Object categorisation in French-Swedish early simultaneous bilinguals

ARE GENDER EFFECTS MODULATED BY GRAMMAR OR CULTURE?

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Abstract

If most scholars tend to agree that the native language of a speaker does influence the way they will understand the reality around them, the question becomes ambiguous when it comes to bilingual speakers' cognition. How is their reality affected by the combination of their languages? This study aimed at exploring this question under the angle of grammatical gender. Adult simultaneous early bilingualsin French and Swedish were asked, in an innovative experiment, to match a culturally neutral item to a voice. In a second experiment, the same participants were asked to match a culturally loaded item to a voice. In both experiments, items were carefully chosen according to their grammatical gender. Results indicate that grammatical gender was not a predictor of voice assignment. However, the perceived cultural stereotypes of the items used in the second experiment appeared to be a robust predictor of voice assignment. Findings suggest thus that grammatical gender does not affect how simultaneous early bilingualism French and Swedish would conceptualise artifacts, but cultural gender would.

Keywords

Linguistic relativity, Grammatical gender, French, Swedish, Cultural gender effect

Contents

1. INTRODUCTION

The relationship between language and thought is an endless topic of research amongst linguists of all time. In the modern history of the field and following the principle of linguistic relativity as early theorized by Whorf (1956), a link connecting language and thought has been proven to exist, either with language reflecting the speaker's inner cognition or with language influencing the way a speaker may conceptualize the world. However, when it comes to the mind of bilinguals, the gap remains important and unresearched. Would they be influenced by one language over the other?

As stated by Slobin (1991) "The language or languages that we learn in childhood are not neutral coding systems of an objective reality" (p. 16). In this line of thought, grammatical gender is an interesting case to investigate cross-linguistically as every language has its own way of categorizing nouns, even though we can find patterns in language families. For instance, most of the romance languages, including French, categorize nouns as either feminine or masculine. Other languages, like Swedish, categorize nouns as either common or neuter.

When it comes to bilingual speakers, most studies have investigated effects of grammatical gender on second language learners rather than simultaneous early bilinguals (Kurinski and Sera, 2011; Costa et al. 2002; Bassetti and Nicoladis, 2016). With their work suggesting weak effects of grammatical gender on second language learners, even when highly proficient, the question remains open as to how simultaneous early bilinguals would behave. Moreover, most of the previous work including bilinguals (Sera et al, 1994, 2002; Philips and Boroditsky 2003) has either compared speakers of languages that have similar grammatical gender systems (e.g., Spanish with French or German) or speakers of a language whose grammatical gender system has a masculine/feminine distinction with one that does not have a grammatical gender at all (e.g., Spanish with English). A strong theory here is that if a learner's first language has a grammatical gender category, she would be less prone to be affected by the second language's grammatical gender system. This however opens the question of how speakers of languages that have a dual gender category that differs from the masculine/feminine distinction, such as Swedish speakers would behave in a similar setting. Would they show similar effects to e.g., English speakers whose language's gender category is empty, or will they show different results if they also know a language that has a masculine/feminine grammatical gender? These kinds of test on bilinguals are yet to be empirically tested in the academic world.

Moreover, studying bilinguals can help clarify whether relationships between grammatical gender and thinking are effects of language or of culture, two factors that cannot be disentangled in cross-linguistic comparisons of monolinguals. Also, some effects of grammatical gender may

be due to *thinking for speaking* rather than showing effects of *language on thinking*. This can be tested by asking bilinguals to perform tasks in a second language that does not have grammatical gender. If grammatical gender has effects when bilinguals are tested in English, this cannot be explained as *thinking for speaking*. Finally, if knowledge of more than one language decreases the effects of grammatical gender, such a result would have practical implications for language learning and teaