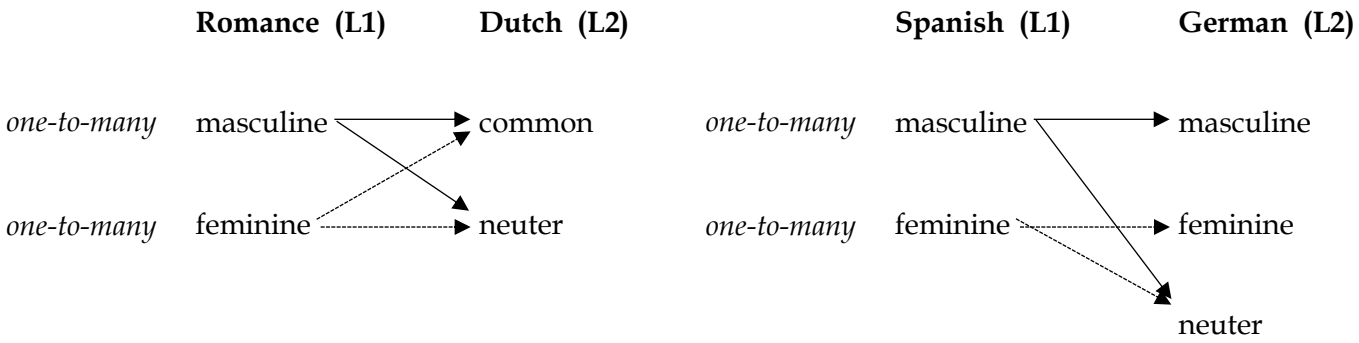


Figure 4.12. *Difference in L1 transfer mapping between the Romance (including Spanish) and Dutch gender values and the Spanish and German gender values.*

There are also important differences between the gender systems of L1 Romance-L2 Dutch and L1 Spanish-L2 German bilinguals. The somewhat higher degree of L1 transfer that seems to be possible for L1 Spanish-L2 German bilinguals than for L1 Romance-L2 Dutch bilinguals may be due to the difference in learner mapping between the L1 and the L2 gender values for each of these language pairings. Like Romance and Dutch, there are also one-to-many mappings between the gender values in Spanish and German, however, unlike Romance and Dutch, in the context of L1 transfer, each of the gender values in Spanish do not map onto all of the gender values in German (Figure 4.12). While from a linguistic perspective it could be claimed that the mappings between Spanish and German are similar to the mappings between Romance and Dutch, given that the bilinguals in this study are adult second language learners who have had to develop a conscious strategy for learning the gender of the nouns in German, from the perspective of the learner it would not be expected that each of the Spanish gender values would map onto all of the German gender values.

For L1 Romance (including L1 Spanish) speakers learning L2 Dutch, nouns that are masculine in the L1 could theoretically be either common or neuter in the L2, and the same is true of feminine nouns; L1 feminine nouns could reasonably be expected to correspond to either gender in Dutch. For L1 Spanish speakers learning L2 German, however, some of the L1-L2 gender mappings are more straight-forward. Since both the L1 and the L2 have masculine and feminine gender values, from the learner's perspective it is logical that the L1 values would map onto the same values in the L2. The complexity in the mapping comes from the neuter value in the L2, which could correspond to either masculine or feminine in the L1, thus creating the one-to-many mapping between the Spanish gender values and those in German. This difference between Romance and Dutch and Spanish and German could be interpreted as the mapping in L1 transfer between Romance and Dutch gender values being somewhat more complex than the mapping between gender values in Spanish and German. The less complex mapping in L1 transfer between Spanish and German would allow for a higher degree of L1 transfer in L1 Spanish-L2 German bilinguals than previously reported for bilingual speakers of languages with asymmetric gender systems (Sabourin, Stowe & de Haan, 2006; Sabourin & Stowe, 2008; Ellis, Conradie & Huddlestone, 2012; Blom, Polišenská & Weerman, 2008).

4.2.4 Conclusion

These data offer new evidence of a masculine as default strategy in L1 Spanish-L2 German bilinguals, a finding which is surprising given that extensive previous research has shown that L1 speakers of a language with grammatical gender (such as Spanish) tend to transfer gender information from their L1, while the use of a default gender strategy is more typical of L1 speakers of a language without grammatical gender (such as English). This atypical default strategy can be attributed to the representation of the Spanish-German asymmetric gender system. From a

psycholinguistic perspective, the findings from the L2 picture-naming task (4.1) have shown that this L1-L2 gender system has a unique representation (particularly for neuter) and that the nature of this unique representation seems to allow masculine as default as an L2 gender use strategy, even though there is evidence suggesting it has a processing cost compared to L1 transfer. From the perspective of language acquisition, previous research has found that *surface transfer*, or the transfer of L1 gender values into the L2, tends to not be available as an L2 gender use strategy when gender systems are not sufficiently similar. While there does not seem to be a complete lack of surface transfer in the case of these L1 Spanish-L2 German bilinguals, the dominance of the default strategy indicates that the asymmetry between the L1 and the L2 significantly reduces the degree to which transfer into the L2 is possible.

4.3 L2 grammaticality judgment task

The second experiment, an L2 grammaticality judgment task, was designed to complement the production data on the representation of asymmetric gender systems from the L2 picture-naming task and to more directly test the L2 gender use strategies found in the error analysis. In this experiment, L1 French-L2 German bilinguals were asked to make binary judgments on the grammaticality of German DPs. This experiment further investigates the findings from the L2 picture-naming task by focusing on another language pairing (French-German rather than Spanish-German) and by providing processing data. L1 French-L2 German bilinguals were chosen given that the gender feature in French is similar to that in Spanish (both languages have two gender values: masculine and feminine) and also due to the fact that participants with that linguistic profile were accessible locally[19].

[19] A similar pattern of results would be expected with L1 Spanish-L2 German bilinguals.

To the best of my knowledge, no psycholinguistic theories of the representation of the L2 grammatical gender system have been proposed specifically for processing studies and therefore this experiment examines the same proposals examined using the L2 picture-naming task (outlined in 4.2), namely, the *gender integrated representation hypothesis* (Salamoura & Williams, 2007) and the *gender autonomous representation hypothesis* (Costa et al, 2003).

Language processing differs importantly from language production in that while language production is top-down (starts with higher level linguistic representations such as the abstract representation of the word form and ends with basic word component information like phonemes), language processing is bottom-up (basic word component information to higher level linguistic representations). In this experiment I adopt the *BIA+* (Dijkstra & Van Heuven, 2002) model of bilingual word recognition and assume (as the authors suggest) that syntactic word information (lemma) would be represented between the word level and the semantic information (see Figure 3.8). I further assume, in keeping with the assumptions in the L2 picture-naming task, that gender is represented as nodes connected to the lemmas. These assumptions imply that in bilingual word recognition, competition between the gender value of the L2 target noun and the L1 translation equivalent would take place between word level information (lexical orthography and lexical phonology) and semantic information (Figure 4.13).

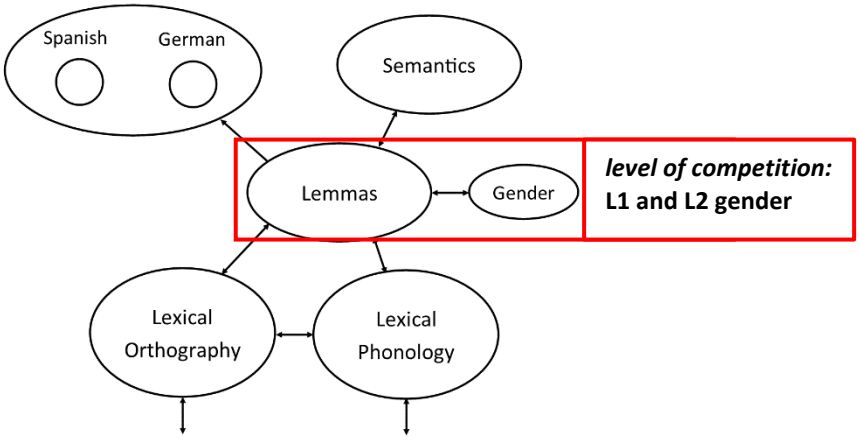


Figure 4.13. *Level of competition between L1 and L2 gender information in the* BIA+ *model (adapted from Dijkstra & Van Heuven, 2002).*

In word recognition, the presentation of the written DP stimulus would activate orthographic and phonological information which in turn activates word candidates in both the L1 and the L2 (though here I focus only on the target L2 noun). Since word recognition is non-selective, the activation of the target L2 noun would also result in the activation of the equivalent noun in the L1. At the lemma level, these L1 and L2 syntactic word forms would also activate feature information, such as grammatical gender. According to the *gender integrated representation hypothesis* (Salamoura & Williams, 2007), the L1 and L2 grammatical gender systems are represented as a single set of shared gender nodes and thus activation of the L1 and L2 word forms would spread activation to the same (in the case of gender congruent nouns) or different (in the case of gender incongruent nouns) gender nodes that are common to both languages (Figure 4.14).

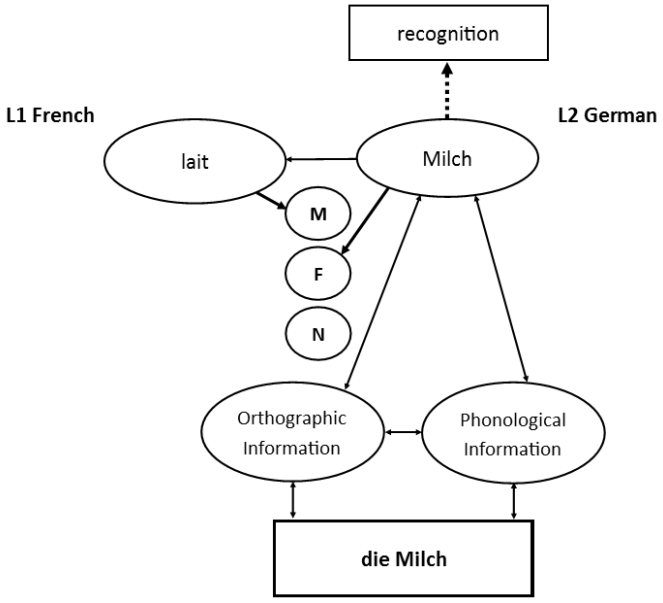


Figure 4.14. *Word recognition in the* BIA+ *model including the integrated representation of gender (figure shows L1 M-L2 F noun 'milk').*

The *gender autonomous representation hypothesis* (Costa et al, 2003), on the other hand, assumes no competition at the level of feature selection since the L1 and the L2 word forms would activate gender nodes that are unique to each language (Figure 4.15).

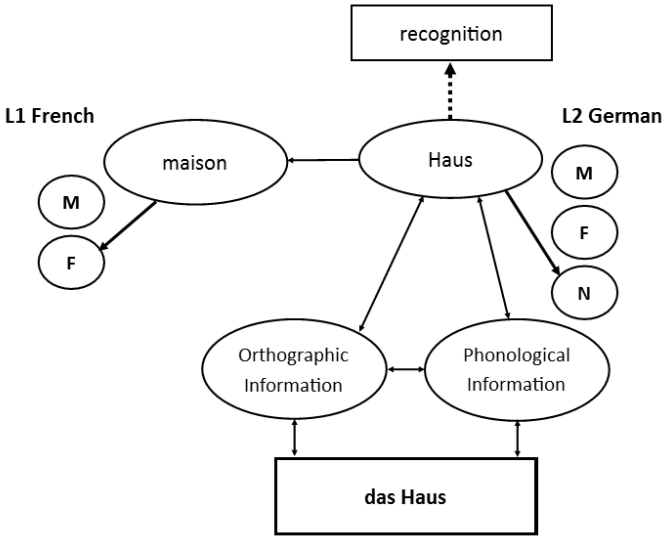


Figure 4.15. *Word recognition in the* BIA+ *model including the autonomous representation of gender (figure shows L1 F-L2 Nt noun 'house').*

The predictions made by each of these gender representation proposals are the same in word recognition as in word production (Table 4.10). Under the *gender integrated representation hypothesis*, RTs for L1 and L2 nouns that coincide in gender value will be significantly faster than nouns of different gender values given that with gender congruent nouns both the L1 and L2 nouns activate the same gender node (thereby eliminating any competition in the gender selection process), whereas gender incongruent nouns create competition due to the L1 and the L2 activating different gender nodes within a shared set. While this hypothesis doesn't make any predictions for nouns bearing a gender value only present in the L2, following the results of the L2 picture-naming task it is expected that when the gender incongruency involves an L2 neuter noun RTs will be slower than those for congruent nouns but less slow than those for incongruent nouns involving only masculine and feminine nouns. This is due to the unique representation of the L2-only gender value that is not subject to the same level of competition in the selection process as gender values that are present in both the L1 and the L2.

Table 4.10. Predictions following both psycholinguistic proposals and previous experiment.

Gender congruency of L1 and L2 nouns	**Examples of L1-L2 nouns**	**Gender integrated**	**Gender autonomous**
gender congruent	masculine-masculine; feminine-feminine	faster RTs due to facilitation effect of same L1 and L2 gender	no effect on RTs
gender incongruent	masculine-feminine; feminine-masculine	slower RTs due to interference between L1 and L2 genders	no effect on RTs
L2 nouns whose gender value has no L1 equivalent	masculine-neuter; feminine-neuter	*faster RTs than incongruent nouns; slower RTs than congruent nouns*	no effect on RTs

Italics indicate prediction based on results from L2 picture-naming task (4.1).

The *gender autonomous representation hypothesis* again predicts no effect of gender congruency between the L1 and L2 nouns on the RTs due to the language-specific representation of the L1 and L2 gender nodes which are not subject to crosslinguistic competition. This includes L2 neuter nouns as whether or not the L1 and L2 gender systems are symmetric or asymmetric does not alter the fact that activation of L1 and L2 gender nodes is restricted to language-specific sets of nodes.

To the best my knowledge no previous studies have specifically examined the representation of L1 and L2 grammatical gender from the perspective of bilingual word recognition. Thus, the most relevant previous research is from the language production studies discussed in Section 3 and outlined briefly in Section 4.1. The results from the L2 picture-naming task in this study have contributed further evidence to the significant body of results supporting the *gender integrated representation hypothesis*.

This experiment also aims to further investigate L2 gender use strategies. As outlined in 4.2, previous research on L2 acquisition has shown that L1 speakers of languages with a gender feature tend to transfer gender information from the L1 into the L2 (i.e. Grandfeldt, 2000; Sabourin & Haverkort, 2003). On the other hand, L1 speakers of a language without grammatical gender opt for the use of masculine as default strategy (Franceschina, 2001; Schlig, 2003; Alarcón, 2011; White et al, 2004; Montrul, Foote & Perpiñán, 2008; McCarthy, 2007; Grüter, Lew-Williams & Fernald, 2012). Contrary to these previous findings, in analysis of the erroneous DPs produced in the L2 picture-naming task (4.2), I found that L1 Spanish-L2 German bilinguals tended to overgeneralize the use of the masculine gender in German rather than transfer the gender value of the Spanish noun into German. I attributed this finding to the unique nature of the

representation of asymmetric gender systems, particularly with respect to the gender value present in the L2 but not the L1 (neuter in this case).

Like in the error analysis, in the grammaticality judgment task, the use of either L1 transfer or masculine as a default would only be clearly evident with nouns that are feminine in the L1 (French in this case) and neuter in the L2 (German). In Table 4.8 I illustrated that this is the only condition in which errors involving the masculine D are not confounded with L1 transfer. With L1 feminine-L2 neuter nouns, the higher error rates for ungrammatical DPs containing a masculine D would suggest that the L1 French-L2 German bilinguals have more difficulty recognizing this use of masculine as ungrammatical, implying a tendency to opt for the overgeneralization of masculine as a default strategy. On the other hand, higher error rates in DPs involving L1 feminine-L2 neuter nouns presented with a feminine D would show that these bilinguals are less able to recognize the error when the gender value of the L1 noun is attributed to the L2 noun, representing the use of L1 transfer in L2 gender errors.

Three of the main research questions and hypothesis are addressed in this experiment, all of which were examined in the L2 picture-naming task and error analysis. They are copied below:

Research Question I:	Do asymmetric gender systems in the mind of the bilingual have an L1-L2 shared representation or are the L1 and L2 representations independent?
Hypothesis I:	Asymmetric gender systems have a shared representation.
Research Question II:	Does the gender value not present in both of the bilinguals' languages (neuter in this study) have a separate representation from the values shared by both the L1 and the L2?
Hypothesis II:	The asymmetric gender value is represented as an L2-specific gender node in the L1-L2 shared gender system.

Research Question III: What L2 gender strategy do bilingual speakers of two languages with formal gender features use?

Hypothesis III: Bilingual speakers of two languages with grammatical gender will primarily transfer the gender value of the L1 noun into the L2 (L1 transfer).

4.3.1 Participants

13 L1 French-L2 German bilinguals recruited at the University of Ottawa from intermediate German language courses and the School of Psychology's Integrated System of Participation in Research (ISPR) participated in this experiment as well as 27 L1 German speakers recruited at the Universität Mannheim in Germany. The bilingual participants had an intermediate level of proficiency in German, as measured by the Goethe Institut's proficiency test (mean=43.3%, SD=3.1). Their mean age was 19.3 (SD=1.7) for the L1 French-L2 German group and 21.9 (SD=3.1) for the L1 German group, and all participants had normal or corrected-to-normal vision. Less than a third (31%) of the L1 French-L2 German participants reported having taken some Spanish in secondary school, and all of the L1 German participants had taken various language courses (including Latin and some Romance languages) in secondary school as well. All of the participants reported knowledge and use of English in their daily lives.[20] Four participants (3 L1 French-L2 German bilinguals; 1 L1 German speaker) had to be excluded from the data analysis due to low proficiency in German (in the case of the bilinguals) and misinterpreted instructions (L1 German participant).

[20] None of the participants reported using any L2s besides English on a regular basis.

4.3.2 Materials

The stimuli for this experiment consisted of 192 high-frequency German nouns (180 experimental stimuli and 12 practice stimuli). Grammatical gender congruency between the German nouns and their French translation equivalents was manipulated to create three main conditions: gender congruent nouns, gender incongruent nouns, and L2 neuter nouns. These main conditions were also further broken down into subconditions consisting of L1 masculine-L2 masculine and L1 feminine-L2 feminine nouns (gender congruent), L1 masculine-L2 feminine and L1 feminine-L2 masculine nouns (gender incongruent) and L1 masculine-L2 neuter and L1 feminine-L2 neuter nouns (L2 neuter). All stimuli are included in Appendix B.

The nouns were matched as closely as possible for frequency across conditions in German and in French using COSMAS II (COSMAS II, 2008) and LEXIQUE 3.80 (New et al, 2001), respectively. Noun frequency (Table 4.11) did not differ significantly by condition in German ($F(2,177)=.226$, $p=.798$) or in French ($F(2,177)=.194$, $p=.824$).

Table 4.11. Mean log frequency by language and noun gender congruency condition.

	congruent nouns	**incongruent nouns**	**L2 neuter nouns**
German	1.4 (.67)	1.4 (.61)	1.5 (.61)
French	1.8 (.60)	1.7 (.66)	1.8 (.58)

Standard deviations appear in parentheses.

Word ending was not strictly controlled in either French or German due to the complex relationship between phonological and morphological information and gender distribution in both languages. In keeping with the L2 picture-naming task, it was assumed that L2 learners would not be able to adopt a reliable strategy to deduce the gender value from the word form in German. No cognates between French and German were included and none of the French nouns

had an initial vowel or silent '*h*' to avoid the inclusion of L1 words in which the definite determiner takes the unmarked form *l'* for phonological reasons.

4.3.3 Design

The experimental task consisted of a total of 360 experimental trials presented across two blocks each containing 180 experimental stimuli. Within each block the stimuli were randomized by the presentation software such that no more than three stimuli from the same congruency condition were presented consecutively. In order to control for task effects, presentation order of the stimuli as well as the buttons that represented 'correct' and 'incorrect' were counterbalanced across participants.

Each experimental stimulus was presented twice, once with the German D that formed a grammatical DP and once with another German D to form an ungrammatical DP (Figure 4.16).

Figure 4.16. *Sample grammatical (left) and ungrammatical (right) stimuli.*

The incorrect determiner that appeared was manipulated in order to provide insight into the types of errors committed by the participants. To this end, incorrect determiners represented either transfer of the gender value from French (the L1) or the use of a default gender strategy (masculine), with the following exceptions: gender congruent nouns and L2 neuter nouns that are feminine in French. In the case of gender congruent nouns, since the nouns have the same gender value in both German and French, any determiner errors would not allow for the distinction between the two L2 gender use strategies and thus errors with the neuter D were included simply to balance the number of correct and incorrect responses and also to increase the

number of stimuli that appeared with the neuter D. Neuter nouns that are feminine in French represent a unique situation because these are the only nouns for which two different determiner errors offer insight into L2 gender strategies. Errors with the masculine D would represent a masculine as default strategy and errors with the feminine D would represent L1 transfer. In order to test both of these possibilities, two lists were created, one in which ungrammatical DPs with L1 feminine-L2 neuter noun conditions appeared with the masculine D and another where the ungrammatical DPs contained the feminine D. The distribution of the determiners in each of the lists is outlined in Tables 4.12 and 4.13.

Table 4.12. Distribution of German determiners for stimuli in List 1.

	congruent nouns		incongruent nouns		L2 neuter nouns		**Total**	
gender (German-French)	M-M	F-F	M-F	F-M	M-Nt	F-Nt	gram-matical	ungram-matical
masculine (*der*)	30		30	30	30	30	60	90
feminine (*die*)		30	30	30			60	30
neuter (*das*)	30	30			30	30	60	60
Total							180	180

Note: Grammatical stimuli indicated by grey shading.

Table 4.13. Distribution of German determiners for stimuli in List 2.

	congruent nouns		incongruent nouns		L2 neuter nouns		**Total**	
gender (German-French)	M-M	F-F	M-F	F-M	M-Nt	F-Nt	gram-matical	ungram-matical
masculine (*der*)	30		30	30	30		60	60
feminine (*die*)		30	30	30		30	60	60
neuter (*das*)	30	30			30	30	60	60
Total							180	180

Note: Grammatical stimuli indicated by grey shading.

4.3.4 Procedure

The experimental sessions lasted approximately 40 minutes and each participant was tested individually. All the L1 French-L2 German bilinguals received remuneration for completing the experiment: those recruited from German language courses received a small sum and those recruited from the ISPR received course credit. Those recruited in Germany received a small gift following the experimental session as a token of appreciation for their collaboration.

Participants performed an L2 grammaticality judgment task in which they were asked to press a button to indicate whether each written German DP was grammatical or ungrammatical.

The stimuli were presented on a 22″ monitor using *Experiment Builder* (SR Research). Each DP was presented in 20 point Times New Roman font and was centered in the middle of the screen. Each trial consisted of a fixation cross screen (500 ms) and a stimulus screen which remained until the participant responded or for a maximum of 3,000 ms. Button response times were recorded by the computer through the presentation software.

Prior to the L2 grammaticality judgment task, the bilingual participants took a German proficiency test and all participants completed a language background questionnaire.

4.3.5 Results

4.3.5.1 Data

Responses exceeding 3 SD of the participants' mean by condition were discarded and responses exceeding 2.5 SD were centered within 2.5 SD of the mean (3.2% of the data underwent this procedure). Responses for 7 stimuli had to be excluded from the analyses given that the nouns in the target DPs have the same singular and plural word form and therefore DP manipulation that was intended to be ungrammatical (the use of *die*$_{F}$ with non-feminine Ns) could be considered

grammatical if the DP was interpreted as being plural (though all other DPs in the task were singular). Since all target nouns had been taken into account when matching each of the gender congruency conditions for frequency, the exclusion of these stimuli could result in the conditions no longer being matched for frequency. In order to prevent the pattern of results from possibly being attributable to a noun frequency effect, the frequency of the German nouns was included as a covariate in all analyses.

4.3.5.2 Analyses

A series of repeated-measures ANOVAs were run on RTs and error rates for both grammatical and ungrammatical stimuli using means calculated by items[21]. RTs and error rates for grammatical and ungrammatical stimuli were analysed separately due to the fact that the processing of these different types of stimuli are not directly comparable.

Omnibus ANOVAs with the factors Congruency (RTs: congruent versus incongruent versus L2 neuter nouns; Error rates: M-M versus F-F versus M-F versus F-M versus M-Nt versus F-Nt nouns)[22] and Native Language (L1 French versus L1 German) were run to determine the overall pattern of results. Native Language was a between-items factor and Congruency a within-items factor. Further ANOVAs were run on the L1 French-L2 German bilinguals' data to examine whether the presentation of an incorrect masculine D or an incorrect feminine D with German neuter nouns had a significant effect on the results. In these ANOVAs the factors were

[21] Items was included as the random factor rather than participants due to the inclusion of German N frequency as a covariate in all of the analyses. The fact that the means were calculated by items rather than by participants could mean that some of the participants' L2 gender use strategies were masked in the analysis.

[22] Since the gender representation models do not make predictions for nouns of specific genders–only gender congruent versus incongruent nouns–only the three main levels of gender congruency were included in the RT analyses that examined the representation of the L1-L2 gender system. This is also consistent with the analysis in the L2 picture-naming task. With the error rates, it was pertinent to analyse the results by subcondition in order to address possible gender use strategies evident in the manipulation of the correct and incorrect Ds.

Incongruency (M-F versus F-M versus M-Nt versus F-Nt nouns) and Stimuli List (list 1 versus list 2), with Stimuli List being a within-items factor and Incongruency a between-items factor.[23] As a measure of effect size, partial eta squared (η_p^2) is reported.

4.3.5.3 Reaction times

The results of the omnibus ANOVA run on RTs for grammatical stimuli showed a significant main effect of both Congruency (F(2,169)=5.463, p=.005, η_p^2=.061) and Native Language (F(1,169)=299.124, p<.001, η_p^2=.639), which was further qualified by the significant interaction between these two factors (F(2,169)=3.846, p=.023, η_p^2=.044). To further investigate the interaction between Congruency and Native Language, a univariate ANOVA was run for each level of Native Language, revealing that Congruency was only significant for the L1 French-L2 German bilinguals (F(2,170)=4.468, p=.013, η_p^2=.050) and not the L1 German speakers (F(2,170)=2.942, p=.055). An LSD post hoc test showed that the bilinguals' RTs for grammatical DPs containing gender congruent nouns was significantly faster than RTs for DPs with either incongruent (p=.033) or L2 neuter (p=.005) nouns (Figure 4.17).[24]

[23] The alpha level in these subsequent ANOVAs was adjusted to .01 in order to avoid possible Type 1 errors due to multiple comparisons.

[24] There was no significant difference between RTs for grammatical DPs containing incongruent and L2 neuter nouns (p=.488).

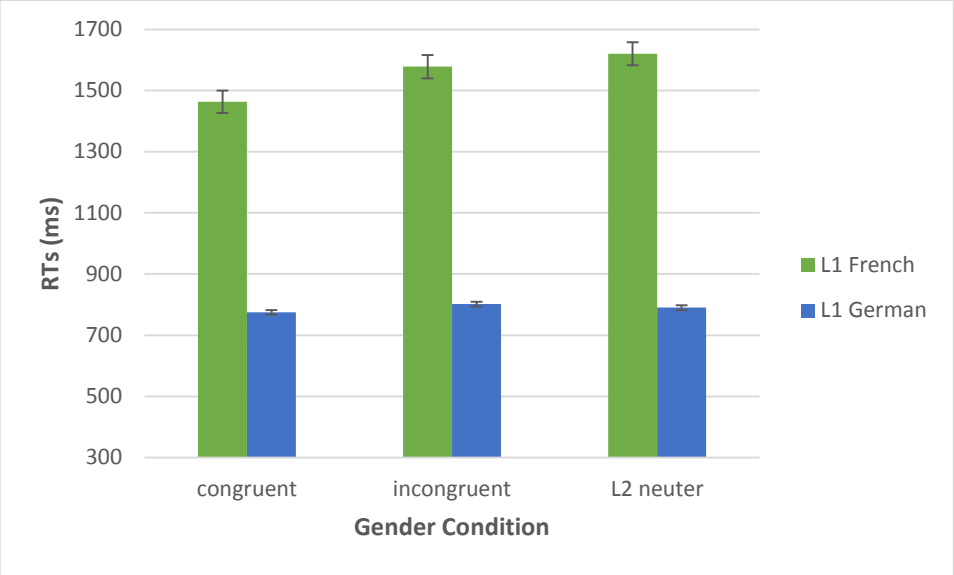


Figure 4.17. *L1 French-L2 German and L1 German mean RTs for grammatical stimuli. (Error bars represent the standard error of the mean)*

The omnibus ANOVA run on RTs for ungrammatical stimuli showed a main effect of Native Language ($F(1,169)=182.797$, $p<.001$, $\eta_p^2=.520$), and no effect for Congruency ($F(2,169)=.006$, $p=.994$). There was no significant interaction between the factors ($F(2,169)=.070$, $p=.933$). The significant effect of Native Language indicated that L1 German speakers responded significantly faster than the L1 French-L2 German bilinguals. Mean RTs for all stimuli for both groups are presented in Table 4.14.

Table 4.14. Mean RTs for grammatical and ungrammatical stimuli in all gender conditions.

	L1 French – L2 German		**L1 German**	
Gender Condition	*Grammatical Stimuli*	*Ungrammatical Stimuli*	*Grammatical Stimuli*	*Ungrammatical Stimuli*
congruent	1462 (294)	1797 (328)	775 (66)	885 (46)
incongruent	1580 (289)	1792 (367)	802 (53)	898 (57)
L2 neuter	1619 (302)	1786 (369)	790 (61)	898 (61)
gender effect (cong-incong)	-118*			
gender effect (cong-neut)	-157*			
gender effect (incong-neut)	-39			

Note: Standard deviations appear in parentheses. Significant gender congruency effects are marked *.

The results of the ANOVA focusing on masculine versus feminine erroneous Ds in DPs involving L1 feminine-L2 neuter Ns did not reveal any significant main effect of Incongruency (F(3,101)=.805, p=.494) or Stimuli List (F(1,101)=.080, p=.778). This shows that whether the erroneous D was masculine or feminine did not significantly affect the RTs for ungrammatical stimuli in either group.

4.3.5.4 Error rates

The results of the omnibus ANOVA run on error rates for grammatical stimuli showed a significant main effect of both Congruency (F(5,166)=6.367, p<.001, η_p^2=.161) and Native Language (F(1,166)=55.995, p<.001, η_p^2=.252). There was no significant interaction between the factors (F(5,166)=1.592, p=.165). With respect to Congruency, pairwise comparisons indicated that error rates were significantly lower for L1 feminine-L2 feminine nouns than L1 masculine-L2 masculine nouns (p<.001), L1 masculine-L2 feminine F nouns than L1 masculine-L2 masculine nouns (p<.001), L1 masculine-L2 neuter nouns than L1 masculine-L2 masculine nouns (p=.038) and L1 feminine-L2 neuter nouns than L1 masculine-L2 masculine nouns (p=.018)[25]. The significant effect of Native Language indicated that L1 German speakers displayed significantly lower error rates than the L1 French-L2 German bilinguals. Error rates for the grammatical stimuli are shown in Figure 4.18.

[25] There were no significant differences between the error rates for grammatical stimuli in the following gender congruency conditions: L1 M-L2 F vs L1 F-L2 F nouns (p=1.000); L1 M-L2 M vs L1 F-L2 M nouns (p=.623); L1 F-L2 F vs L1 F-L2 M nouns (p=.187); L1 M-L2 F vs L1 F-L2 M nouns (p=.189); L1 F-L2 F vs L1 M-L2 Nt nouns (p=1.000); L1 F-L2 F vs L1 F-L2 Nt nouns (p=1.000); L1 M-L2 F vs L1 M-L2 Nt nouns (p=1.000); L1 F-L2 M vs L1 M-L2 Nt nouns (p=1.000); L1 M-L2 F vs L1 F-L2 Nt nouns (p=1.000); L1 F-L2 M vs L1 F-L2 Nt nouns (p=1.000); and L2 M-L2 Nt vs L1 F-L2 Nt nouns (p=1.000).

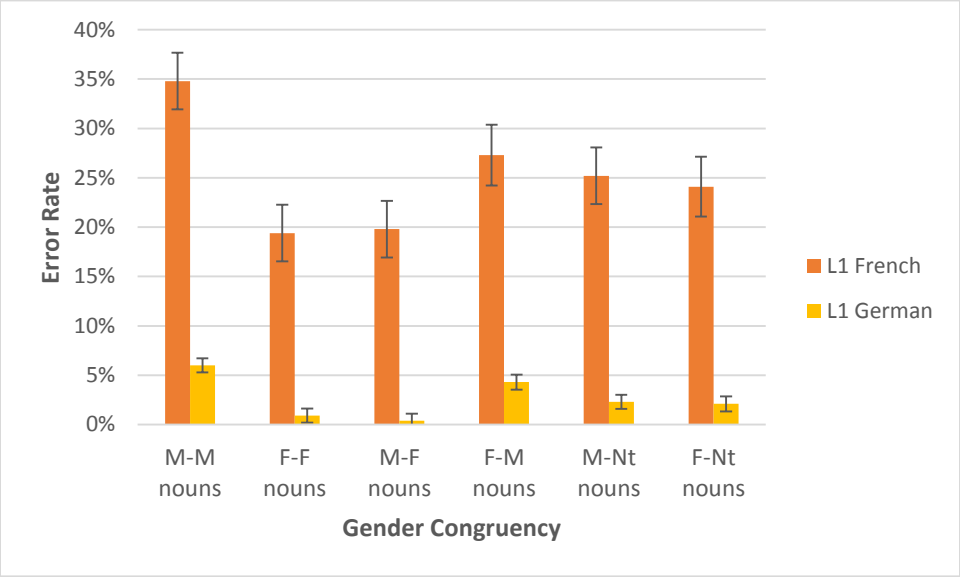


Figure 4.18. *L1 French-L2 German and L1 German mean error rates for grammatical stimuli.*

(Error bars represent the standard error of the mean)

The omnibus ANOVA run on error rates for ungrammatical stimuli again revealed a significant main effect of both Congruency ($F(5,166)=2.763$, $p=.020$, $\eta_p^2=.077$) and Native Language ($F(1,166)=163.944$, $p<.001$, $\eta_p^2=.497$). Unlike with the error rates for the grammatical stimuli, the two factors did interact significantly for the ungrammatical stimuli error rates ($F(2,166)=2.695$, $p=.023$, $\eta_p^2=.075$). A univariate ANOVA run on each level of Native Language showed that Congruency was significant for the L1 French-L2 German bilinguals ($F(5,167)=2.797$, $p=.019$, $\eta_p^2=.077$) but not the L1 German speakers ($F(2,167)=.688$, $p=.633$). The error rates for both groups are illustrated in Figure 4.19.

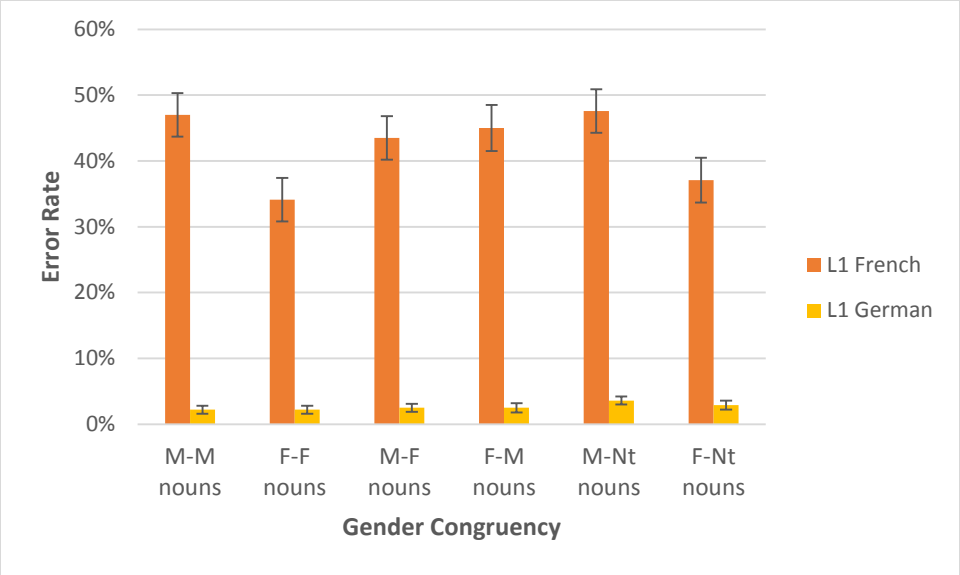


Figure 4.19. *L1 French-L2 German and L1 German mean error rates for ungrammatical stimuli. (Error bars represent the standard error of the mean)*

An LSD post hoc test revealed that the bilinguals' error rates for ungrammatical DPs were significantly lower for L1 feminine-L2 feminine nouns than L1 masculine-L2 masculine nouns (p=.006), L1 feminine-L2 feminine nouns than L1 masculine-L2 feminine (p=.040), L1 feminine-L2 feminine nouns than L1 feminine-L2 masculine nouns (p=.024), L1 feminine-L2 feminine nouns than L1 masculine-L2 neuter nouns (p=.004), L1 feminine-L2 neuter nouns than L1 masculine-L2 masculine (p=.040), and L1 feminine-L2 neuter nouns than L1 masculine-L2 neuter nouns (p=.030).[26] Mean error rates for all stimuli for both groups are presented in Table 4.15.

Table 4.15. Mean error rates (%) for grammatical and ungrammatical stimuli in all gender conditions.

	L1 French – L2 German		**L1 German**	
Gender Condition	*Grammatical Stimuli*	*Ungrammatical Stimuli*	*Grammatical Stimuli*	*Ungrammatical Stimuli*
M-M nouns	34.8 (15.4)	47.0 (16.0)	6.0 (7.1)	2.2 (2.4)
F-F nouns	19.4 (17.4)	34.1 (17.7)	0.9 (1.7)	2.2 (2.8)
M-F nouns	19.8 (15.9)	43.5 (15.6)	0.4 (1.3)	2.5 (3.3)

[26] There were no significant differences between the error rates for ungrammatical stimuli in the following gender congruency conditions: L1 M-L2 M vs L1 M-L2 F nouns (p=.466); L1 M-L2 M vs L1 F-L2 M nouns (p=.668); L1 M-L2 F vs L1 F-L2 M nouns (p=.784); L1 M-L2 M vs L1 M-L2 Nt nouns (p=.904); L1 F-L2 F vs L1 F-L2 Nt (p=.515) nouns; L1 M-L2 F vs L1 M-L2 Nt nouns (p=.396); L1 F-L2 M vs L1 M-L2 Nt nouns (p=.586); L1 M-L2 F vs L1 F-L2 Nt nouns (p=.175); and L1 F-L2 M vs L1 F-L2 Nt nouns (p=.115).

F-M nouns	27.3 (13.0)	45.0 (17.7)	4.3 (4.1)	2.5 (2.9)
M-Nt nouns	25.2 (17.7)	47.6 (21.4)	2.3 (3.6)	3.6 (5.3)
F-Nt nouns	24.1 (16.3)	37.1 (17.9)	2.1 (2.9)	2.9 (3.6)

Note: Standard deviations appear in parentheses.

The results of the ANOVA focusing on masculine versus feminine erroneous Ds in DPs involving L1 feminine-L2 neuter Ns did not reveal a main effect of Incongruency ($F(3,108)=1.402$, $p=.246$) but Stimuli List was significant ($F(1,101)=22.373$, $p<.001$, $\eta_p^2=.172$), illustrating that error rates were significantly lower in bilinguals who were assigned list 2 than those assigned to list 1 (Figure 4.20).

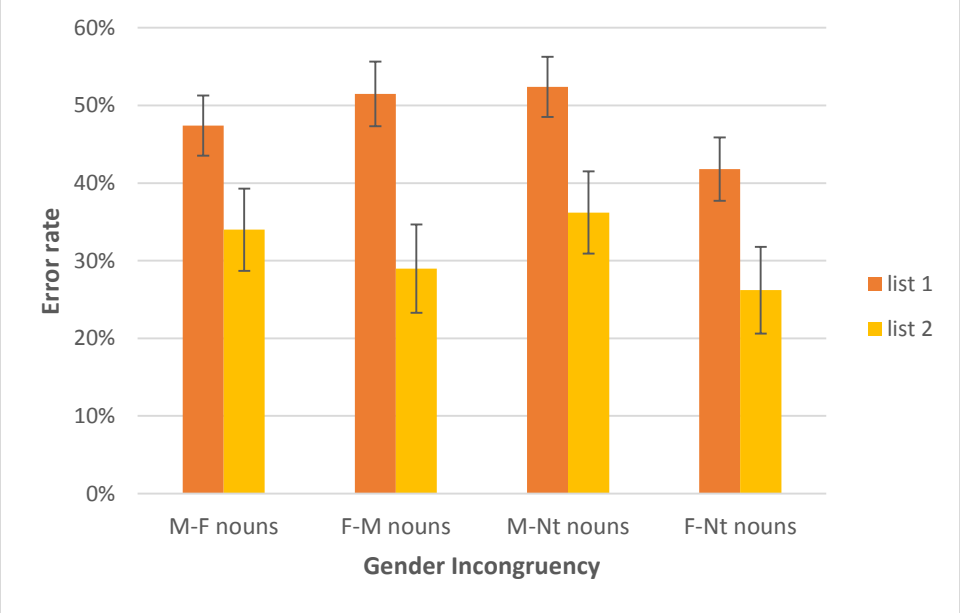


Figure 4.20. *Mean error rates for ungrammatical stimuli by list.*
(Error bars represent the standard error of the mean)

4.3.6 Discussion

The results show that gender congruency between the L1 and the L2 significantly affects RTs for grammatical stimuli and the error rates for both grammatical and ungrammatical stimuli.

4.3.6.1 L1-L2 gender representation

The RTs for grammatical stimuli revealed that DPs containing gender congruent nouns had significantly faster RTs than DPs with either gender incongruent nouns or L2 neuter nouns. The facilitation in the response when the nouns have the same gender value in both the L1 and the L2 and the interference created by the nouns of different gender values in the L1 and the L2 supports the *gender integrated representation hypothesis* (Salamoura & Williams, 2007) and is in line with much of the previous research with symmetric gender systems (Paolieri et al, 2010b; Morales, Paolieri & Bajo, 2011; Lemhöfer, Spalek & Schriefers, 2008; Bordag, 2004; Bordag & Pechmann, 2007). This result is also consistent with the results found in the L2 picture-naming task performed by the L1 Spanish-L2 German bilinguals (presented in 4.1), with the exception of the L2 neuter nouns. In this task, L1 French-L2 German bilinguals were slower to respond to grammatical DPs containing L2 neuter nouns, a finding which could be attributable to the different linguistic profile of the bilinguals or to the different type of task. With respect to linguistic profile, the L1 French bilinguals had a mean German proficiency score which was 10% lower than that of the L1 Spanish bilinguals. It is clear from acquisition research that the representation and use of the L2 changes throughout the process of acquisition and it is therefore possible that the representation of L2 neuter is still unstable in the lower proficiency bilinguals. In terms of the task differences, this task requires the recognition of the presented DP plus an additional decision (whether or not is it grammatical) whereas the picture-naming task only requires that the retrieved N/DP be orally produced. This additional decision could result in the neutralization of any time gained in the recognition process by the reduced interference with L2 neuter nouns compared to nouns mismatched for masculine and feminine between the L1 and L2.

4.3.6.2 Use of L2 gender

The error rates for the grammatical stimuli showed a significant effect of gender congruency in both the L1 French and L1 German groups. A closer look at the locus of this effect shows that it results from L1 feminine-L2 feminine, L1 masculine-L2 feminine, L1 masculine-L2 neuter and L1 feminine-L2 neuter nouns (that is, a mix of congruent, incongruent and L2 neuter noun conditions) all having significantly lower error rates than L1 masculine-L2 masculine nouns (a congruent noun condition; see Figure 4.13). This is highly unexpected for the L1 German speakers who should be unaffected by the gender congruency between German and French. It is also unexpected for the L1 French bilinguals, however, as error rates would logically be lowest for nouns of the same gender value in both the L1 and the L2. The fact that the error rates are highest with French M-German M nouns (7.5% higher than the second highest error rate for the bilinguals and 1.7% higher for the L1 German speakers) but among the lowest for the other gender congruent noun condition (L1 feminine-L2 feminine) suggests that this effect is likely attributable to the stimuli in the L1 masculine-L2 masculine condition rather than an effect of the gender congruency manipulations between French and German. It is unclear what aspect of the stimuli could have caused this effect as the most likely culprit, noun frequency, was controlled in the design and also included as a covariate in the analyses.

The error rates for the ungrammatical stimuli displayed a very different pattern of results than those for the grammatical stimuli. With the ungrammatical stimuli, the effect of congruency was only significant in the L1 French-L2 German bilinguals and was shown to be significant in six contrasts between gender congruency conditions (see Figure 4.14). The significant differences and their possible explanations are summarized in Table 4.16.

Table 4.16. Summary of significant differences in error rates for ungrammatical stimuli.

Gender Conditions	Incorrect D Presented		Possible Explanations
F-F < M-M	*das*$_{Nt}$	*das*$_{Nt}$	M-M stimuli; F more salient due to markedness
F-F < M-F	*das*$_{Nt}$	*der*$_{M}$	congruent Ns less error-prone than incongruent Ns
F-F < F-M	*das*$_{Nt}$	*die*$_{F}$	congruent Ns less error-prone than incongruent Ns
F-F < M-Nt	*das*$_{Nt}$	*der*$_{M}$	congruent Ns less error-prone than incongruent Ns; difficulty rejecting incorrect masculine D with neuter Ns
F-Nt < M-M	*die*$_{F}$ / *der*$_{M}$	*das*$_{Nt}$	M-M stimuli
F-Nt < M-Nt	*die*$_{F}$ / *der*$_{M}$	*der*$_{M}$	difficulty rejecting incorrect masculine D with neuter Ns

The L1 French-L2 German bilinguals were significantly better at rejecting ungrammatical DPs containing L1 feminine-L2 feminine nouns than those with L1 masculine-L2 masculine nouns (ie. errors such as 'das$_{Nt}$ Birne$_{F}$' *(poire$_{F}$)* were easier to detect than 'das$_{Nt}$ Flug$_{M}$' *(vol$_{M}$)*). Given the results of the error rates with the grammatical stimuli, it seems that this result could arise from the specific nouns that were chosen for the M-M condition[27]. An alternate explanation could be the fact that feminine is the most marked gender in their L1, and as such, ungrammatical DPs involving German nouns with a feminine French equivalent are more salient errors to these bilinguals than ungrammatical DPs involving German nouns with a masculine equivalent in French.

The fact that the bilinguals displayed significantly lower error rates for L1 feminine-L2 feminine nouns than L1 masculine-L2 feminine nouns and L1 feminine-L2 masculine nouns (ie. errors such as 'das$_{Nt}$ Birne$_{F}$' *(poire$_{F}$)* were accepted less than errors such as 'der$_{M}$ Wand$_{F}$' *(mur$_{M}$)* and 'die$_{F}$ Brief$_{M}$' *(lettre$_{F}$)*) can be accounted for by the fact that errors in DPs involving nouns of the same gender in the L1 and the L2 would be easier to detect than errors in DPs containing nouns of

[27] Since there is only one instance of a noun with an ending that is atypical of German masculine nouns (as per the gender assignment rules outlined in 2.4), it seems unlikely that irregularities in the form of the nouns in this condition can account for the different pattern of results with M-M nouns.

different L1 and L2 genders. This is due to the fact that a single gender node is activated by both the L1 and the L2 noun, facilitating the word recognition process and making concord errors easier to detect.[28] The same explanation is applicable to the lower error rates for L1 feminine-L2 feminine nouns compared to L1 masculine-L2 neuter nouns (ie. 'das$_{Nt}$ Birne$_{F}$' *(poire$_{F}$)* versus 'der$_{M}$ Glas$_{Nt}$' *(verre$_{M}$)*), however, in the case of the L2 neuter nouns, the difficulty in rejecting ungrammatical DPs comprised of D_M + N_{Nt} could also be evidence of a masculine as default L2 gender use strategy, in parallel with what was observed in the error analysis of the L2 picture-naming task data (see 4.2.6). If the bilinguals opt for a default gender use strategy in their L2, they would be less sensitive to ungrammatical DPs involving the erroneous use of the masculine D. The significantly higher error rates for L1 masculine-L2 neuter nouns over L1 feminine-L2 neuter nouns (ie. 'der$_{M}$ Glas$_{Nt}$' *(verre$_{M}$)* versus 'die$_{F}$/der$_{M}$ Kleid$_{Nt}$' *(robe$_{F}$)*) could also be accounted for in the dominance of a masculine as default strategy in the L1 French-L2 German bilinguals. While L1 masculine-L2 neuter nouns always appeared with the incorrect masculine D in the ungrammatical DPs, L1 feminine-L2 neuter nouns appeared with either the incorrect masculine or feminine D, depending on the list the participant was assigned to. It is therefore possible that all ungrammatical DPs involving German neuter nouns were significantly more difficult for the bilinguals to reject, and the fact that some of the participants were presented with the incorrect feminine D with German neuter nouns (which would be easier to reject if the use of a masculine default is the dominant L2 gender use strategy since feminine Ds in this case would represent errors resulting from L1 transfer) can account for the lower error rates with German neuter nouns with feminine French equivalents than those with masculine French equivalents.

[28] The fact that this does not seem to apply to M-M nouns as well as F-F nouns is likely due to noise in the data created by the specific nouns chosen for the M-M condition.

While these results from the differences in error rates for the ungrammatical DPs provide some evidence suggesting the use of masculine as a default strategy, the analyses that specifically targeted differences in RTs or error rates for ungrammatical DPs according to whether the incorrect D clearly represented L1 transfer (feminine D with L1 feminine-L2 neuter Ns) or masculine as default (masculine D with L1 feminine-L2 neuter Ns) did not reveal any statistically significant evidence in favour of one gender use strategy over the other. No significant effect was found for RTs, and only a significantly effect of the list assigned to the participant was found in the error rates. While this effect does show that list 1 (the list in which the D in ungrammatical DPs represented masculine as default) had significantly higher error rates than list 2 (in which erroneous Ds represented L1 transfer), since this effect was significant in the other gender congruency conditions as well (in which the stimuli did not differ between lists), it cannot be conclusively determined which of the L2 gender use strategies appeared to be dominant in these L1 French-L2 German bilinguals.

4.3.7 Conclusion

This experiment has offered further evidence in support of asymmetric gender systems having a representation that is shared between the L1 and the L2. Like the L1 Spanish-L2 German bilinguals, L1 French-L2 German bilinguals responded significantly faster to L1-L2 gender congruent nouns than incongruent nouns, a finding which was robust in spite of the different linguistic profile of the bilinguals (L1 as well as level of L2 proficiency) and the different task requirements (additional judgment step in grammaticality judgment task).

The results from this experiment are not as consistent with the findings in the L1 Spanish-L2 German bilinguals with respect to the representation of neuter, the L2 gender value not present

in the L1. With the L1 Spanish-L2 German bilinguals, it was evident that neuter has a unique representation that results in significantly less interference in the response than the interference created by gender incongruency that is limited to the gender values present in both the L1 and the L2 (that is, nouns that are mismatched for masculine and feminine between languages). This finding was not evident in the results with the L1 French-L2 German bilinguals. While the significant difference between gender congruent nouns and nouns involving some type of incongruency was not affected by the different linguistic profile or the different task requirements, it seems that evidence of the nature of the representation of the L2 gender not present in the L1 can be more easily masked by the additional step required in the grammaticality judgment task compared to the L2 picture-naming task or by the more unstable nature of this representation in bilinguals with a lower level of L2 proficiency. More data from similar tasks and participants more closely matched in proficiency would allow for a clearer picture of the representation of the L2 gender value not present in the L1.

While there is some evidence of a preference for the use of masculine as a default strategy in the L2, the fact that only one gender congruency condition allowed L1 transfer and masculine as default to be teased apart and the fact that not all participants were presented with stimuli representing both possible L2 gender use strategies limit the scope of the conclusions that can be drawn regarding L2 gender use in this experiment. It would be relevant to add more data from additional L1 French-L2 German bilinguals and to also expand the investigation of L2 gender use to different experimental paradigms.

5. The Study: Code-Switching and the Mental Lexicon

This chapter presents evidence from the use of gender in code-switching, offering further insight into the nature of the representation of asymmetric grammatical gender systems in the bilingual mental lexicon. Code-switching within the Determiner Phrase (DP) provides a complementary perspective to the psycholinguistic data presented in Chapter 4 in that the lack of ungrammaticality[29] allows the bilinguals to adopt gender use strategies that are indicative of their representation of L1-L2 grammatical gender. Furthermore, data from code-switching lend themselves to testing formal proposals, thus examining the connection (or disconnection) between the linguistic theory and the psycholinguistic reality of the representation and use of the L2 for the bilingual. Though some authors (ie. Poplack, 1981; Joshi, 1985) propose that code-switching grammars are governed by a special set of rules, following MacSwan (2000) I assume that code-switching is not subject to any additional constraints beyond the requirements of the grammars of the languages being mixed. Both formal proposals tested in this study adopt MacSwan's (2000) proposal and thus the code-switching data provide information that is relevant to non-switched grammars as well.

5.1 Code-switched acceptability judgment task

In order to investigate the use of gender in code-switched DPs, I designed a code-switched acceptability judgment task in which L1 Spanish-L2 German and L1 German-L2 Spanish bilinguals were asked to rate sentences containing an initial code-switched DP. Specifically, this experiment examines whether two formal proposals, the *double-feature valuation mechanism*

[29] In the strictest sense; it is clear that code-switching is rule-governed and thus alternation between languages is not without constraint.

(Liceras et al, 2008) or the *gender congruency algorithm* (González Vilbazo, 2005), can account for bilinguals' use of gender in Spanish-German code-switched DPs.

The *double-feature valuation mechanism* (Liceras et al, 2008) is an adaptation of Pesetsky and Torrego's (2001) proposal regarding nominative and agreement features in subject-verb agreement. In parallel to their proposal, in *double-feature valuation mechanism*, Liceras and colleagues (2008) assume that inherent lexical gender (GEN) is a feature on the noun (N) and Gender Agreement (Φ) is a feature on the determiner (D). The *mechanism* predicts that bilinguals will prefer code-switches within the DP in which the D is marked for the gender of the translation equivalent N. This is due to the way in which features are valued in code-switched DPs according to the mechanism. In this account, the uninterpretable GEN feature on the D is valued on the GEN feature on the translation equivalent N, and, similarly, the uninterpretable Φ feature on the translation equivalent N (uΦ) is valued on the interpretable Φ feature on the D. In this case, the features of the switched N are not relevant to gender marking in the switched DP and thus it would not be expected that switched DPs would display any gender agreement between the D and the N in the switch. Figures 5.1 and 5.2 illustrate the *double-feature valuation mechanism* in Spanish D-German N and German D-Spanish N switched DPs, respectively (left: 'the table'; right: 'the book').

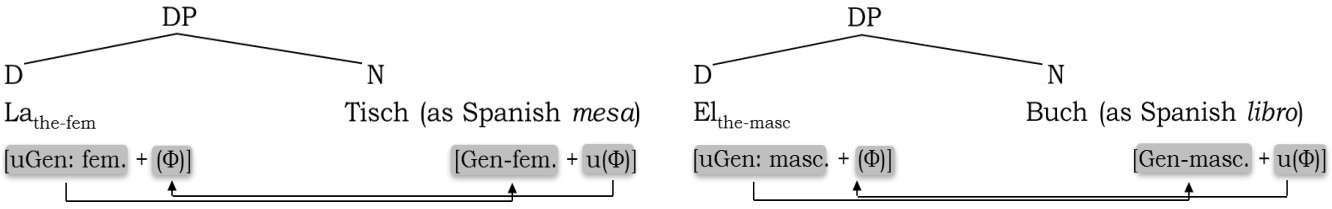


Figure 5.1. *Spanish D-German N code-switched DPs for gender-incongruent (left; F-M noun) and neuter nouns (right; M-Nt noun).*

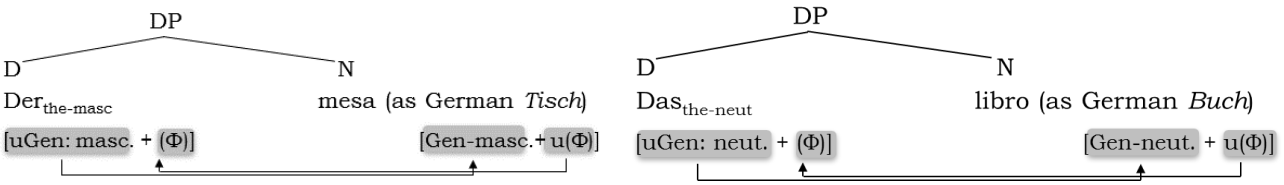


Figure 5.2. *German D-Spanish N code-switched DPs for gender-incongruent (left; F-M noun) and neuter nouns (right; M-Nt noun).*

In contrast, the *gender congruency algorithm* (González Vilbazo, 2005) predicts that bilinguals will mark the D for the gender of the switched N in Spanish-German switched DPs. This algorithm consists of five detailed steps that can be summarized as the selection of the D that best matches the features specified on the N in the switched DP. According to González Vilbazo (2005), Spanish has one gender feature, [±feminine], while German has two, [±masculine] and [±feminine], to allow for the distinction of the masculine and neuter gender values. As illustrated in Figure 5.3, in Spanish D-German N switched DPs the [±masculine] feature on the German N is simply ignored due to the lack of corresponding feature in Spanish. As described from the perspective of Distributed Morphology, in order to avoid feature clashes, [±masculine] is deleted on the German D or N through Impoverishment when the other word in the switched DP is specified for Spanish.

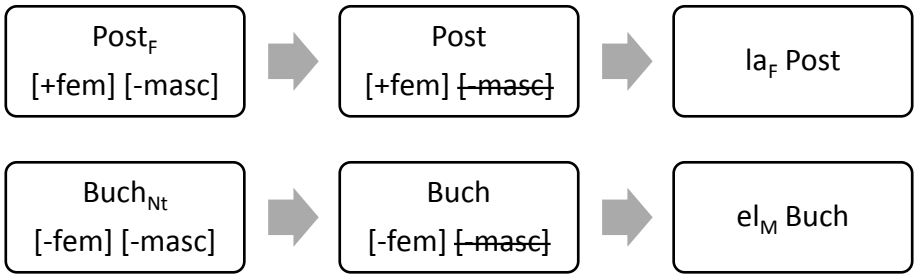


Figure 5.3. *Spanish D-German N code-switched DPs for feminine (top) and neuter (bottom) nouns.*

German D-Spanish N switches involving feminine Spanish Ns are unproblematic for the algorithm, however, masculine Spanish Ns bearing only the feature [-fem] leave it unclear as to whether the masculine or neuter D should be used (Figure 5.4). In these cases González Vilbazo

(2005) argues that only *ein*, the masculine/neuter indefinite D which is underspecified for [±masculine], creates an acceptable switched DP[30].

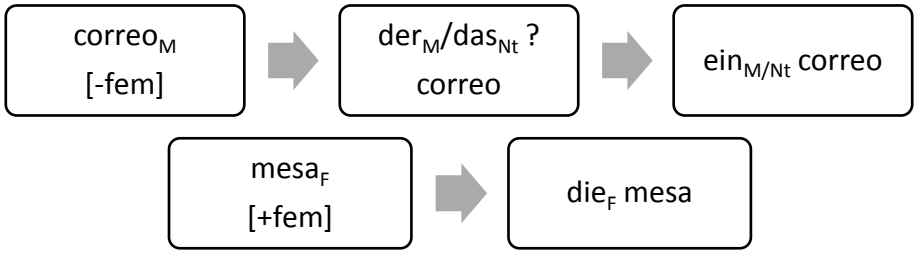


Figure 5.4. *German D-Spanish N code-switched DPs for feminine (top) and masculine (bottom) nouns.*

As has been shown, these two proposals make opposite predictions for the Spanish-German code-switched DPs that should be preferred by L1 Spanish-L2 German and L1 German-L2 Spanish bilinguals. Table 5.1 shows the switched DPs predicted for Ns that differ in gender between Spanish and German. Interestingly, for Spanish D-German N DPs, both proposals predict a switch with a masculine D and a neuter N for nouns that are masculine in Spanish and neuter in German.

Table 5.1. Code-switched Spanish-German DP predicted by both formal proposals.

Double-feature	***Gender congruency***	**Double-feature**	***Gender congruency***	**Nouns**			
Spanish D-German N		*German D-Spanish N*		*Spanish*		*German*	
el$_M$ Post$_F$	la$_F$ Post$_F$	die$_F$ correo$_M$	ein$_{M/Nt}$ correo$_M$	correo	M	Post	F
la$_F$ Tisch$_M$	el$_M$ Tisch$_M$	der$_M$ mesa$_F$	die$_F$ mesa$_F$	mesa	F	Tisch	M
el$_M$ Buch$_{Nt}$	el$_M$ Buch$_{Nt}$	das$_{Nt}$ libro$_M$	ein$_{M/Nt}$ Buch$_{Nt}$	libro	M	Buch	Nt
la$_F$ Bett$_{Nt}$	el$_M$ Bett$_{Nt}$	das$_{Nt}$ cama$_F$	die$_F$ cama$_F$	cama	F	Bett	Nt

Previous research has not provided clear evidence for either the *double-feature valuation mechanism* (Liceras et al, 2008) or the *gender congruency algorithm* (González Vilbazo, 2005), though the data do support each of these proposals to some extent. Radford et al's (2007) naturalistic data from

[30] This cannot be accounted for by Distributed Morphology.

2L1 French-German bilingual children showed that they tended to produce DPs in which the D was marked for the gender of the translation equivalent N, which is evidence in favour of the *double-feature valuation mechanism* (Liceras et al, 2008). Contrary to Radford et al (2007), Cantone and Müller (2008), Eichler, Hager and Müller (2012) and González Vilbazo (2005) found that 2L1 Italian-German, 2L1 French-German, 2L1 Spanish-German and 2L1 French-Italian (child) bilinguals produced significantly more DPs in which the D was marked for the gender of the switched N, which supports the *gender congruency algorithm* (González Vilbazo, 2005).

One main research question and a subquestion are addressed in this chapter. The research questions and the corresponding hypotheses are as follows:

Research Question IV: Do L1 Spanish-L2 German and L1 German-L2 Spanish bilinguals prefer Spanish-German code-switched DPs in which the D is marked for the gender of the translation equivalent N or the switched N?

Hypothesis IV: Both L1 Spanish-L2 German and L1 German-L2 Spanish bilinguals will prefer code-switched DPs in which the D is marked for the translation equivalent N.

It is hypothesized that both speaker groups will prefer switched DPs in which the determiner is marked for the gender of the translation equivalent of the translation equivalent noun. While the only available evidence for Spanish-German code-switched DPs shows that both children (Eichler et al, 2012) and adults (González Vilbazo, 2005) prefer and produce determiners marked for the gender of the noun in the switch, the participants in each of these studies were balanced bilinguals (2L1), unlike the participants in this study who are clearly L1 dominant. It is due to this important difference in linguistic profiles between these participant groups that my hypothesis is that both L1 Spanish-L2 German and L1 German-L2 Spanish speakers will prefer DPs in which the D is

marked for the translation equivalent N, as has been previously shown for unbalanced Spanish-dominant Spanish-English bilinguals (ie. Liceras et al, 2008).

Research Question IVa: Does definiteness play in a role in D gender preferences for German D-Spanish N switches involving a masculine Spanish N?

Hypothesis IVa: Masculine and neuter definite Ds will be dispreferred over the masculine/neuter indefinite D *ein*.

It is also hypothesized that the masculine/neuter indefinite D form *ein* will be preferred over the masculine and neuter definite D forms. This is following the *gender congruency algorithm*, which posits that it is unclear which definite D would match the features of the Spanish masculine N given that both masculine and neuter are [-feminine]. In order to bypass this difficulty, the indefinite D form should be preferred as it is underspecified for [±masculine], and therefore corresponds to both masculine and neuter.

5.1.1 Participants

24 L1 Spanish-L2 German bilinguals (mean age=32.1, SD=11.3) and 15 L1 German-L2 Spanish bilinguals (mean age=27.0, SD=7.8) participated in this experiment. Participants were recruited through colleagues in Spain and Germany as well as through social media. All participants had an intermediate-advanced level of proficiency in the L2: the L1 Spanish-L2 German bilinguals' mean proficiency in German was 63% (SD=5.5) (measured by the 30-question written grammar test of the Goethe-Institut (2010)) and the L1 German-L2 Spanish bilinguals' mean proficiency in Spanish was 88% (SD=3.7) (measured by the 35-question written grammar Wisconsin Placement Test (2009)). All participants also reported to know English and 21% of L1 Spanish-L2 German and 27% of L1 German-L2 Spanish bilinguals reported to have some knowledge of French, though only English was reported to be regularly used at the time of testing.

5.1.2 Materials

The experimental stimuli consisted of 120 sentences following the template Target DP + Prepositional Phrase + Copula (*ser/sein*) + Adjective (Example 5.1). The target DP was code-switched between Spanish and German; in half of the stimuli the switch consisted of a German D and a Spanish N (German D-Spanish N) and the other half consisted of a Spanish D and a German N (Spanish D-German N). A total of 72 inanimate concrete nouns were selected for the code-switched DPs: 60 nouns for experimental stimuli and 12 for fillers. Grammatical gender congruency between the Spanish and German Ns was manipulated to create four conditions: nouns that are masculine in Spanish and feminine in German (Spanish M-German F; M-F nouns); nouns that are feminine in Spanish and masculine in German (Spanish F-German M; F-M nouns); nouns that are masculine in Spanish and neuter in German (Spanish M-German Nt; M-Nt nouns); and nouns that are feminine in Spanish and neuter in German (Spanish F-German Nt; F-Nt nouns). Following the other experiments in this study, only Spanish nouns with canonical word endings (masculine: *-o*, feminine: *-a*) were included. All sentences were grammatical and no prepositional phrases or adjectives were marked for gender. Only the target DP contained a code-switch; the rest of the sentence continued in the same language as the N in the DP so as to seem as natural as possible.

(5.1) a. Stimulus example with German D-Spanish N target DP

Der periódico *de la universidad es radical.*	definite D
the$_{\text{M-GER}}$ **newspaper**$_{\text{M-SP}}$ of the university is radical	
'The university newspaper is radical.'	
Ein periódico *de la universidad es radical.*	indefinite D
a$_{\text{M-GER}}$ **newspaper**$_{\text{M-SP}}$ of the university is radical	
'A university newspaper is radical.'	

b. Stimulus example with Spanish D-German N target DP

El Rock *in der Garderobe ist rot.* definite D

the$_{\text{M-SP}}$ **skirt**$_{\text{M-GER}}$ in the closet is red

'The skirt in the closet is red.'

Un Rock *in der Garderobe ist rot.* indefinite D

a$_{\text{M-SP}}$ **skirt**$_{\text{M-GER}}$ in the closet is red

'A skirt in the closet is red.'

The gender of the D as well as definiteness was also manipulated. The distribution of the stimuli appears in Tables 5.2 and 5.3.

Table 5.2. Stimuli details for Spanish Determiner-German Noun DPs (52 total).

Condition		**Spanish D-German N DPs**			
noun gender		*definite determiners*		*indefinite determiners*	
Spanish	**German**	**masculine (el)**	**feminine (la)**	**masculine (un)**	**feminine (una)**
masculine	feminine	3	3	3	3
feminine	masculine	3	3	3	3
masculine	neuter	3	3	3	3
feminine	neuter	3	3	3	3

For the Spanish D-German N DPs, there were a total of 12 stimuli for each noun gender congruency condition. The 12 stimuli were divided equally among definite and indefinite and masculine and feminine D forms (Table 5.2). The sentences with indefinite Ds were variants of the sentences with definite Ds, the only difference between the two variants being the definiteness of the D.

Table 5.3. Stimuli details for German Determiner-Spanish Noun DPs (60 total).

Condition		**German D-Spanish N DPs**				
noun gender		*definite determiners*			*indefinite determiners*	
Spanish	**German**	**masculine (der)**	**feminine (die)**	**neuter (das)**	**masculine/neuter (ein)**	**feminine (eine)**
masculine	feminine	3	3	3	3	3

feminine	masculine	3	3	3	3	3
masculine	neuter	3	3	3	3	3
feminine	neuter	3	3	3	3	3

For the German D-Spanish N DPs, there were a total of 15 stimuli for each noun gender congruency condition (additional stimuli were required to allow for the inclusion of the neuter definite D). The 15 stimuli were divided equally among definite and indefinite and masculine, feminine and neuter D forms (Table 5.3). As with the Spanish D-German N DPs, the sentences with indefinite Ds were variants of the definite D sentences. Given that the masculine and neuter D have the same form in the indefinite, 12 of the sentences with the masculine or neuter definite D did not have an indefinite variant (in order to maintain the same number of sentences in each condition). All stimuli are included in Appendix C.

5.1.3 Design

The acceptability judgment task consisted of 120 sentences. In order to counterbalance the stimuli presentation, two lists were created with the stimuli randomized according to the constraint that no more than three sentences with the same type of switched DP, determiners of the same gender or nouns from the same gender congruency condition could appear consecutively. All study information appeared in the participants' L1 and all task instructions were presented in both Spanish and German. The task was preceded by a short practice session of 6 sentences containing Spanish-German code-switches in which the position of the switch was manipulated to create varying degrees of acceptability. Participants received feedback on their responses during the practice session in order to train them to use all points on the Likert scale in their ratings. The Likert scale contained 4 points, described in the instructions as 'totally unacceptable, terrible' (1); 'relatively unacceptable, quite bad' (2); 'relatively acceptable, quite good' (3); and 'totally

acceptable, excellent' (4). In the practice session points 1 and 4 were labelled 'terrible/schrecklich' and 'excelente/exzellent', respectively. During the experimental task none of the 4 points were labelled.

5.1.4 Procedure

Participants completed the acceptability judgment task through a webpage hosted by surveygizmo.com. The experimental session lasted approximately 45 minutes and was completed independently by the participant. All participants were entered in a draw for a one of four 20 euro Amazon gift cards in exchange for completing the experiment.

Prior to the practice session and the experimental task, participants completed an abbreviated language background questionnaire and an L2 proficiency test (German proficiency in the case of the L1 Spanish bilinguals and Spanish proficiency in the case of the L1 German bilinguals).

5.1.5 Results

Repeated-measures analyses of variance (ANOVAs) were run on mean acceptability ratings calculated by participants. The factors were Congruency (M-F versus F-M versus M-Nt versus F-Nt nouns), Determiner Gender (masculine versus feminine[31]), Definiteness (definite versus indefinite determiners) and Native Language (L1 Spanish versus L1 German). In all analyses, Congruency, Determiner Gender and Definiteness were within-subjects factors and Native Language a between-subjects factor. Effect size is reported as partial eta squared (η_p^2). Since none

[31] While neuter determiners were also included in German D-Spanish N DPs, neuter was excluded from the omnibus ANOVAs because the asymmetry between German and Spanish (Spanish has no neuter value) and between definite and indefinite German determiners (neuter has a unique definite form but is collapsed with masculine in the indefinite) created missing data cells that prevented the ANOVA from being carried out. Furthermore, the exclusion of neuter from the initial analyses also allowed for the same analysis to be run on the data from both German D-Spanish N and Spanish D-German N switches.

of the research questions could be meaningfully addressed by the direct comparison of the German D-Spanish N and the Spanish D-German N switches, separate analyses were run for each type of code-switched DP.

5.1.5.1 German D-Spanish N switched DPs

Results of the ANOVA on mean ratings for German D-Spanish N switches (excluding neuter determiners, as indicated in footnote 31) showed no significant main effect of Congruency ($F(3,111)=1.769$, $p=.157$), Determiner Gender ($F(1,37)=2.070$, $p=.159$), Definiteness[32] ($F(1,37)=.465$, $p=.500$) or Native Language ($F(1,37)=2.880$, $p=.098$). There were, however, significant interactions between Determiner Gender and Definiteness ($F(1,37)=3.936$, $p=.055$, $\eta_p^2=.096$) and between Congruency and Determiner Gender ($F(3,111)=24.921$, $p<.001$, $\eta_p^2=.402$).[33]

Given that Determiner Gender was shown to interact significantly with other factors, neuter determiners were included in the analyses of simple main effects in order to obtain a complete picture of the pattern of results. To further investigate the interaction between Determiner Gender and Definiteness, a univariate repeated-measures ANOVA that directly targeted masculine and neuter definite and indefinite determiners was run. Due to the difficulty the indefinite determiner *ein* (which is both masculine and neuter) posed to the analysis, the data were somewhat unconventionally recoded such that there were three levels in the analysis: masculine definite determiners, neuter definite determiners and masculine/neuter indefinite determiners. The

[32] Given that neuter was excluded from the omnibus analysis, *ein* was coded as masculine for the purposes of this ANOVA.

[33] The following interactions were not significant: Congruency*L1 ($F(3,111)=1.423$, $p=.240$); Determiner Gender*L1 ($F(1,37)=2.647$, $p=.112$); Definiteness*L1 ($F(1,37)=1.925$, $p=.174$; Congruency*Definiteness ($F(3,111)=.544$, $p=.653$; Congruency*Determiner Gender*L1 ($F(3,111)=1.401$, $p=.246$); Congruency*Definiteness*L1 ($F(3,111)=.797$, $p=.498$); Determiner Gender*Definiteness*L1 ($F(1,37)=.033$, $p=.858$); Congruency*Determiner Gender*Definiteness ($F(3,111)=1.397$, $p=.248$); and Congruency*Determiner Gender*Definiteness*L1 ($F(3,111)=.197$, p=898).

results of the ANOVA revealed no significant main effect (F(2,76)=1.210, p=.304), indicating that the ratings did not vary according to whether the masculine or neuter determiners were definite or indefinite (Figure 5.5). This means that the significant interaction found in the omnibus ANOVA pertained to levels of Determiner Gender and Definiteness that were not relevant to Research Question IVa given that the focus is exclusively on the effect of definiteness in masculine and neuter determiners.

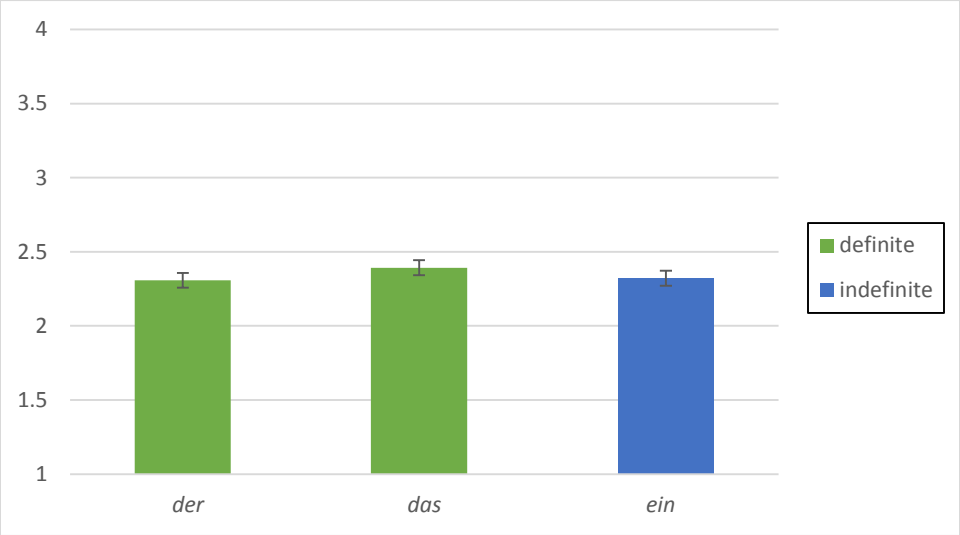


Figure 5.5. *Mean ratings for masculine (der, ein) and neuter (das, ein) Determiners. (Error bars represent the standard error of the mean)*

In order to determine the locus of the interaction between Congruency and Determiner Gender, a univariate repeated-measures ANOVA was run for each level of Congruency. Determiner Gender was significant at all levels of Congruency: M-F nouns (F(2,76)=8.275, p=.001, η_p^2=.179); F-M nouns (F(2,76)=6.550, p=.007, η_p^2=.147); M-Nt nouns (F(2,76)=11.511, p<.001, η_p^2=.232); and F-Nt nouns (F(2,76)=17.584, p<.001, η_p^2=.316). Mean ratings are presented in Table 5.4.

Table 5.4. Mean ratings by Congruency and Determiner Gender.

Noun Congruency		**Mean Rating**		
Spanish	*German*	*masculine D*	*feminine D*	*neuter D*
masculine	feminine	2.54 (.75)	2.08 (.67)	2.28 (.79)
feminine	masculine	2.23 (.78)	2.61 (.76)	2.22 (.81)
masculine	neuter	2.56 (.74)	2.08 (.69)	2.55 (.86)
feminine	neuter	1.89 (.67)	2.71 (.85)	2.51 (.96)

Note: Standard deviations appear in parentheses.

For Spanish M-German F nouns (ie. *der*$_{M}$ *correo*$_{M}$), pairwise comparisons showed that masculine Ds were rated significantly higher than feminine ones ($p<.001$), with no significant differences between masculine and neuter Ds ($p=.063$) or between feminine and neuter Ds ($p=.328$). For Spanish F-German M nouns (ie. *die*$_{F}$ *mesa*$_{F}$), feminine Ds were rated significantly higher than both masculine ($p=.030$) and neuter ($p=.030$) ones, with no significant difference between masculine and neuter Ds ($p=1.000$). The opposite pattern was found with Spanish M-German Nt nouns (ie. *der*$_{M}$/*das*$_{Nt}$ *libro*$_{M}$), namely, that masculine and neuter Ds were rated significantly higher than feminine ones ($p=.001$ and $p=.003$, respectively), and masculine and neuter Ds again were not rated significantly differently ($p=1.000$). Finally, for Spanish F-German Nt nouns (ie. *die*$_{F}$/*das*$_{Nt}$ *cama*$_{F}$), both feminine and neuter Ds were rated significantly higher than masculine ones ($p<.001$ in both cases), with no significant difference between feminine and neuter Ds ($p=.649$). Mean determiner ratings by Congruency condition are shown in Figure 5.6, with significant differences indicated by asterisks.

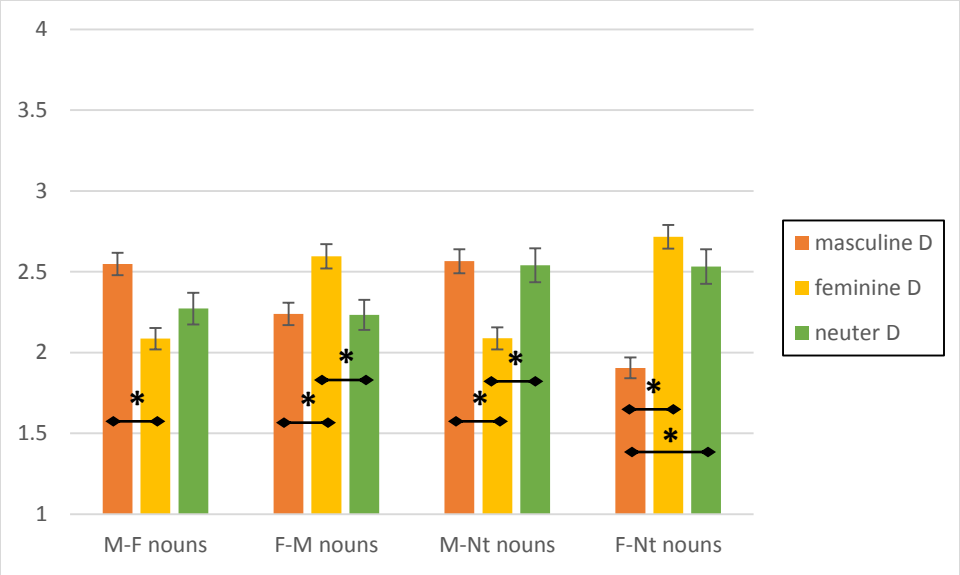


Figure 5.6. *Mean ratings for determiner gender by Congruency condition. (Error bars represent the standard error of the mean)*

5.1.5.2 Spanish D-German N switched DPs

Results of the ANOVA on mean ratings for Spanish D-German N switches, unlike those for German D-Spanish N switches, showed a significant main effect of Congruency (F(3,111)=6.373, p=.001, η_p^2=.147) and Determiner Gender (F(1,37)=8.255, p=.007, η_p^2=.182), though Definiteness (F(1,37)=.009, p=.924) and Native Language (F(1,37)=.315, p=.578) were not significant. The significant effects were further qualified by two significant three-way interactions: Congruency, Determiner Gender and Definiteness (F(3,111)=4.596, p=.006, η_p^2=.111) as well as Congruency, Determiner Gender and Native Language (F(3,111)=4.392, p=.010, η_p^2=.106).[34]

[34] The following interactions were not significant: Congruency*L1 (F(3,111)=1.937, p=.128; Determiner Gender*L1 (F(1,37)=.295, p=.591); Definiteness*L1 (F(1,37)=.928, p=.342); Congruency*Definiteness (F(3,111)=1.482, p=.223); Determiner Gender*Definiteness (F(1,37)=1.777, p=.191); Congruency*Definiteness*L1 (F(3,111)=2.442, p=.068); Determiner Gender*Definiteness*L1 (F(1,37)=2.563, p=.118); and Congruent*Determiner Gender*Definiteness*L1 (F(3,111)=1.623, p=.188).

In order to tease apart the interaction between Congruency, Determiner Gender and Definiteness, a univariate repeated-measures ANOVA was run at each level of Congruency for masculine and feminine determiners. Congruency was not significant at any level for masculine determiners, and was only significant for Spanish M-German F nouns ($F(1,38)=6.719$, $p=.013$, $\eta_p^2=.150$) with feminine determiners, indicating that indefinite feminine determiners were rated significantly higher than definite ones. Since no research questions address the effect of definiteness in feminine determiners and neither of the formal proposals investigated in this experiment make predications for definiteness effects beyond masculine and neuter German D, this result is considered beyond the scope of this study and will not be considered further.

To further investigate the Congruency, Determiner Gender and Native Language interaction, a univariate repeated-measures ANOVA was performed at each level of Congruency for L1 Spanish and L1 German bilinguals. For the L1 Spanish bilinguals, feminine Ds were rated significantly higher than masculine ones (ie. la_{F} $Post_{\mathrm{F}}$) with Spanish M-German F nouns ($F(1,23)=5.929$, $p=.023$, $\eta_p^2=.205$), while masculine Ds were rated significantly higher than feminine ones (ie. el_{M} $Buch_{\mathrm{Nt}}$) with Spanish M-German Nt nouns ($F(1,23)=14.824$, $p=.001$, $\eta_p^2=.392$). There was no significant effect of Determiner Gender for Spanish F-German M ($F(1,23)=.018$, $p=.894$) or Spanish F-German Nt ($F(1,23)=.001$, $p=.973$) nouns.

Table 5.5. Mean ratings by Congruency and Determiner Gender.

Noun Congruency		**L1 Spanish**		**L1 German**	
Spanish	*German*	*masc D*	*fem D*	*masc D*	*fem D*
masculine	feminine	2.51 (.67)	2.79 (.77)	2.54 (.93)	2.81 (.77)
feminine	masculine	2.60 (.68)	2.62 (.84)	2.84 (.69)	2.41 (.85)
masculine	neuter	2.80 (.79)	2.01 (.80)	2.55 (.70)	2.49 (.71)
feminine	neuter	2.59 (.83)	2.59 (.87)	3.16 (.64)	2.65 (.74)

Note: Standard deviations appear in parentheses.

For the L1 German bilinguals, masculine Ds were rated significantly higher than feminine ones (ie. el_{M} $Tisch_{M}$ / el_{M} $Bett_{Nt}$) with Spanish F-German M nouns (F(1,14)=5.876, p=.029, η_p^2 =.296) and with Spanish F-German Nt nouns (F(1,14)=10.062, p=.007, η_p^2 =.418). In the case of the L1 German bilinguals, there was no significant effect of Determiner Gender for Spanish M-German F nouns (F(1,14)=1.200, p=.292) or Spanish M-German Nt nouns (F(1,14)=.119, p=.735).

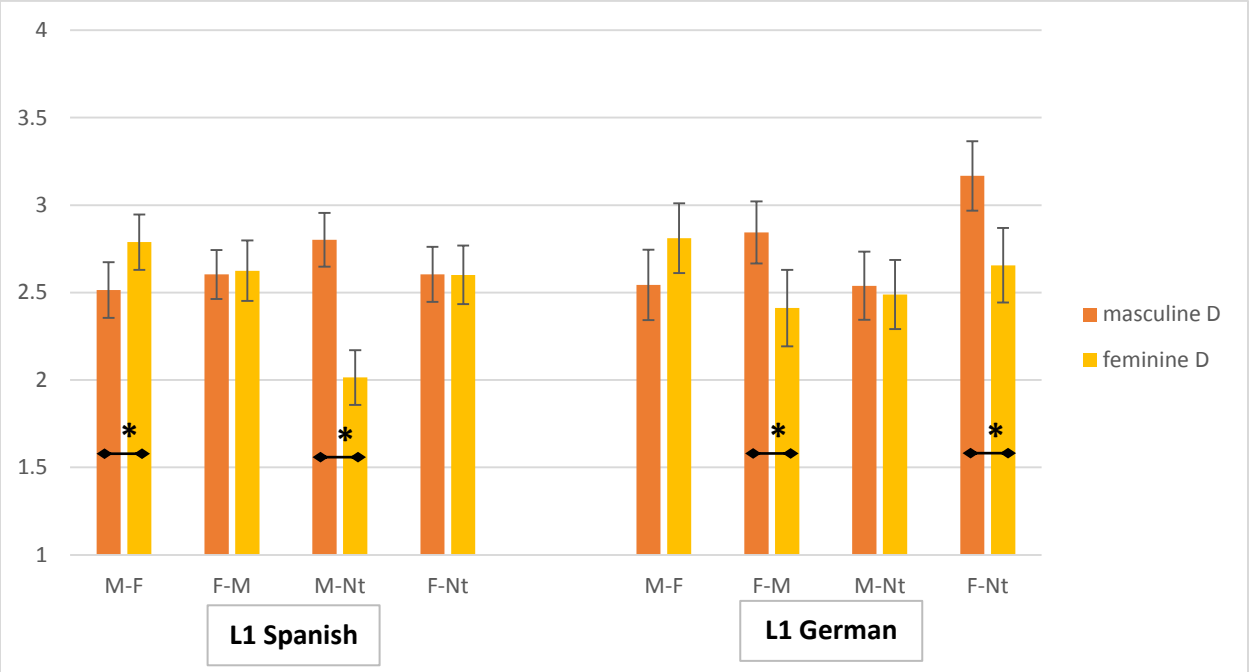


Figure 5.7. *Mean ratings for determiner gender by Congruency condition and group. (Error bars represent the standard error of the mean)*

Mean determiner ratings by Congruency for both groups are shown in Table 5.5 and Figure 5.7 (with significant differences indicated by asterisks in Figure 5.7).

5.1.6 Discussion

The results from the acceptability judgment task show that while the definiteness of the D in the code-switched DPs seems to have little effect on the ratings, there is a consistent interplay

between the gender of the D and the gender congruency condition of the N. Interestingly, the bilingual groups do not differ significantly in their ratings of the German D-Spanish N switched DPs, but show different tendencies with Spanish D-German N DPs. The highest rated D for each noun gender congruency condition is shown in Table 5.6.

Table 5.6. Highest rated determiner in each noun congruency condition by group.

Noun Cong		**German D-Spanish N**		**Spanish D-German N**	
Spanish	*German*	*L1 Spanish*	*L1 German*	*L1 Spanish*	*L1 German*
masculine	feminine	masc D		fem D	fem D (trend)
feminine	masculine	fem D		masc = fem D	masc D
masculine	neuter	masc = neut D		masc D	masc = fem D
feminine	neuter	fem D (trend)		masc = fem D	masc D

In German D-Spanish N switches, both groups of bilinguals have a clear preference for masculine Ds with Spanish M-German F nouns and feminine Ds with Spanish F-German M nouns. They also show a trend towards a preference for feminine Ds with Spanish F-German Nt nouns. With Spanish M-German Nt nouns, they prefer either D that bears the feature [-fem] in German (namely, masculine and neuter), without displaying a significant preference for either *der* or *das*.

In Spanish D-German N switches, the L1 Spanish and L1 German bilinguals seem to have a significant preference for certain Ds in different conditions. L1 Spanish bilinguals show a clear preference for feminine Ds with Spanish M-German F and masculine Ds with Spanish M-German Nt nouns but rate masculine and feminine Ds approximately the same with Spanish F-German M and Spanish F-German Nt nouns. In contrast, L1 German bilinguals show a clear preference for masculine Ds with Spanish F-German M and Spanish F-German Nt nouns while rating masculine and feminine nouns the same with Spanish M-German Nt nouns and displaying a

preference for feminine Ds that only trends towards significance with Spanish M-German F nouns.

5.1.6.1 Gender use strategies

The preference for one determiner over another in each of the noun congruency conditions is indicative of a certain gender use strategy in code-switched DPs. The possible source of each D form by noun congruency condition appears in Table 5.7.[35]

Table 5.7. Gender use strategy by determiner gender in each noun congruency condition.

N Congruency		**German D-Spanish N**			**Spanish D-German N**	
Spanish	*German*	*masc D*	*fem D*	*neut D*	*masc D*	*fem D*
masc	fem	switch	translation	?	translation	switch
fem	masc	translation	switch	?	switch	translation
masc	neut	switch	?	translation	trans/switch	?
fem	neut	default	switch	translation	switch	translation

Note: 'translation'=translation equivalent N; 'switch'=switched N; 'default'=masculine as a default

There are essentially two possible gender use strategies: the D either agrees with the N in the switch or with the translation equivalent of the switched N. While the use of most of the Ds in each noun congruency condition can be linked to one of these strategies, there are two instances of the neuter and feminine Ds that are difficult to attribute to a specific strategy (indicated by '?' in Table 5.7). Furthermore, in Spanish D-German N switches involving Spanish M-German Nt nouns, there are two possible strategies linked to the masculine D. The masculine D could represent agreement with the Spanish N, or the insertion of the only Spanish D specified for [-

[35] In this task, it cannot be ruled out that some of the pattern of results could be attributable to other factors such as the misclassification of L2 nouns in the bilinguals' lexicons. However, the risk of the effect of factors other than the L1-L2 gender congruency manipulations having an impact on the data is no higher than in many other studies which also do not have additional control measures such as a post-task to gauge accuracy in L2 noun classification. Furthermore, a concerted effort was made in the task design to reduce possible noise in the data by choosing high frequency nouns, reviewing the stimuli with multiple professors of German and discussing the stimuli with some of the participants (which resulted in the elimination of some stimuli from the analysis).

fem]. If the masculine D represents agreement with the Spanish N, the use of masculine would indicate agreement with the translation equivalent N. On the other hand, if the masculine D is inserted as the only [-fem] D option in Spanish, the gender use strategy would be agreement with the switched N, since through Impoverishment the German neuter N would be specified only as [-fem], just like the masculine D in Spanish. Along similar lines, with Spanish F-German Nt nouns the use of the masculine D can be attributed to agreement with the switched N, under the assumption that in the switched DP the German neuter N is specified only as [-fem] and therefore agrees with the Spanish masculine D.

Applying these strategies to the results in Table 5.6 reveals a relatively clear overall gender use strategy in both groups with German D-Spanish N switches, while with Spanish D-German N switches the L1 German bilinguals display a less consistent strategy and L1 Spanish bilinguals do not appear to adopt a dominant strategy at all (Table 5.8). With German D-Spanish N switches, the data analysis showed that both the L1 Spanish and the L1 German bilinguals generally preferred agreement between the D and the switched N. This preference was clear with Spanish M-German F, Spanish F-German M, and Spanish F-German Nt nouns. Given that with Spanish M-German Nt nouns the bilinguals rated both German Ds specified as [-fem] the same (*der* and *das*), neither group of bilinguals displays a discernible agreement preference in this condition. However, the fact that the preference is clearly for agreement between the D and the switched N in three of the four gender congruency conditions suggests that this type of agreement is the dominant strategy in both groups with German D-Spanish N switches.

Unlike with German D-Spanish N switches, the L1 Spanish and the L1 German bilinguals displayed different gender use strategies with Spanish D-German N switches. With Spanish D-German N switches, the L1 Spanish bilinguals do not seem to display a clear agreement

preference across gender congruency conditions. These bilinguals only display a clear preference for agreement between the D and the switched N in the case of Spanish M-German F nouns and with Spanish F-German M and Spanish F-German Nt nouns the L1 Spanish bilinguals display an equal preference for both types of agreement between the D and the N. It is difficult to interpret their preferences with Spanish M-German Nt nouns given that agreement with the translation equivalent N and agreement with the switched N are confounded in this gender congruency condition (assuming that through Impoverishment the German neuter noun is only specified as [-fem]). L1 German bilinguals, on the other hand, display a considerably more consistent gender use strategy, preferring agreement between the D and the switched N in Spanish D-German N switches with Spanish M-German F, Spanish F-German M and Spanish F-German Nt nouns. The L1 German bilinguals do not seem to display any discernible gender use strategy with Spanish M-German Nt nouns.

Table 5.8. Gender use strategy according the highest rated determiner in each noun congruency condition.

N Congruency		**German D-Spanish N**	**Spanish D-German N**	
Spanish	*German*	*L1 Spanish/German*	*L1 Spanish*	*L1 German*
masc	fem	switched N	switched N	switched N
fem	masc	switched N	switch = trans N	switched N
masc	neut	switch = trans N	trans / switch N	trans / switch N = ?
fem	neut	switched N	switch = trans N	switched N

5.1.6.2 Individual gender use strategies

It has been noted in other studies on the use of gender in nominal agreement (ie. Hopp, 2013) that participants that form a homogenous group with respect to linguistic profile may not adopt the same gender use strategy. In order to investigate whether individual gender use strategies were being masked by analysing participants in groups based on their L1, the highest rated D in each

noun gender congruency condition was linked to a gender use strategy according the classifications outlined in Table 5.7. The use of gender with both German D-Spanish N and Spanish D-German N switches was then examined. Participants were classified as either overall strategy users (a general strategy was adopted with no more than one other strategy used in any condition with either type of switch), switch-specific strategy users (one strategy was consistently adopted for German D-Spanish N or Spanish D-German N switches but another strategy was used with the other type of switch) or no strategy users (there was evidence of the use of both strategies as well as conditions in which no clear strategy could be deduced). Spanish M-German Nt nouns were excluded from the individual analysis due to the fact that the two agreement strategies are confounded in that congruency condition.

A summary of the individual strategies appears in Table 5.9. Approximately two-thirds of the bilinguals adopted a switch-specific strategy (including having a discernible strategy with one type of switch but not the other), and the remaining third showed evidence of a consistent strategy (or lack thereof) with both types of switched DPs.

Table 5.9. Summary of individual gender use strategies.

Gender strategy	**Overall strategy users**	**Switch-specific strategy users**	
		German D-Spanish N	*Spanish D-German N*
switched N	8	5	11
translation N	2	3	9
none	6	15	3
total	16 / 41%	23 / 59%	

When the individual strategies are broken down by the L1 of the participant (Table 5.10), it is clear that just over 50% of participants in both groups used a gender strategy that varied according to the type of switched DP. The groups differ, however, in the distribution of the

participants who adopted an overall strategy and those who showed no evidence of any strategy. In the L1 Spanish group, slightly more participants appeared to use no strategy than those who adopted a consistent strategy (6 participants versus 5 participants). In the L1 German group, on the other hand, more than twice as many participants were consistent strategy users than those who adopted no discernible strategy (5 versus 2 participants).

Table 5.10. Individual gender use strategies by participant L1.

L1	Overall strategy users	Switch-specific strategy users	No strategy users
Spanish	21%	54%	25%
German	34%	53%	13%

Figure 5.8 illustrates the specific gender use strategy adopted by the L1 Spanish and L1 German participants, divided according to whether the strategy was overall or switch-specific. L1 Spanish bilinguals who were consistent strategy users were equally divided between agreement with the switched N and lack of an overall gender use strategy (17%). Those who showed a gender use strategy specific to each type of switch overwhelmingly showed no discernible gender use strategy in German D-Spanish N switches (42%) but a clear tendency to favour agreement with the translation equivalent N in Spanish D-German N switches (33%).

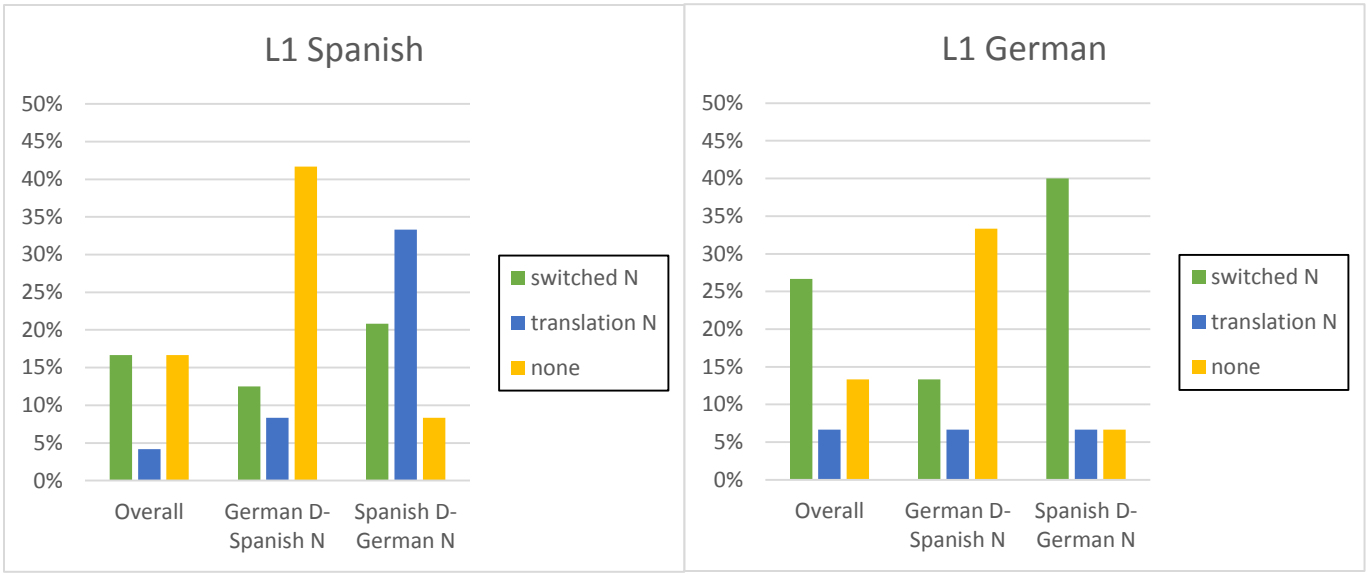


Figure 5.8. *Breakdown of participant gender use strategies by type of strategy user and group.*

L1 German bilinguals who displayed an overall gender use strategy primarily opted for agreement with the switched N (27%). Those who adopted a switch-specific strategy showed no clear preference for any gender use strategy with German D-Spanish N switches (33%) and a strong preference for agreement with the switched N (40%) with Spanish D-German N switches.

The pattern of results seems clearer when the gender use strategies are analyzed by individual participant and grouped according to whether the strategy was used more generally or appeared to be specific to each type of switch. There are relatively few participants who adopted a consistent strategy, but of those who did, the dominant strategy was agreement with the switched N. As was shown in the ANOVA results, for German D-Spanish N switches, both bilingual groups patterned the same, though, contrary to the results when participants were analyzed as a group, the individual strategy results suggest that none of the bilinguals adopted a discernible gender use strategy with these switches. With Spanish D-German N switches, the individual gender use strategy analysis is much clearer than the group analysis results, which showed no clear gender use strategy in either bilingual group. Interestingly, in these switches the groups had

opposite tendencies. While the L1 Spanish bilinguals preferred agreement with the translation equivalent N, the L1 German group preferred agreement with the N in the switch.

5.1.6.3 Agreement within the code-switched DP

A summary of the dominant gender use strategy analyzed by group and by individual participant appears in Table 5.11.

Table 5.11. Dominant gender strategy by DP type and participant L1 according to group and individual analyses.

	L1 Spanish		**L1 German**	
DP type	*group*	*individual*	*group*	*individual*
German D-Spanish N	switched N	none	switched N	none
Spanish D-German N	none	translation N	none	switched N

The individual analysis revealed that the majority of the participants from both bilingual groups opted for a gender use strategy that was specific to the type of switched DP (German D-Spanish N versus Spanish D-German N). For German D-Spanish N switches, when analyzed by group, the results seem to indicate that both bilingual groups significantly prefer agreement with the N in the switch. Different results emerge when participants are analyzed individually, however, with both bilingual groups showing no discernible gender use strategy in these types of switches. Given that a preference for agreement with the switched N is generally dominant in the bilinguals who adopted a gender use strategy that was consistent across both types of switches, the difference in the results between the group and individual analyses is likely attributable to the separation of the overall strategy users from the switch-specific strategy users in the individual but not the group analysis.

Assuming that the results from the individual analyses offer a more accurate picture of the results (given that bilinguals with similar linguistic profiles do not necessarily adopt the same gender use strategy), it appears that there is no dominant gender use strategy for both the L1 Spanish and the L1 German bilinguals in the case of German D-Spanish N switches. In the case of Spanish D-German N switches, however, the dominant gender use strategy for the L1 Spanish bilinguals seems to be agreement with the translation equivalent N while the L1 German bilinguals opt for agreement with the N in the switch.

It is interesting that the bilingual groups pattern together with German D-Spanish N switches but not with Spanish D-German N switches. The lack of gender use strategy with German D-Spanish N switches suggests that both groups do not have clear preferences in agreement when the D has more gender options than the N. In this case, any strategy that the bilinguals may have shown in single-language contexts (ie. gender errors in producing L2 DPs, discussed in 4.2) gets lost when they are faced with gender information from the L1 and the L2 which can be realized through agreement with the determiner in at least two different ways (according to the gender of the switched N or the translation equivalent N).

With Spanish D-German N switches, however, the opposite tendencies in the bilingual groups seems to be linked to their L1. While the L1 Spanish group prefers agreement between the D and the translation equivalent N, the L1 German group prefers agreement with the N in the switch. Given that both groups of bilinguals are L1 dominant, it is not surprising that the L1 Spanish group prefers the Spanish D to agree with the Spanish translation equivalent N, and the L1 German group prefers the Spanish D to agree with the switched German N.

Returning to Research Question IV regarding the dominant gender use strategy in Spanish-German code-switched DPs, it seems that the answer is not as straight-forward as either the

double-feature valuation hypothesis or the *gender congruency algorithm* would predict. With German D-Spanish N switches, there was neither a preference for agreement with the switched N, nor the translation equivalent, and with the Spanish D-German N switches, the preference varied by the bilinguals' L1, with each group preferring agreement with the N in their native language (the translation equivalent N in the case of the L1 Spanish bilinguals and the switched N in the case of the L1 German bilinguals). None of these results were significantly affected by the definiteness of the D (Research Question IVa) and thus the *gender congruency algorithm*'s account of agreement in German D-Spanish N switches involving masculine Spanish Ns does not seem to represent the psycholinguistic reality for these groups of bilinguals.

With respect to the two formal proposals, it seems that neither the *double-feature valuation hypothesis* nor the *gender congruency algorithm* can entirely account for the results in this experiment. For the *double-feature valuation hypothesis*, this is apparently due in part to how the 'analogical criterion' (which is the basis for the *double-feature valuation hypothesis*) was extended to switches between two languages with grammatical gender. In previous work on Spanish-English code-switched DPs, the analogical criterion has been shown to hold particularly in the case of L1 Spanish bilinguals (ie. Liceras et al, 2008) and thus can also be described as bilinguals' preference for agreement between the D and the N in their L1, since, in Spanish D-English N DPs, the criterion states that agreement will take place between the D and the translation equivalent N (Spanish). Assuming this definition more accurately extends the analogical criterion to code-switched DPs in which both languages bear formal gender, the analogical criterion can account for the fact the L1 Spanish-L2 German and L1 German-L2 Spanish bilinguals in this study prefer switched DPs in which the D agrees with the L1 noun, regardless of whether or not it appears in the switch.

In terms of the *gender congruency algorithm*, there is limited evidence of a systematic preference for agreement with the switched N, as the algorithm would predict. Furthermore, there is little effect of the definiteness of the D in Spanish-German code-switched DPs, and none of the isolated effect that was found suggested that the underspecified indefinite masculine/neuter D form *ein* was preferred over the masculine and neuter definite Ds in German D-Spanish N switches involving masculine Ns. It is, however, clear that L1 Spanish and L1 German bilinguals do not apply a clear agreement strategy to the German D-Spanish N DPs to the same extent they do with to the Spanish D-German N DPs. This supports the motivation behind the positing of an effect of definiteness, namely, that German D-Spanish N DPs pose more difficulties with respect to agreement than Spanish D-German N DPs.

5.1.7 Conclusion

In this chapter I have presented experimental data on Spanish-German code-switching within the DP. The results have shown that neither the L1 Spanish-L2 German nor the L1 German-L2 Spanish bilinguals display a clear preference for agreement with either the switched noun or the translation equivalent in German D-Spanish N switched DPs. In Spanish D-German N switched DPs, on the other hand, each group prefers agreement between the determiner and the noun in their L1, regardless of whether it appears in the switch or is a translation equivalent. This evidence does not fully support either of the two formal proposals for gender agreement in code-switched DPs, though the extended definition of the 'analogical criterion' is able to account for the results with the Spanish D-German N code-switched DPs.

These code-switched interpretation data build on the findings from production and processing data presented in Chapter 4 regarding the nature of asymmetric grammatical gender systems. The fact that both the L1 Spanish and the L1 German bilinguals displayed preferences (to varying

degrees) for agreement between the D and the translation equivalent N indicates that both L1 and L2 gender information is available to these bilinguals and thus supports an integrated representation of the L1-L2 asymmetric gender systems. With respect to the nature of the asymmetric gender system, the lack of a clear gender use strategy in both bilingual groups for German D-Spanish N is in parallel with the fact that the use of masculine as a default gender strategy was found to be the primary source of L2 DP errors in production. A significant effect of L1 transfer would typically be expected in these bilinguals, yet results from both studies show that these bilinguals resort to a back-up strategy (overgeneralization of the default form to all contexts) or are not able to use a strategy at all when trying resolve conflict between the three gender values in German and the two values in Spanish. While this difficulty does not entirely exclude L1 transfer (as shown in Chapter 4), it does illustrate the unique nature of the asymmetric gender systems and its consequence on the production and processing of the L2.

6. Discussion: The Representation of Asymmetric Gender Systems

This chapter considers the production data from the L2 picture-naming task, the processing data from the L2 grammaticality judgment task and the interpretation data from the Spanish-German code-switched acceptability judgment task in the context of the representation of asymmetric gender systems. The experimental evidence converges on the integrated nature of the L1-L2 gender system, the unique nature of representation of the gender value not present in the L1 and the consequence of the asymmetric representation on the bilinguals' use of gender in the L2.

6.1 Gender integrated representation of asymmetric gender systems

According to the *gender integrated representation hypothesis* (Salamoura & Williams, 2007), the L1 and the L2 gender systems are represented as a single set of shared gender nodes. Evidence of these shared gender nodes is the varying levels of competition in the selection of the gender value of the noun, as illustrated most clearly in significantly longer reaction times (RTs) for nouns that differ in gender between the L1 and the L2. Both the production data from the L1 Spanish-L2 German bilinguals and the processing data from the L1 French-L2 German bilinguals show significant differences in the RTs as well as the error rates according to the L1-L2 gender congruency of the target noun.

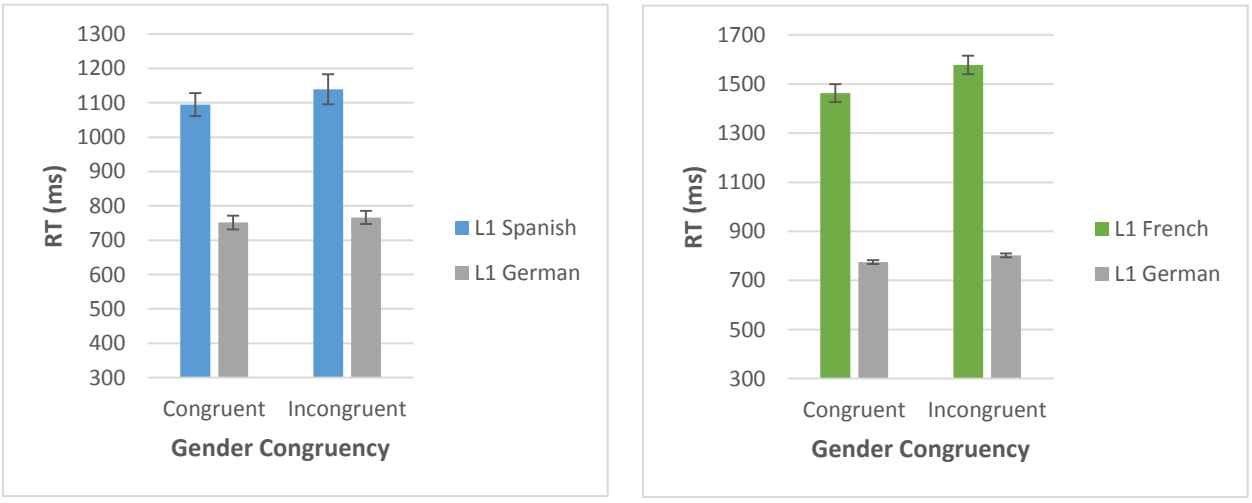


Figure 6.1. *Mean RTs for the two groups of bilinguals and L1 German controls.*

Figure 6.1 shows the mean RTs for the L1 Spanish-L2 German (left) and L1 French-L2 German (right) bilinguals as well as the L1 German control group for each experiment. The pattern of results is the same in both sets of data: bilinguals' RTs for gender congruent nouns are significantly faster than RTs for gender incongruent nouns while the native speakers' RTs do not differ significantly across conditions. These findings are consistent in spite of the different types of data (production versus processing) and the different linguistic profiles of the bilinguals (L1 Spanish versus L1 French).

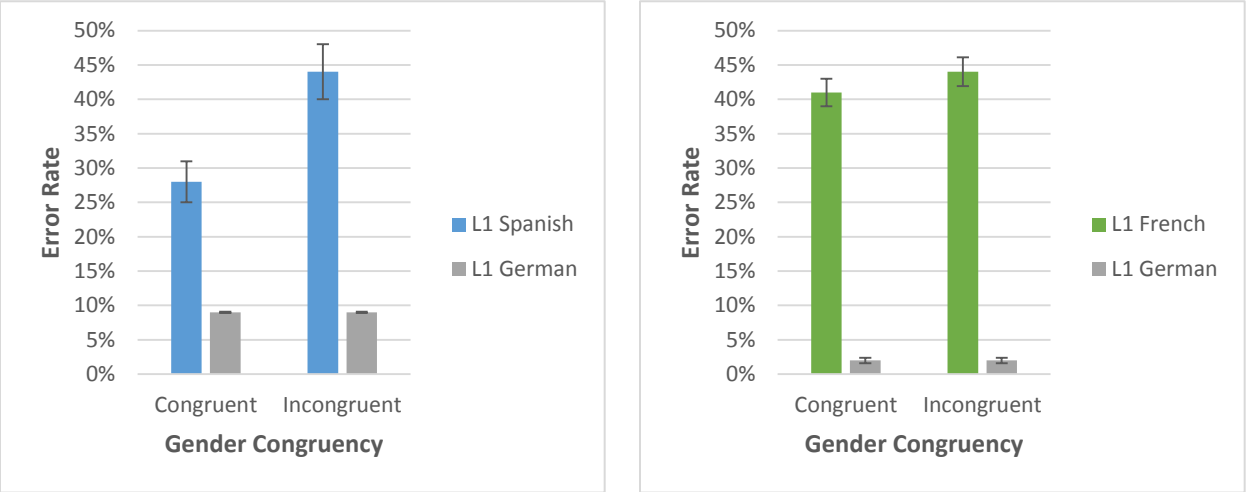


Figure 6.2. *Mean error rates for the two groups of bilinguals and L1 German controls.*

The error rates for both groups of bilinguals as well as the L1 German control groups are presented in Figure 6.2. Again the error rates pattern the same in that only the bilinguals make fewer errors with gender congruent than gender incongruent nouns.

The patterns in the RT and error rate data that show an interaction between the L1 and L2 gender information are also supported by the code-switched interpretation data. Both L1 Spanish-L2 German and L1 German-L2 Spanish bilinguals displayed a preference for agreement between the D and the translation equivalent N with some Spanish-German and German-Spanish code-switched DPs, even if that type of agreement was not necessarily the dominant gender use

strategy. The fact that the D can be marked for the gender of the N that does not appear in the code-switch illustrates that gender information from both L1 and L2 is available to these bilinguals upon retrieval of the noun in the switched DP.

Together these results offer robust evidence of the integrated representation of the L1 and L2 gender systems even when the L1 and the L2 have a different number of gender values. To the best of my knowledge, this is the first study to examine the representation of L1 and L2 grammatical gender in Romance-Germanic language pairings in which the formal gender feature not only differs in number of values between languages but is also realized significantly differently in the L1 and the L2. These findings add to the existing evidence of an integrated L1-L2 gender representation for bilingual speakers of languages with symmetric gender systems such as Italian-Spanish bilinguals (Paolieri et al, 2010b; Morales, Paolieri & Bajo, 2011), Spanish-Catalan bilinguals (Costa et al, 2003), Italian-French bilinguals (Costa et al, 2003), German-Czech bilinguals (Bordag, 2004), Czech-German bilinguals (Bordag, 2004; Bordag & Pechmann, 2007), and Greek-German bilinguals (Salamoura, 2007; Salamoura & Williams, 2007).

6.2 Representation of the L2 gender value not present in the L1

While it seems clear from the results of the L2 picture-naming and L2 grammaticality judgment tasks that the gender values common to both languages have an integrated representation, this does not address the asymmetry in the French/Spanish and German gender systems. Since previous research has not offered any evidence regarding the representation of an L2 gender value that is not present in the L1 there is no existing theoretical context in which to situate the findings from this study.

Due to the fact that both gender incongruent nouns (L1 masculine-L2 feminine and L1 feminine-L2 masculine) and L2 neuter nouns (L1 masculine-L2 neuter and L1 feminine-L2 neuter) are by definition 'incongruent', comparing these two types of incongruency between the L1 and the L2 should shed light on the nature of the representation of neuter and how it differs from the representation of gender values present in both of the bilinguals' languages.

The results from the L2 picture-naming task provide initial evidence of the unique representation of neuter. The L1 Spanish-L2 German bilinguals named the pictures significantly faster with L2 neuter target nouns than target nouns which were mismatched for gender values present in both languages. A similar pattern was found in the error rates, namely, that significantly fewer errors were produced in the L2 neuter condition than the gender incongruent condition. Figure 6.3 shows the RTs (left) and the error rates (right) for the L1 Spanish-L2 German bilinguals.

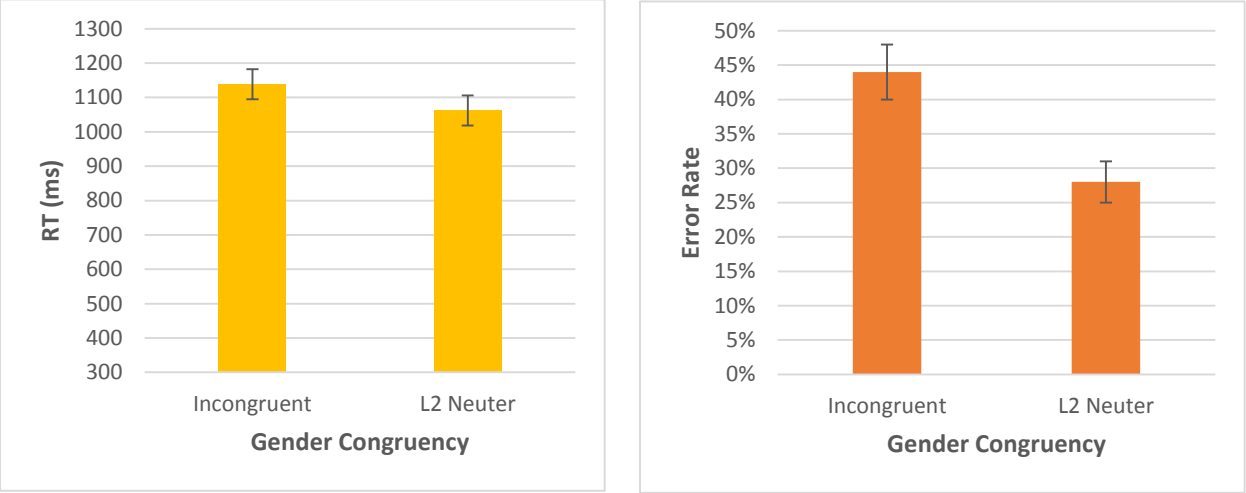


Figure 6.3. *Mean RTs and error rates for the L1 Spanish-L2 German bilinguals.*

Assuming differences in RTs between gender congruency conditions is evidence of varying levels of competition in the selection of the gender node, the significantly faster RTs for L2 neuter nouns than gender incongruent ones indicates that the activation of the L1 gender node interferes significantly less in the response when the target L2 gender does not exist in the L1 than when

the L1 and the L2 each activate different gender nodes, but ones that are common to both languages. This suggests that the nature of the representation of neuter is not as integrated as the gender values common to both languages. Further support for this less-integrated representation is provided by the error rates which show that significantly fewer errors were produced when the L2 target noun was neuter. The fact that neuter has a unique representation seems to allow the bilinguals to better identify the erroneous gender information coming from the L1 noun than when the target noun and the L1 noun are mismatched for masculine and feminine.

The results from the L2 grammaticality judgment task are not as clear with regard to the representation of neuter. Unlike the L1 Spanish-L2 German bilinguals, the L1 French-L2 German bilinguals showed slightly longer RTs and only marginally lower error rates for L2 neuter nouns in comparison to gender incongruent nouns (Figure 6.4). Statistically, for the group of bilinguals performing this task, the two types of 'incongruency' are not different. There are multiple possible explanations for the discrepancy between the L1 Spanish and L1 French groups, including linguistic profile (native language; the fact that the L1 French speakers had a somewhat lower level of proficiency in German) and experimental differences (task requirements; sample size).

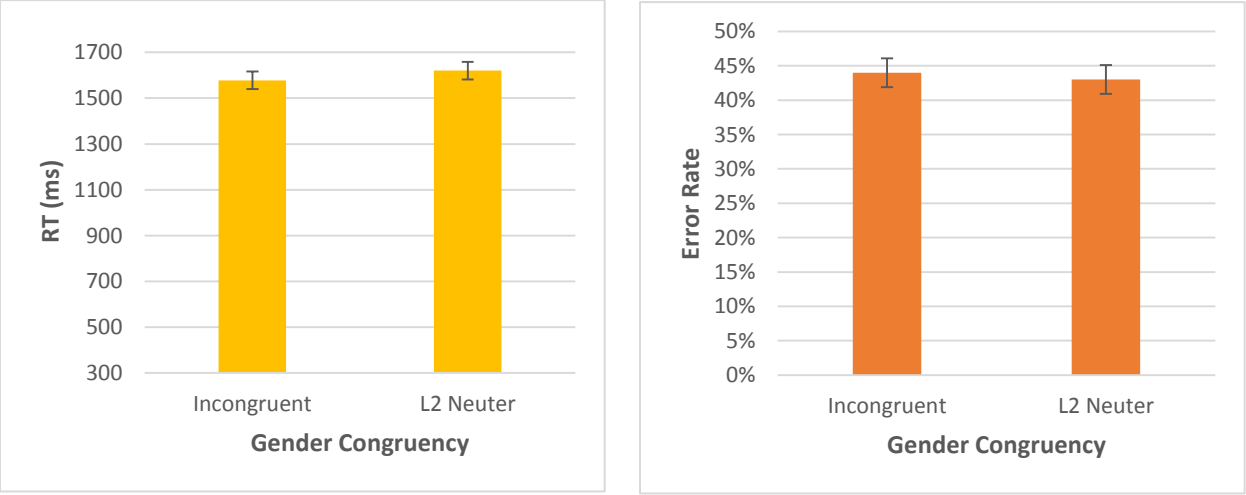


Figure 6.4. *Mean RTs and error rates for the L1 French-L2 German bilinguals.*

With respect to linguistic profile, given that French and Spanish have the same number of gender values that bear the same labels and have a similar distribution in each language, there seems to be no immediately obvious reason to expect that L1 French speakers would have a significantly different representation of neuter than L1 Spanish speakers. The results could be attributable to the lower level of L2 proficiency in the L1 French speakers; while the L1 Spanish group obtained a mean proficiency score of 53.7%, the L1 French group's score was 10% lower at 43.3%. Since the representation and use of the L2 develops over the course of acquisition it is possible that the representation of gender—particularly the gender value the bilinguals have no native language experience with—is less stable in the bilinguals with a lower L2 proficiency. If the bilinguals have less clearly established links between the L2 noun and the neuter gender node then delays in accessing the neuter gender node could negate the effect of reduced interference from the activation of the gender of the noun in the L1.

Experimental differences could also account for the results in the L1 French group. The grammaticality judgment task required the recognition of the L2 Determiner Phrase (DP) and then the comparison of the retrieved DP to the DP stimulus and a grammaticality judgment to be made. The picture-naming task, on the other hand, required that the DP (or bare N) retrieved in response to the picture stimulus simply be orally produced. The additional demands of the task on the L1 French group may be masking the effect of the unique representation of neuter such that judgments for all by definition 'incongruent' nouns result in approximately the same RT.

It is not possible to discern the precise cause of the differing results in the L1 French group given the present data. In order to compare the L1 French and L1 Spanish speakers more directly, the type of task or the linguistic profile of the bilinguals should be kept consistent in future studies.

6.3 Gender use strategies in asymmetric gender systems

How bilinguals use gender in the L2 when their languages have asymmetric gender systems offers a complementary perspective to the RT data on the nature of the gender representation. Though bilinguals whose L1 has a formal gender feature have frequently been shown to produce/accept ungrammatical gender agreement in the L2 when this agreement would be grammatical according to the gender of the L1 noun, evidence from all tasks in this study suggests that an L2 gender use strategy based on L1 gender information is not always available to bilinguals whose languages differ in number of gender values. Results from the L2 picture-naming and L2 grammaticality judgment tasks suggest that L1 Spanish-L2 German and L1 French-L2 German bilinguals tend to opt for the use of a masculine as default strategy (as is typically shown for L1 English learners of a language with grammatical gender). Similarly, in the code-switched acceptability judgment task, L1 Spanish-L2 German and L1 German-L2 Spanish bilinguals displayed variable preferences with respect to the use of gender in switched DPs.

The error analysis of the data from the L2 picture-naming task performed by the L1 Spanish-L2 German bilinguals revealed that most of the errors produced involved the ungrammatical use of the masculine German determiner (*der*), though for L1 feminine-L2 masculine nouns the most prevalent error was with the feminine determiner (*die*). The proportion of errors produced in each gender congruency condition is illustrated in Figure 6.5.

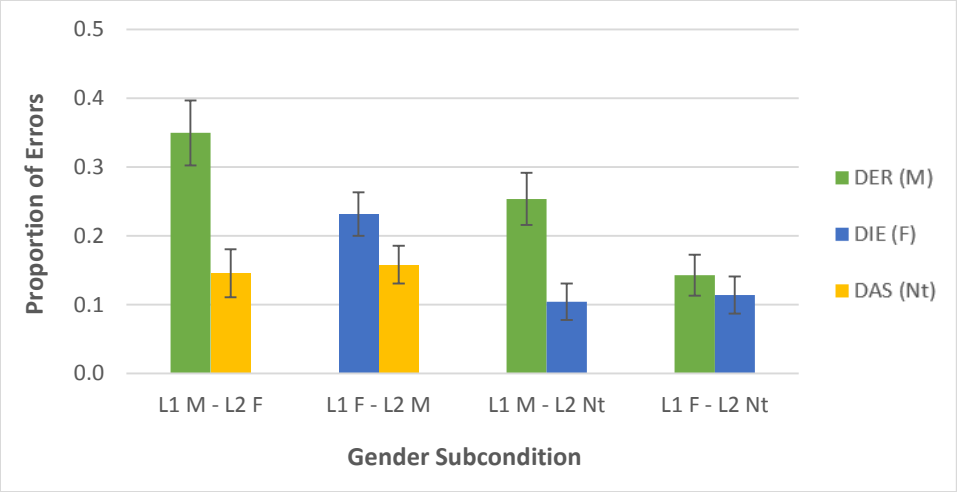


Figure 6.5. *Proportion of errors produced by the L1 Spanish-L2 German bilinguals.*

Even though the ungrammatical use of the masculine determiner with L1 masculine-L2 feminine and L1 masculine-L2 neuter nouns could be represent either masculine as default or L1 transfer, the fact that the ungrammatical use of the masculine determiner also constitutes the majority of the errors with L1 feminine-L2 neuter nouns in which masculine is clearly a default strategy (since the use of the feminine determiner would represent L1 transfer) suggests that the dominant gender use strategy is, in fact, masculine as default. Further evidence supporting the use of a default strategy comes from the much higher use of the masculine determiner than the feminine determiner in the total errors (24.9% versus 15.0%, respectively) and also from the nearly identical mean RTs for masculine determiner errors across gender congruency conditions (1391 versus 1394 versus 1395 ms), which could be interpreted as the same process underlying all ungrammatical uses of the masculine determiner.

The error rates for ungrammatical stimuli in the L2 grammaticality judgment task performed by the L1 French-L2 German bilinguals also offer some support for the use of a default gender strategy. These bilinguals accepted significantly fewer ungrammatical DPs containing L2 neuter nouns when the L1 noun was feminine than when the L1 noun was masculine (Figure 6.6).

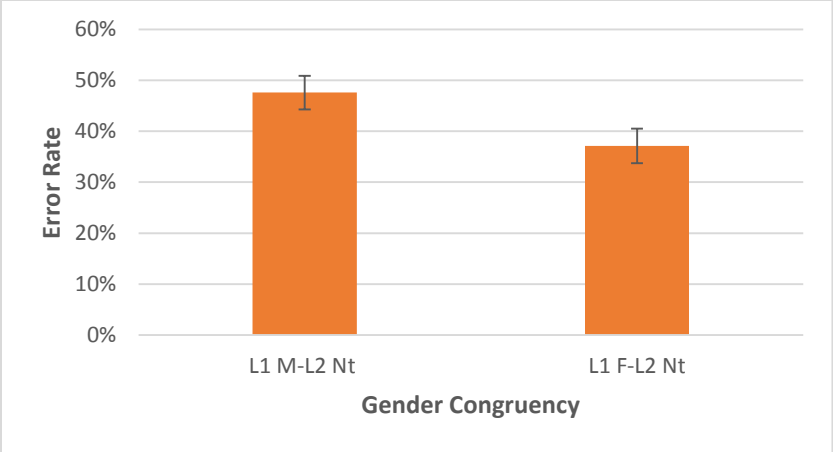


Figure 6.6. *L1 French-L2 German bilinguals' mean error rates for ungrammatical stimuli.*

Importantly, while the ungrammatical determiner presented with L1 masculine-L2 neuter nouns was consistently masculine (representing either L1 transfer or masculine as default), the ungrammatical determiner presented with L1 feminine-L2 neuter nouns was masculine in list 1 (representing masculine as default) but feminine in list 2 (representing L1 transfer). An analysis of the error rates for L1 feminine-L2 neuter nouns broken down by the gender marked on the ungrammatical determiner showed that L1 French-L2 German bilinguals accepted significantly fewer ungrammatical stimuli when the incorrect determiner was feminine (*die*) than when it was masculine (*der*) (Figure 6.7).

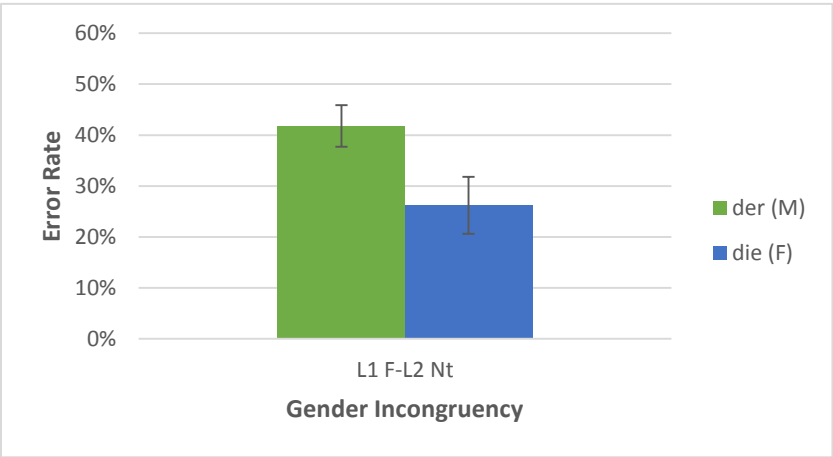


Figure 6.7. *L1 French-L2 German bilinguals' mean error rates for ungrammatical L1 F-L2 Nt stimuli.*

Interpreted in the light of the difference between the error rates according to the gender marked on the ungrammatical determiner presented with L1 feminine-L2 neuter nouns, the significantly lower error rates with L1 feminine-L2 neuter nouns compared to L1 masculine-L2 neuter nouns could be evidence that the erroneous use of the masculine determiner was more difficult for the bilinguals to correctly reject than the erroneous use of the feminine determiner. Since the masculine determiner clearly represents masculine as default with L1 feminine-L2 neuter nouns, this could be interpreted as masculine as default being the underlying L2 gender use strategy in the L1 French-L2 German bilinguals as well as the L1 Spanish-L2 German bilinguals. The basis for this interpretation is the fact that if the L1 French-L2 German bilinguals would tend to overgeneralize the use of masculine in their L2 errors it would be expected that they would be less sensitive to the ungrammatical use of masculine than the ungrammatical use of the determiner marked for the gender of the L1 noun. In the context of the L2 grammaticality judgment task, evidence of masculine as default being the predominant gender use strategy in these bilinguals is apparent in the higher acceptance of ungrammatical stimuli involving masculine determiner errors than feminine determiner errors, since masculine would be the default while feminine is an L1 transfer error.[36]

While the language mixing in the code-switched acceptability judgment task does not allow for an analysis of strictly ungrammatical DPs, the L1 Spanish-L2 German and L1 German-L2 Spanish bilinguals' different ratings of switched DPs according to the gender marked on the determiner

[36] An important caveat to this interpretation of the results is the fact that the difference in the error rates between lists was significant across gender congruency conditions and not limited to L1 feminine-L2 neuter nouns. It is clear from the results of the L2 grammaticality judgment task (see 4.3) that more data is needed to increase the statistical power in the analyses, and, ultimately, the difficulties with the task outlined in 4.3.7 should be addressed by designing another experiment targeting L2 gender use strategies. That being said, since some of the results pattern with the more robust results from the L1 Spanish-L2 German bilinguals, it is reasonable to consider the limited evidence the L1 French-L2 German bilinguals' data can offer in support of a dominant L2 gender use strategy in bilingual speakers of language pairings with asymmetric gender systems.

provides a window into their L2 gender use strategy. The individual analyses of gender use in the switched DPs revealed that the majority of the bilinguals adopted different gender use strategies for German D-Spanish N (i.e. *die*$_{F}$ *mesa*$_{F}$) and Spanish D-German N (i.e. *la*$_{F}$ *Tisch*$_{M}$) switched DPs. Figure 6.8 shows the predominant gender use strategies for the L1 Spanish-L2 German (left) and L1 German-L2 Spanish (right) bilinguals. Both groups coincide in their lack of a clear gender use strategy in German D-Spanish N switched DPs.

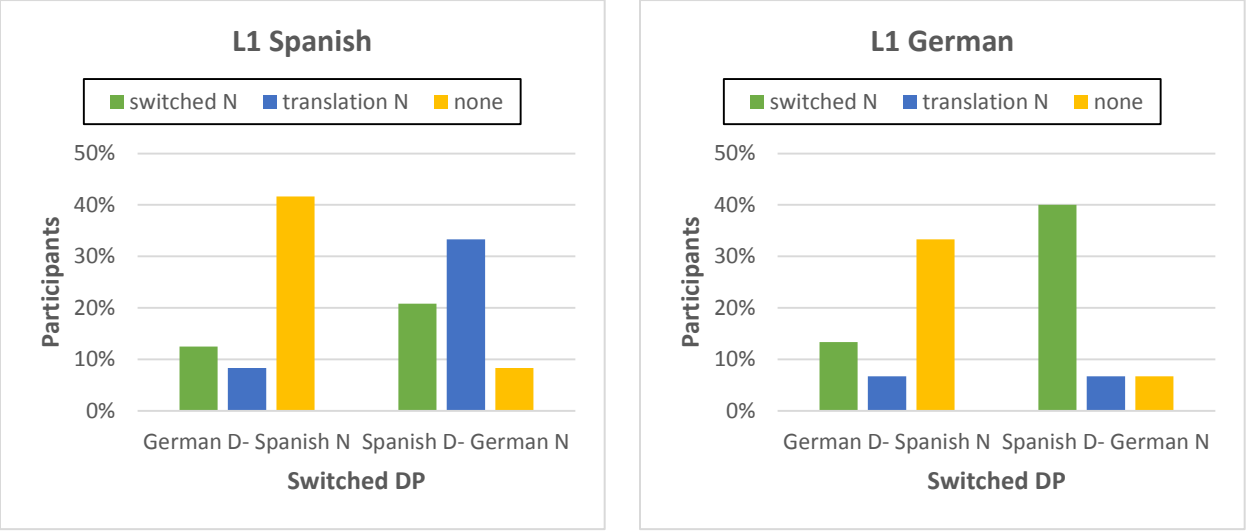


Figure 6.8. *Individual gender use strategies for L1 Spanish-L2 German and L1 German-L2 Spanish bilinguals for each type of switched DP.*

These groups differ in gender use with Spanish D-German N switched DPs, however. While the L1 Spanish-L2 German bilinguals mostly prefer the Spanish D to agree with the translation equivalent (Spanish) N, the L1 German-L2 Spanish bilinguals clearly prefer the Spanish D to agree with the (German) N in the switch. The bilinguals' gender use strategies with Spanish D-German N switches is not unlike an L1 transfer strategy in single-language contexts in that each group prefers that the D be marked for the gender of the N in their L1, regardless of whether it is a translation equivalent or whether it appears in the switch. The lack of a clear gender strategy with German D-Spanish N switches, on the other hand, seems to illustrate the difficulty of the

Spanish-German asymmetric gender system, which is particularly problematic when the D has more gender value options than the N. However, given that most of the gender use strategies were switch-specific and that a different strategy (or lack thereof) seemed to be used with each type of switch, there is no definitive evidence of a particular gender strategy in code-switching for either L1 Spanish-L2 German or L1 German-L2 Spanish bilinguals.

Together, the results from all three tasks converge on the fact that L2 gender use is not straight-forward for bilinguals whose languages have asymmetric gender systems (Spanish-German and French-German). The L2 picture-naming data provide the clearest evidence of a default strategy, though there is also some use of L1 transfer. The L2 grammaticality judgment data seem to support the use of a default strategy, though to a more limited extent. The code-switched acceptability judgment data also offer evidence of an L1 transfer-like strategy, though with some of the switched DPs no clear gender use strategy is discernible.

Table 6.1. Summary of L2 gender use strategies by task.

Task	**L2 gender use**
L2 picture-naming	masculine as default; some L1 transfer
L2 grammaticality judgment	masculine as default (minimal evidence)
code-switched DP acceptability judgment	L1 transfer/no clear strategy

The evidence of L2 gender use from all three tasks is summarized in Table 6.1. The strong evidence of a default strategy or no clear gender strategy at all in some contexts is in line with the proposal that L1 transfer is not possible when the L1 and the L2 gender systems are not sufficiently similar (Sabourin, Stowe & de Haan, 2006; Sabourin & Stowe, 2008). However, the fact that there is some L1 transfer evident in the picture-naming data and significant amounts of an L1 transfer-like strategy in the code-switched DP ratings suggests that L1 transfer is not

entirely impossible, but rather that the availability of L1 transfer as an L2 gender use strategy is reduced for bilinguals whose languages have asymmetric gender systems.

6.4 Asymmetric gender representation hypothesis

It is clear that the existing proposals for the representation of L1-L2 gender systems cannot account for bilingual speakers of languages with asymmetric gender systems. The representation of asymmetric gender systems is undoubtedly relevant to psycholinguistic research as many language pairings differ in number of gender values or in the labels given to each of these values. To lay a foundation for investigating the representation of gender in a much broader range of language pairings, I propose the *asymmetric gender representation hypothesis*.

The *asymmetric gender representation hypothesis* posits that gender values common to both languages are represented as a single set of shared gender nodes while gender value(s) present only in the L2 have a unique representation that is encoded separately from the L1-L2 integrated nodes (Figure 6.9). This unique representation is subject to significantly less interference from the activation of a shared gender node than when more than one shared gender node is activated.

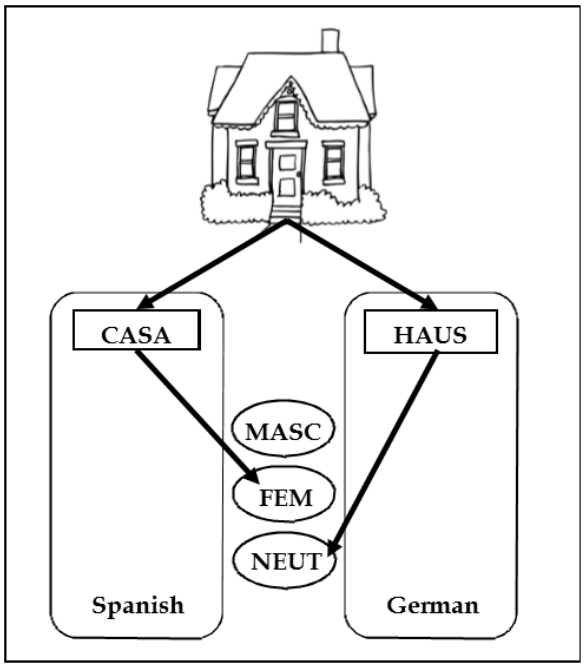


Figure 6.9. *Asymmetric gender representation of 'house' in Spanish-German bilinguals.*

This representation account is an extension of the *gender integrated representation hypothesis* (Salamoura & Williams, 2007), and as such, makes the same predictions for nouns of the same gender in the L1 and the L2 and nouns of different genders (but limited to gender values common to both languages). In the context of L2 spoken word production, activation at the conceptual level activates the word in both the L1 and the L2. With L1-L2 gender congruent nouns, both words activate a single, shared gender node which facilitates the production of the L2 noun given that the activation level of the L2 gender information required for selection of the target noun is increased by the L1 noun also activating the same gender node.

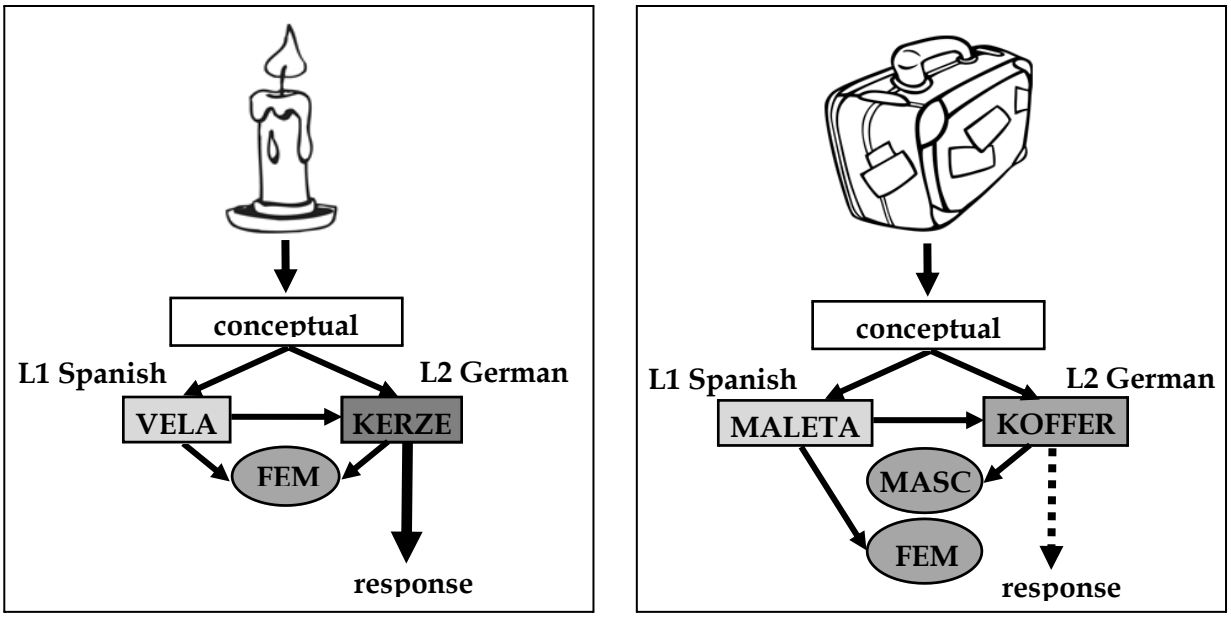


Figure 6.10. *Activation scheme for gender congruent (left) and gender incongruent (right) nouns, according to the gender integrated representation and the asymmetric gender representation hypotheses.*

With L1-L2 gender incongruent nouns (nouns mismatched for gender values common to both languages), however, the L1 and the L2 words activate different gender nodes in the shared system, creating competition between the nodes that interferes with the selection of the L2 gender information and thus slowing down the production of the L2 target noun. Figure 6.10 illustrates both the *gender integrated representation hypothesis* and the *asymmetric gender representation hypothesis* account of gender congruent (left) and incongruent (right) nouns.

Only the *asymmetric gender representation hypothesis* makes predictions for one or more gender values present only in the L2. For nouns bearing an L2-only gender value, while the activation of the L1 word activates a gender node within the shared system, the activation of the L2 word activates a gender node within an L2-specific subset of the gender nodes (Figure 6.11). Since the gender information required for the production of the target L2 noun is part of an L2-specific representation, it is not subject to interference created by the activation of a gender node within the L1-L2 integrated system. Due to this reduced interference created by the activation of a shared

gender node and a L2-specific one (rather than two shared nodes), the production of the L2 noun is faster when the target noun bears a gender value only present in the L2 than when the L1 and L2 nouns differ in gender value within the limits of the values common to both languages.

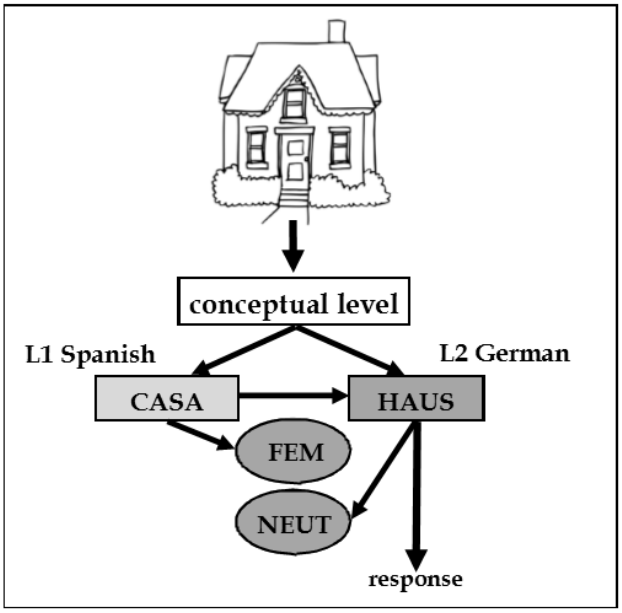


Figure 6.11. *Activation scheme for nouns bearing an L2-only gender value, according to the asymmetric gender representation hypothesis.*

The fundamentally integrated nature of asymmetric gender systems (with the exception of the L2-specific gender value) hinges on the L1 and the L2 having at least one gender value in common (i.e. masculine). In the case of language pairings where all the gender values differ in the L1 and the L2 (i.e. Spanish: masculine, feminine; Dutch: common, neuter), it would be difficult to integrate the L2 gender nodes into the existing L1 system. In such instances the *asymmetric gender representation hypothesis* would predict a language-specific gender node representation, much like what has been proposed under the *gender autonomous representation hypothesis* (Costa et al, 2003). Figure 6.12 shows the L2 gender representation predicted for Spanish-Dutch bilinguals.

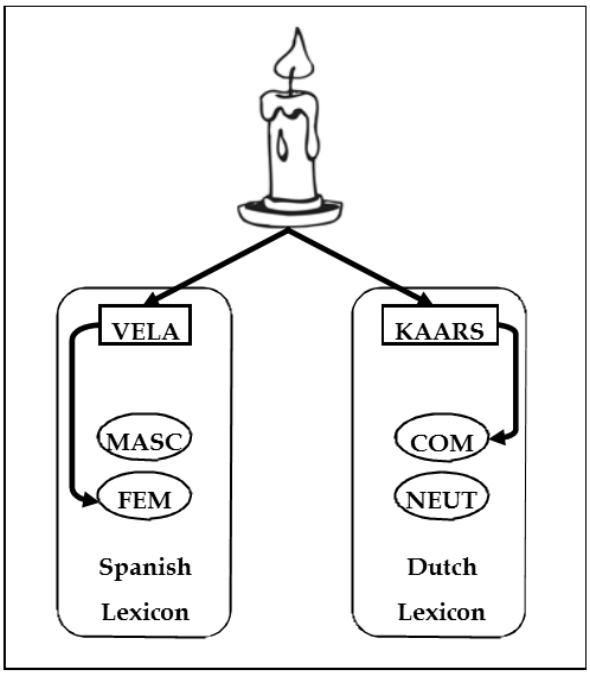


Figure 6.12. *Asymmetric gender representation of 'candle' in Spanish-Dutch bilinguals.*

The *asymmetric gender representation hypothesis* is limited in its scope and further research must be done to both test this hypothesis in more language pairings and to extend it to include languages with asymmetric gender systems in which it is the L1, rather than the L2, that has one or more additional gender values.

6.5 L1 transfer continuum

Asymmetric gender systems also pose a challenge to existing proposals for the use of gender in the L2. Bilingual speakers of languages with asymmetric gender systems do not seem to behave like other bilinguals whose L1 has a formal gender feature, but at the same time do not represent a homogenous group themselves. In order to account for the varying degrees of the use of L1 gender information in the L2 by bilinguals whose L1 and L2 have asymmetric gender systems I propose the *L1 transfer continuum*.

The underlying assumption of the *L1 transfer continuum* is that L1 transfer would be the dominant strategy in all bilinguals whose L1 has a formal gender feature and, when this is not the case, it can be accounted for in terms of the degree of symmetry between the gender systems in the bilingual's languages. This assumption stems from the fact that much of the previous research has shown that the use of L1 gender information in the L2 is the primary source of errors in L2 gender agreement (or primary gender use strategy in code-switching) for bilinguals whose L1 has a formal gender feature (i.e. White et al, 2004; Liceras et al, 2008).

The *L1 transfer continuum* states that the availability of L1 transfer as an L2 gender use strategy depends on the degree of overlap between the L1 and the L2 gender systems. At the low end of the continuum are language pairings in which the L1 and the L2 have completely different gender values, and at the high end are languages with completely symmetric gender systems. For bilingual speakers of languages with no overlap in L1 and L2 gender values, no L1 transfer is possible due to the extreme asymmetry between the gender systems. For bilinguals whose languages are completely symmetric, on the other hand, L1 transfer is expected to be the dominant L2 gender use strategy.

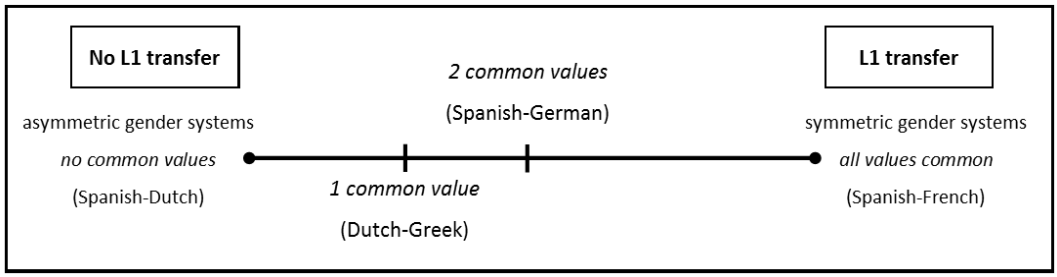


Figure 6.13. *L1 transfer continuum with language pairing examples.*

Language pairings with some degree of overlap in the L1 and L2 gender values fall at the middle points on the continuum. The continuum predicts that if the L1 and the L2 gender systems have only one value in common, only very minimal amounts of L1 transfer will be possible, while a

slightly higher degree of L1 transfer is possible when the languages have two gender values in common, etc. Figure 6.13 illustrates the *L1 transfer continuum*.

Bilinguals whose languages have completely asymmetric gender systems are expected to resort to the use of one gender value as a default strategy since L1 transfer, the preferred strategy, is not available with such language pairings. In this study, the consequence of the asymmetric gender systems between Spanish and German was also evident in the lack of a discernible gender use strategy (in opposed to a default strategy), at least in a language mixing context. As the language pairings become more symmetric (that is, as they move towards the L1 transfer side of the continuum) the use of a default or lack of any gender strategy at all gradually becomes less dominant as L1 transfer becomes increasingly available.

From the perspective of lexical access, this gradience in the availability of L1 transfer to bilinguals with different linguistic profiles can be accounted for by the mechanisms underlying L1 transfer and the use of masculine as a default strategy[37]. For example, this study has shown that L1 Spanish-L2 German bilinguals can transfer gender information from the L1 into the L2 with L1 feminine-L2 masculine nouns but that these bilinguals use a masculine as default strategy with L1 feminine-L2 neuter nouns[38]. L1 transfer is the dominant L2 gender use strategy with L1 feminine-L2 masculine nouns due to the fact that the L1 and L2 nouns are mismatched for gender values present in both languages (masculine and feminine) and the fact that the L1 noun bears the marked gender value in Spanish (feminine). Figure 6.14 illustrates the L1 transfer mechanism

[37] These mechanisms do not representation conscious strategies on the part of the L2 learner as the majority of the data in this study comes from online tasks in which the time pressure and demands of the tasks would not allow the learner to work through conscious strategies they may have developed for offline L2 gender use.
[38] These two gender congruency conditions were chosen to illustrate the underlying mechanisms in the L2 gender use strategies due to the fact that the dominant errors in each of these conditions can be unambiguously attributed to L1 transfer and masculine as default, respectively.

with 'table', a noun that is feminine in Spanish and masculine in German. In this case, L1 noun *mesa* activates the feminine gender node within the L1-L2 shared gender system, while L2 noun *Tisch* activates the shared masculine gender node. When the selection of the correct gender node fails, the majority of the errors result from L1 transfer due to the fact that there are weaker links between the L2 noun and the gender node than there are between the L1 and the gender node (Grüter, Lew-Williams & Fernald, 2012). L1 Spanish bilinguals are particularly likely to produce L1 transfer errors with feminine nouns due to the fact that feminine is in the marked gender in the L1 and therefore it is more difficult for the activation of the masculine gender node to compete with the activation of the feminine node.

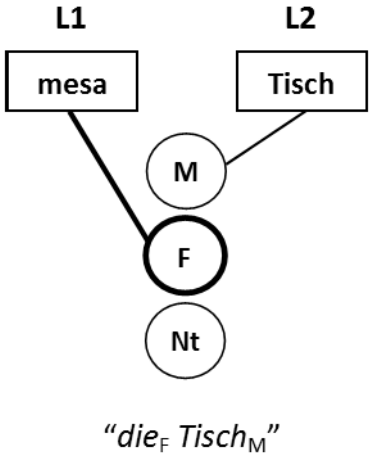


Figure 6.14. *Underlying L1 transfer mechanism for L1 feminine-L2 masculine nouns.*

While L1 feminine-L2 neuter nouns also bear the marked gender value in the L1, unlike with L1 feminine-L2 masculine nouns, the use of masculine as default is the dominant gender use strategy. In this case, the activation of the neuter node, which is specified as an L2-specific gender value, inhibits the selection of the gender node activated by the L1 noun and thus L1 transfer is not available. Figure 6.15 shows the mechanism underlying the use of a masculine as default strategy for 'house', a noun that is feminine in Spanish but neuter in German. In this example, L1 noun '*casa*' activates the shared feminine gender node while L2 noun '*Haus*' activates the neuter

gender node that is part of the shared system but specific to the L2. In spite of the weaker links between the L2 noun and the neuter gender node, the fact that an L2-specific gender value receives some activation inhibits the selection of the feminine gender node since feminine is a gender value present in both the L1 and the L2. This inhibition results in the unavailability of L1 transfer and thus the default gender is imposed as a back-up strategy to meet task or communication demands.

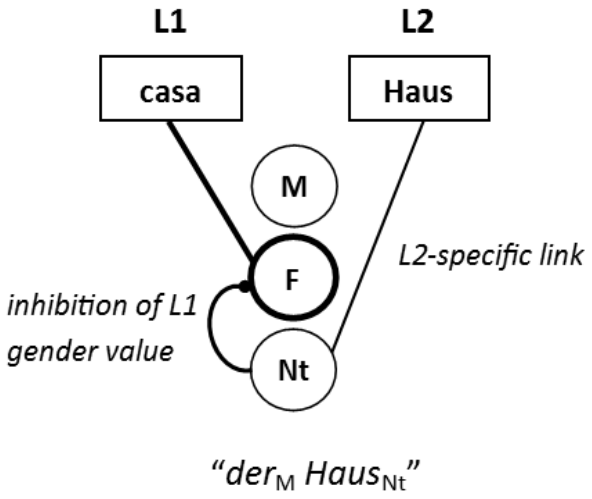


Figure 6.15. *Mechanism resulting in masculine as default for L1 feminine-L2 neuter nouns.*

The mechanism underlying masculine as default functions similarly with other types of nouns, such as L1 masculine-L2 feminine ones, except that, given that the target L2 gender value (feminine) is present in both the L1 and the L2, suppression of the gender node activated by the L1 noun (masculine) occurs due to language-external control processes that recognize the activated gender value as belonging to the L1 noun and thus prevent that node from being selected since the response language is specified as the L2. Figure 6.16 illustrates the masculine as default mechanism for 'newspaper', which is masculine in Spanish and feminine in German.

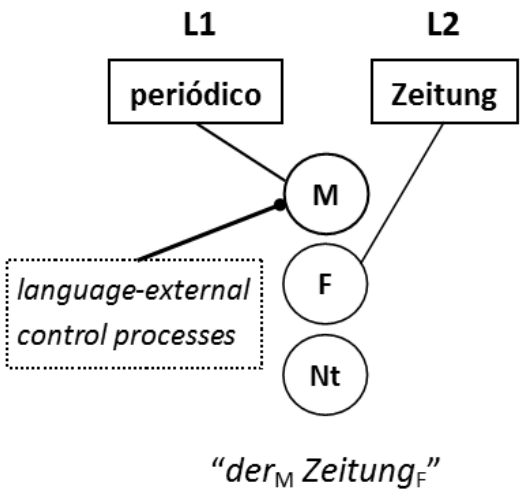


Figure 6.16. *Mechanism resulting in masculine as default for L1 masculine-L2 feminine nouns.*

These L1 transfer and masculine as default mechanisms differ with respect to processing cost, as has been seen in this study in the faster reaction times for L2 DP errors in which the incorrect D is attributable to L1 transfer than for errors in which the incorrect D results from the use of a masculine as default strategy. This is due to the fact that L1 transfer requires fewer steps than masculine as default. With L1 transfer, there are only two steps: failure to retrieve the L2 gender value and the selection of the already-activated gender node corresponding to the L1 gender value. Masculine as default, on the other hand, requires three steps: failure to retrieve the L2 gender value; suppression of the selection of the L1 gender value through language-external control processes or due to the activation of the L2-specific gender node (in the case of L2 neuter nouns); and the application of the default gender value as a back-up strategy. It is due to this

additional step that masculine as default is more effortful than L1 transfer. The contrast between the two mechanisms is shown in Figure 6.17.

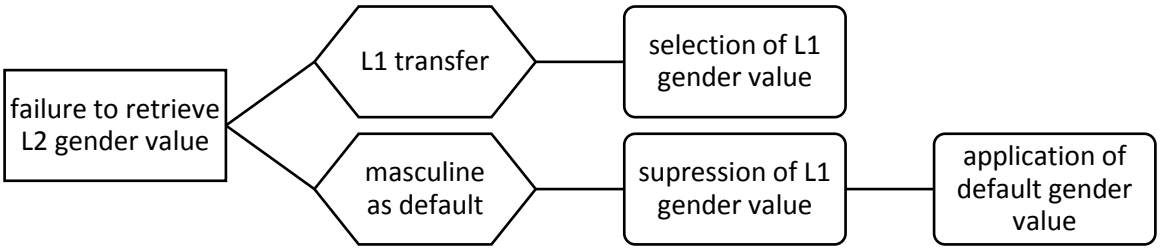


Figure 6.17. *Contrast between the mechanisms underlying L1 transfer and masculine as default.*

From a linguistic perspective, the level of overlap between the L1 and L2 gender values affects the availability of L1 transfer because the number of gender values common to both languages determines the complexity of the mapping between the L1 and L2 gender values. For completely asymmetric language pairings (such as Spanish-Dutch), no direct mapping between the L1 and the L2 gender values is possible and the complexity of the one-to-many mappings results in L1 transfer being unavailable as an L2 gender use strategy. For completely symmetric language pairings (such as Spanish-French), the fact that, from both a linguistic and the learner perspective, there is a one-to-one mapping between the L1 and L2 gender values makes L1 transfer the most likely gender use strategy (Figure 6.18).

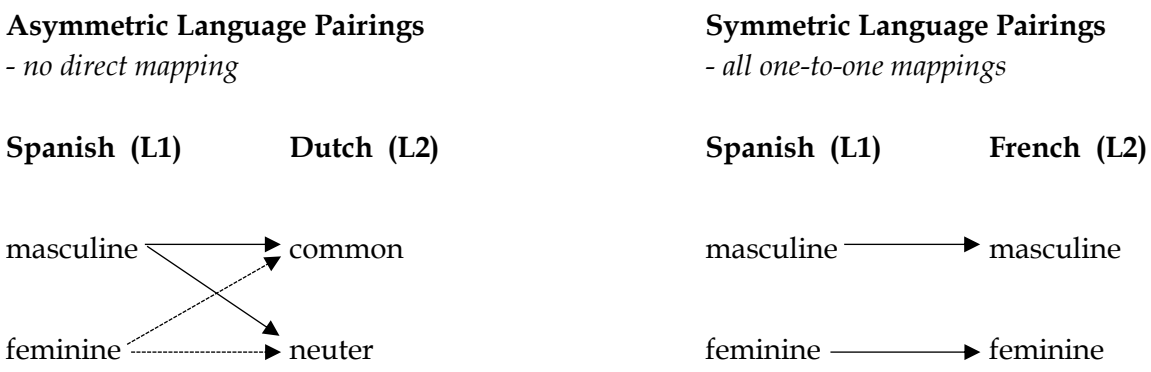


Figure 6.18. *Learner L1-L2 gender value mappings for completely symmetric and asymmetric language pairings*.

Asymmetric language pairings that fall in the middle of the continuum with at least one gender value common to both the L1 and the L2 display more or less complexity in mapping according to the amount of overlap between the gender systems. Gender values that are common to both languages allow the learner to create a direct mapping between the L1 and the L2 gender systems which, while there are still one-to-many mappings between the gender values due to the asymmetry between the languages, reduces the complexity of the mapping enough to allow for some degree of L1 transfer (Figure 6.19). It follows then, that the more direct mappings that the learner can make between the L1 and L2 gender values (even though there are also one-to-many mappings), the relatively less complex the mapping between the L1 and the L2 and therefore the more L1 transfer becomes available as an L2 gender use strategy.

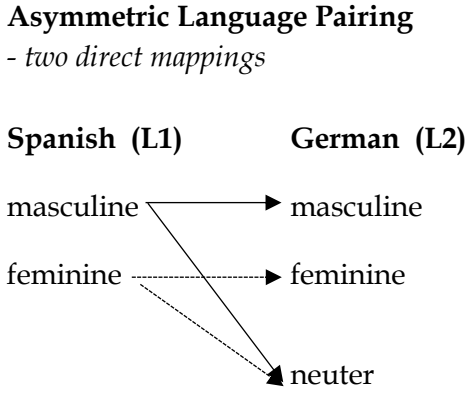


Figure 6.19. *Learner L1-L2 gender value mappings for Spanish and German.*

This continuum is not intended to account for closely-related languages which have had historically symmetric gender systems. The mapping of gender information from German onto Dutch, for example, would be significantly more straight-forward than the mapping of German onto Spanish (for instance), given that Old Dutch displayed a ternary gender system much like that of modern German and in modern Dutch the old masculine and feminine values are simply collapsed into the 'common' value for inanimate nouns.

Naturally, the *L1 transfer continuum* needs to be tested further using more language pairings through research specifically examining L2 gender use errors in light of the gender congruency between the target L2 noun and the L1 translation equivalent. This has not been the primary focus of previous research addressing L2 gender use strategies but this type of approach would contribute significantly more insight into the L2 gender use strategies used by bilinguals whose L1 and L2 both have a formal gender feature.

7. Conclusions

The aim of this study was to investigate the nature and representation of the grammatical gender system in bilingual speakers of languages with a different number of gender values in the L1 and the L2 in order to discern how these asymmetric gender systems differ from gender systems in which the L1 and the L2 bear the same gender values. I examined asymmetric gender systems from complementary psycholinguistic and language acquisition perspectives, including reaction time (RT) and error analysis data from both L2 production and processing tasks as well as interpretation data from a code-switching task. In this chapter I summarize the main findings from each of these experiments as well as two new proposals that can account for the representation and use of the formal gender feature by bilinguals whose L2 has an additional gender value not present in their L1.

The L2 picture-naming task performed by the L1 Spanish-L2 German bilinguals showed that these bilinguals could name the German noun represented by the picture significantly faster when both the L2 target noun and the L1 equivalent bore the same gender value than when the L1 and L2 nouns had different gender values, both of which were present in each of bilinguals' languages (mismatches between masculine and feminine). Interestingly, L2 neuter nouns were produced significantly faster than nouns mismatched for masculine and feminine between the L1 and the L2, suggesting that neuter is not subject to the same interference from the activation of a non-target gender node by the L1 noun.

A similar pattern of results emerged from the processing data of the L2 grammaticality judgment task performed by the L1 French-L2 German bilinguals. These bilinguals were also significantly faster to respond to written grammatical Determiner Phrases (DPs) when the target L2 and the L1 nouns had the same gender value than when they were mismatched for masculine and

feminine. The fact that the gender congruency (or incongruency) of the L1 and L2 nouns affects the RTs—in both production and processing data and for both groups of bilinguals—indicates that the L1 and L2 asymmetric gender system has an integrated representation, with the exception of the L2-specific gender value which, given that it does not seem to be subject to the same level of interference as nouns mismatched for gender values present in both languages, has a separate representation. To account for these results I proposed the *asymmetric gender representation hypothesis* that posits that gender values common to both languages are represented as a single set of shared gender nodes while gender value(s) present only in the L2 have a unique representation that is encoded separately from the L1-L2 integrated nodes.

I also presented an error analysis of production data from the L1 Spanish-L2 German bilinguals, which revealed that the majority of L2 gender errors produced involved the overgeneralization of the masculine determiner. This was shown to represent the use of a masculine as default strategy, which was the dominant L2 gender use strategy, though minimal amounts of the transfer of the gender value from the L1 into the L2 (L1 transfer) were also evident.

The error rates for ungrammatical DPs in the L2 grammaticality judgment task also offered some evidence of the use of masculine as a default strategy. In the processing data this was shown in the L1 French-L2 German bilinguals' reduced ability to correctly reject ungrammatical DPs when they contained a determiner error representing the use of masculine as default than when they contained a determiner error representing L1 transfer. This reduced sensitivity to errors involving the overgeneralization of the masculine determiner suggests that masculine as default is the dominant L2 gender use strategy in the L1 French-L2 German bilinguals as well as the L1 Spanish-L2 German bilinguals.

Further evidence regarding the nature of asymmetric gender systems came from a code-switched DP acceptability judgment task performed by both L1 Spanish-L2 German and L1 German-L2 Spanish bilinguals. These data contributed to the findings regarding the dominant L2 gender use strategy and also informed formal proposals on gender agreement in code-switched DPs. With respect to gender use strategies, the analysis of the strategies adopted by each group of bilinguals showed that both groups tended to adopt a strategy dependent on the direction of the switch (whether the DP contained a Spanish D and a German N or a German D and a Spanish N). For German D-Spanish N switches, neither group consistently used any discernible agreement strategy, and with Spanish D-German N switches, each group preferred that the D be marked for the gender of the N in their respective L1s, regardless of whether the N appeared in the DP or whether it was the translation equivalent. In terms of the formal proposals, neither the *double-feature valuation hypothesis* (Liceras et al, 2008) nor the *gender congruency algorithm* (González Vilbazo, 2005) was entirely supported by these results. In the context of the *double-feature valuation hypothesis*, it seems that defining the extension of the 'analogical criterion' as agreement between the D and the N in the L1 can account for the only clear agreement strategy displayed by the L1 Spanish-L2 German and L1 German-L2 Spanish bilinguals. The *gender congruency algorithm*, on the other hand, does not seem to be able to account for code-switching agreement strategies in L1 dominant Spanish-German bilinguals, as definiteness of the D does not seem to be important to these bilinguals and neither was agreement between the D and the N in the switch the dominant strategy.

I proposed the *L1 transfer continuum* to account for the L2 gender strategies used by the L1 Spanish-L2 German, L1 French-L2 German and L1 German-L2 Spanish bilinguals in the three tasks included in this study. The *L1 transfer continuum* states that the availability of L1 transfer as

an L2 gender use strategy depends on the degree of overlap between the L1 and the L2 gender systems. For languages with asymmetric gender systems in which there are some gender values common to both the L1 and the L2, only minimal amounts of L1 transfer are possible given the complexity of the mapping between the L1 and L2 gender values. Since L1 transfer is primarily unavailable, bilingual speakers of languages such as Spanish/French and German resort to the use of masculine as a default strategy, or do not display any discernible L2 gender use strategy.

In sum, this study has offered clear evidence in favour of the integration of the bilingual mental lexicon at the level of features such as grammatical gender. In particular, it has shown that L1 Spanish-L2 German and L1 French-L2 German bilinguals have a fundamentally integrated representation of L1 and L2 grammatical gender, with the gender value not present in the L1 (neuter) having an L2-specific representation. The consequences of this asymmetric representation are evident in the L2 gender use strategies available to these bilinguals. While the presence of some L1 transfer was found in L2 gender errors and in code-switching agreement preferences, the majority of the data showed that the bilinguals resorted to the use of masculine as a default strategy, and in some code-switching contexts, there was no discernible L2 gender use strategy at all.

I have formalized the representation of asymmetric gender systems in which the L2 has an additional gender value not present in the L1 in the *asymmetric gender representation hypothesis* and degree to which L1 transfer can be expected as the primary L2 gender use strategy in the *L1 transfer continuum*. Future research should test these proposals using additional production and processing data from bilingual speakers of other languages with asymmetric gender systems. It would also be relevant to examine the representation of an L1 gender value not present in the L2 in order to obtain a more rounded picture of the nature of asymmetric gender systems.

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9. Appendix A

L2 Picture-Naming Task: Target Nouns

Gender Congruency	L1-L2 Gender	Target L2 Noun	L1 Equivalent Noun
congruent	*masculine-masculine*	Arm	brazo
		Bau	edificio
		Brand	fuego
		Finger	dedo
		Hut	sombrero
		Ring	anillo
		Schuh	zapato
		Spiegel	espejo
		Teller	plato
	feminine-feminine	Feder	pluma
		Flasche	botella
		Kerze	vela
		Kette	cadena
		Kirche	iglesia
		Pflanze	planta
		Tür	puerta
		Zwiebel	cebolla
incongruent	*masculine-feminine*	Anrichte	armario
		Briefmarke	sello
		Burg	castillo
		Bürste	cepillo
		Halle	pasillo
		Schulter	hombro
		Stufe	peldaño
		Tastatur	teclado
		Windmühle	molino
		Zeitung	periódico
	feminine-masculine	Apfel	manzana
		Ball	pelota
		Koffer	maleta
		Löffel	cuchara
		Mond	luna
		Mund	boca
		Regen	lluvia
		Stein	roca
		Stern	estrella
		Stuhl	silla
		Teppich	alfombra

L2 neuter	*masculine-neuter*	Dach	techo
		Dreieck	triángulo
		Ei	huevo
		Eis	hielo
		Geld	dinero
		Geschenk	regalo
		Klavier	piano
		Kleid	vestido
		Messer	cuchillo
		Spiel	juego
	feminine-neuter	Bett	cama
		Bier	cerveza
		Fahrrad	bicicleta
		Fenster	ventana
		Gras	hierba
		Haus	casa
		Ohr	oreja
		Rad	rueda
		Regal	estantería
		Schwert	espada

10. Appendix B

L2 Grammaticality Judgment Task: Stimuli DPs

Gender Cong	L1-L2 Gender	L2 Noun	L1 Noun	Correct DP Stimulus	Incorrect DP Stimulus
cong	*masc-masc*	Abend	soir	der Abend	das Abend
		Arm	bras	der Arm	das Arm
		Bleistift	crayon	der Bleistift	das Bleistift
		Finger	doigt	der Finger	das Finger
		Fisch	poisson	der Fisch	das Fisch
		Flug	vol	der Flug	das Flug
		Frühling	printemps	der Frühling	das Frühling
		Fuß	pied	der Fuß	das Fuß
		Hammer	marteau	der Hammer	das Hammer
		Helm	casque	der Helm	das Helm
		Himmel	ciel	der Himmel	das Himmel
		Hut	chapeau	der Hut	das Hut
		Kamm	peigne	der Kamm	das Kamm
		Käse	fromage	der Käse	das Käse
		Kreis	cercle	der Kreis	das Kreis
		Kuchen	gâteau	der Kuchen	das Kuchen
		Laden	magasin	der Laden	das Laden
		Monat	mois	der Monat	das Monat
		Morgen	matin	der Morgen	das Morgen
		Mut	courage	der Mut	das Mut
		Pfeffer	poivre	der Pfeffer	das Pfeffer
		Rücken	dos	der Rücken	das Rücken
		Saft	jus	der Saft	das Saft
		Sand	sable	der Sand	das Sand
		Schal	foulard	der Schal	das Schal
		Spiegel	miroir	der Spiegel	das Spiegel
		Tag	jour	der Tag	das Tag
		Traum	rêve	der Traum	das Traum
		Weg	sentier	der Weg	das Weg
		Zug	train	der Zug	das Zug
	fem-fem	Antwort	réponse	die Antwort	das Antwort
		Apotheke	pharmacie	die Apotheke	das Apotheke
		Birne	poire	die Birne	das Birne
		Blume	fleur	die Blume	das Blume
		Brust	poitrine	die Brust	das Brust
		Bühne	scène	die Bühne	das Bühne
		Feder	plume	die Feder	das Feder
		Flasche	bouteille	die Flasche	das Flasche

		Frage	question	die Frage	das Frage
		Frisur	coiffure	die Frisur	das Frisur
		Gabel	fourchette	die Gabel	das Gabel
		Gesellschaft	société	die Gesellschaft	das Gesellschaft
		Gesundheit	santé	die Gesundheit	das Gesundheit
		Grenze	frontière	die Grenze	das Grenze
		Hälfte	moitié	die Hälfte	das Hälfte
		Hand	main	die Hand	das Hand
		Kerze	bougie	die Kerze	das Kerze
		Küche	cuisine	die Küche	das Küche
		Lippe	lèvre	die Lippe	das Lippe
		Metzgerei	boucherie	die Metzgerei	das Metzgerei
		Nacht	nuit	die Nacht	das Nacht
		Sahne	crème	die Sahne	das Sahne
		Sprache	langue	die Sprache	das Sprache
		Stadt	ville	die Stadt	das Stadt
		Stimme	voix	die Stimme	das Stimme
		Straße	rue	die Straße	das Straße
		Tür	porte	die Tür	das Tür
		Ursache	cause	die Ursache	das Ursache
		Woche	semaine	die Woche	das Woche
		Wurst	saucisse	die Wurst	das Wurst
incong	*masc-fem*	Abfahrt	départ	die Abfahrt	der Abfahrt
		Arbeit	travail	die Arbeit	der Arbeit
		Baumwolle	coton	die Baumwolle	der Baumwolle
		Brücke	pont	die Brücke	der Brücke
		Butter	beurre	die Butter	der Butter
		Ecke	coin	die Ecke	der Ecke
		Ehe	mariage	die Ehe	der Ehe
		Fahne	drapeau	die Fahne	der Fahne
		Gefahr	danger	die Gefahr	der Gefahr
		Geige	violon	die Geige	der Geige
		Gurke	concombre	die Gurke	der Gurke
		Heiterkeit	bonheur	die Heiterkeit	der Heiterkeit
		Leber	foie	die Leber	der Leber
		Mauer	mur	die Mauer	der Mauer
		Miete	loyer	die Miete	der Miete
		Milch	lait	die Milch	der Milch
		Reise	voyage	die Reise	der Reise
		Ruhe	silence	die Ruhe	der Ruhe
		Seife	savon	die Seife	der Seife
		Seite	côté	die Seite	der Seite
		Sonne	soleil	die Sonne	der Sonne
		Tafel	tableau	die Tafel	der Tafel

		Traube	raisin	die Traube	der Traube
		Tüte	sac	die Tüte	der Tüte
		Wahl	choix	die Wahl	der Wahl
		Wand	mur	die Wand	der Wand
		Welt	monde	die Welt	der Welt
		Wolke	nuage	die Wolke	der Wolke
		Zeit	temps	die Zeit	der Zeit
		Zeitung	journal	die Zeitung	der Zeitung
	fem-masc	Apfel	pomme	der Apfel	die Apfel
		Ausgang	sortie	der Ausgang	die Ausgang
		Bahnhof	gare	der Bahnhof	die Bahnhof
		Berg	montagne	der Berg	die Berg
		Beruf	profession	der Beruf	die Beruf
		Brief	lettre	der Brief	die Brief
		Dom	cathédrale	der Dom	die Dom
		Fehler	faute	der Fehler	die Fehler
		Grund	raison	der Grund	die Grund
		Gürtel	ceinture	der Gürtel	die Gürtel
		Hunger	faim	der Hunger	die Hunger
		Koffer	valise	der Koffer	die Koffer
		Kopf	tête	der Kopf	die Kopf
		Krieg	guerre	der Krieg	die Krieg
		Löffel	cuillère	der Löffel	die Löffel
		Mund	bouche	der Mund	die Mund
		Rasen	pelouse	der Rasen	die Rasen
		Rauch	fumée	der Rauch	die Rauch
		Regen	pluie	der Regen	die Regen
		Ring	bague	der Ring	die Ring
		Rock	jupe	der Rock	die Rock
		Satz	phrase	der Satz	die Satz
		Schnee	neige	der Schnee	die Schnee
		Schuh	chaussure	der Schuh	die Schuh
		Stein	pierre	der Stein	die Stein
		Strand	plage	der Strand	die Strand
		Stuhl	chaise	der Stuhl	die Stuhl
		Vorschlag	suggestion	der Vorschlag	die Vorschlag
		Wald	forêt	der Wald	die Wald
		Zahn	dent	der Zahn	die Zahn
L2 neuter	*masc-neut*	Bett	lit	das Bett	der Bett
		Blut	sang	das Blut	der Blut
		Boot	bateau	das Boot	der Boot
		Brot	pain	das Brot	der Brot
		Buch	livre	das Buch	der Buch

	Dorf	village	das Dorf	der Dorf
	Ergebnis	résultat	das Ergebnis	der Ergebnis
	Gedicht	poème	das Gedicht	der Gedicht
	Gehirn	cerveau	das Gehirn	der Gehirn
	Gemüse	légume	das Gemüse	der Gemüse
	Geschenk	cadeau	das Geschenk	der Geschenk
	Gespenst	fantôme	das Gespenst	der Gespenst
	Glas	verre	das Glas	der Glas
	Gleis	quai	das Gleis	der Gleis
	Handy	mobile	das Handy	der Handy
	Heft	cahier	das Heft	der Heft
	Herz	coeur	das Herz	der Herz
	Holz	bois	das Holz	der Holz
	Kinn	menton	das Kinn	der Kinn
	Knie	genou	das Knie	der Knie
	Land	pays	das Land	der Land
	Messer	couteau	das Messer	der Messer
	Netz	filet	das Netz	der Netz
	Obst	fruit	das Obst	der Obst
	Schloss	château	das Schloss	der Schloss
	Spiel	jeu	das Spiel	der Spiel
	Wetter	temps	das Wetter	der Wetter
	Wort	mot	das Wort	der Wort
	Wunder	miracle	das Wunder	der Wunder
	Zentrum	centre	das Zentrum	der Zentrum
fem-neut	Auto	voiture	das Auto	der/die Auto
	Bein	jambe	das Bein	der/die Bein
	Blatt	feuille	das Blatt	der/die Blatt
	Ding	chose	das Ding	der/die Ding
	Ende	fin	das Ende	der/die Ende
	Essen	nourriture	das Essen	der/die Essen
	Fahrrad	bicyclette	das Fahrrad	der/die Fahrrad
	Fett	graisse	das Fett	der/die Fett
	Fleisch	viande	das Fleisch	der/die Fleisch
	Gefängnis	prison	das Gefängnis	der/die Gefängnis
	Gemälde	peinture	das Gemälde	der/die Gemälde
	Gesetz	loi	das Gesetz	der/die Gesetz
	Gespräch	conversation	das Gespräch	der/die Gespräch
	Getränk	boisson	das Getränk	der/die Getränk
	Glück	chance	das Glück	der/die Glück
	Haus	maison	das Haus	der/die Haus
	Hemd	chemise	das Hemd	der/die Hemd
	Kleid	robe	das Kleid	der/die Kleid

	Leben	vie	das Leben	der/die Leben
	Licht	lumière	das Licht	der/die Licht
	Lied	chanson	das Lied	der/die Lied
	Pfund	livre	das Pfund	der/die Pfund
	Recht	loi	das Recht	der/die Recht
	Schwimmbad	piscine	das Schwimmbad	der/die Schwimmbad
	Seil	corde	das Seil	der/die Seil
	Tischtuch	nappe	das Tischtuch	der/die Tischtuch
	Verständnis	compréhension	das Verständnis	der/die Verständnis
	Vertrauen	confiance	das Vertrauen	der/die Vertrauen
	Zelt	tente	das Zelt	der/die Zelt
	Zimmer	salle	das Zimmer	der/die Zimmer

11. Appendix C

Code-Switched Acceptability Judgment Task: Stimuli Sentences

German D-Spanish N Stimuli

Spanish	German	D - gender	D - definiteness	Stimulus
masculine	feminine	M	def	Der teclado de la mesa es gris.
masculine	feminine	M/Nt	indef	Ein teclado de la mesa es gris.
masculine	feminine	M	def	Der periódico de la universidad es radical.
masculine	feminine	M/Nt	indef	Ein periódico de la universidad es radical.
masculine	feminine	M	def	Der metro de Madrid es eficiente.
masculine	feminine	F	def	Die correo del vecino es muy infantil.
masculine	feminine	F	indef	Eine correo del vecino es muy infantil.
masculine	feminine	F	def	Die sello del sobre es verde.
masculine	feminine	F	indef	Eine sello del sobre es verde.
masculine	feminine	F	def	Die pomelo del mercado es local.
masculine	feminine	F	indef	Eine pomelo del mercado es local.
masculine	feminine	Nt	def	Das cepillo de la bolsa es azul.
masculine	feminine	M/Nt	indef	Ein cepillo de la bolsa es azul.
masculine	feminine	Nt	def	Das desierto durante el día es sofocante.
masculine	feminine	Nt	def	Das piso de María es horrible.
feminine	masculine	M	def	Der cuchara de plata es elegante.
feminine	masculine	M/Nt	indef	Ein cuchara de plata es elegante.
feminine	masculine	M	def	Der mesa de madera es casi indestructible.
feminine	masculine	M	def	Der tapadera de cristal es muy transparente.
feminine	masculine	F	def	Die montaña de libros es impresionante.
feminine	masculine	F	indef	Eine montaña de libros es impresionante.
feminine	masculine	F	def	Die silla cerca de la ventana es elegante.
feminine	masculine	F	indef	Eine silla cerca de la ventana es elegante.
feminine	masculine	F	def	Die tarta de fresas es excelente.
feminine	masculine	F	indef	Eine tarta de fresas es excelente.
feminine	masculine	Nt	def	Das salida de emergencia es importante.
feminine	masculine	M/Nt	indef	Ein salida de emergencia es importante.
feminine	masculine	Nt	def	Das maleta de la azafata es grande.
feminine	masculine	M/Nt	indef	Ein maleta de la azafata es grande.
feminine	masculine	Nt	def	Das pimienta en la sopa es fuerte.

masculine	neuter	M	def	Der libro de la biblioteca es verde.
masculine	neuter	M/Nt	indef	Ein libro de la biblioteca es verde.
masculine	neuter	M	def	Der juego de cartas es fácil.
masculine	neuter	M	def	Der tejado de la escuela es marrón.
masculine	neuter	F	def	Die regalo hecho a mano es mejor.
masculine	neuter	F	indef	Eine regalo hecho a mano es mejor.
masculine	neuter	F	def	Die pueblo del desierto es muy diferente.
masculine	neuter	F	indef	Eine pueblo del desierto es muy diferente.
masculine	neuter	F	def	Die vaso de cristal es frágil.
masculine	neuter	F	indef	Eine vaso de cristal es frágil.
masculine	neuter	Nt	def	Das secreto del político es sorprendente.
masculine	neuter	M/Nt	indef	Ein secreto del político es sorprendente.
masculine	neuter	Nt	def	Das vestido de algodón es sauve.
masculine	neuter	M/Nt	indef	Ein vestido de algodón es sauve.
masculine	neuter	Nt	def	Das dormitorio de la mansión es grande.
feminine	neuter	M	def	Der hoja con las notas es ilegible.
feminine	neuter	M/Nt	indef	Ein hoja con las notas es ilegible.
feminine	neuter	M	def	Der bebida para niños es dulce.
feminine	neuter	M/Nt	indef	Ein bebida para niños es dulce.
feminine	neuter	M	def	Der propina del cliente es razonable.
feminine	neuter	F	def	Die verdura de esa tienda es local.
feminine	neuter	F	indef	Eine verdura de esa tienda es local.
feminine	neuter	F	def	Die habitación del palacio es enorme.
feminine	neuter	F	indef	Eine habitación del palacio es enorme.
feminine	neuter	F	def	Die fruta del Caribe es dulce.
feminine	neuter	F	indef	Eine fruta del Caribe es dulce.
feminine	neuter	Nt	def	Das bicicleta para la carrera es veloz.
feminine	neuter	M/Nt	indef	Ein bicicleta para la carrera es veloz.
feminine	neuter	Nt	def	Das pierna del acróbata es muy flexible.
feminine	neuter	Nt	def	Das casa del vecino es azul.

Spanish D-German N Stimuli

Spanish	**German**	**D - gender**	**D - definiteness**	**Stimulus**
masculine	feminine	M	def	El Leber von der Spenderliste ist bereit.
masculine	feminine	M	indef	Un Leber von der Spenderliste ist bereit.
masculine	feminine	M	def	El Gurke aus dem Garten ist köstlich.

masculine	feminine	M	indef	Un Gurke aus dem Garten ist köstlich.
masculine	feminine	M	def	El Toilette in dem Restaurant ist kaputt.
masculine	feminine	M	indef	Un Toilette in dem Restaurant ist kaputt.
masculine	feminine	F	def	La Banane aus dem Biomarkt ist organisch.
masculine	feminine	F	indef	Una Banane aus dem Biomarkt ist organisch.
masculine	feminine	F	def	La Frisur wie Justin Bieber ist populär.
masculine	feminine	F	indef	Una Frisur wie Justin Bieber ist populär.
masculine	feminine	F	def	La Stelle bei der Regierung ist reizvoll.
masculine	feminine	F	indef	Una Stelle bei der Regierung ist reizvoll.
feminine	masculine	M	def	El Krieg im Mittlerer Osten ist gefährlich.
feminine	masculine	M	indef	Un Krieg im Mittlerer Osten ist gefährlich.
feminine	masculine	M	def	El Brief von meiner Cousine ist hier.
feminine	masculine	M	indef	Un Brief von meiner Cousine ist hier.
feminine	masculine	M	def	El Rock in der Garderobe ist rot.
feminine	masculine	M	indef	Un Rock in der Garderobe ist rot.
feminine	masculine	F	def	La Schmetterling im Wald ist schön.
feminine	masculine	F	indef	Una Schmetterling im Wald ist schön.
feminine	masculine	F	def	La Strand am Fluss ist ruhig.
feminine	masculine	F	indef	Una Strand am Fluss ist ruhig.
feminine	masculine	F	def	La Schal aus Wolle ist warm.
feminine	masculine	F	indef	Una Schal aus Wolle ist warm.
masculine	neuter	M	def	El Boot auf See ist blau.
masculine	neuter	M	indef	Un Boot auf See ist blau.
masculine	neuter	M	def	El Heft mit vielen Seiten ist schwer.
masculine	neuter	M	indef	Un Heft mit vielen Seiten ist schwer.
masculine	neuter	M	def	El Ei von dem Bauer ist frisch.
masculine	neuter	M	indef	Un Ei von dem Bauer ist frisch.
masculine	neuter	F	def	La Schloss auf dem Land ist groß.
masculine	neuter	F	indef	Una Schloss auf dem Land ist groß.
masculine	neuter	F	def	La Feld mit Weizen ist grün.
masculine	neuter	F	indef	Una Feld mit Weizen ist grün.
masculine	neuter	F	def	La Messer im Schrank ist spitz.
masculine	neuter	F	indef	Una Messer im Schrank ist spitz.
feminine	neuter	M	def	El Bett im Hotel ist unbequem.
feminine	neuter	M	indef	Un Bett im Hotel ist unbequem.
feminine	neuter	M	def	El Hemd des Kindes ist schmutzig.
feminine	neuter	M	indef	Un Hemd des Kindes ist schmutzig.

feminine	neuter	M	def	El Knie des Spielers ist gebrochen.
feminine	neuter	M	indef	Un Knie des Spielers ist gebrochen.

feminine	neuter	F	def	La Ohr der Katze ist verletzt.
feminine	neuter	F	indef	Una Ohr der Katze ist verletzt.
feminine	neuter	F	def	La Gedicht von Shakespeare ist kompliziert.
feminine	neuter	F	indef	Una Gedicht von Shakespeare ist kompliziert.
feminine	neuter	F	def	La Rad des Autos ist platt.
feminine	neuter	F	indef	Una Rad des Autos ist platt.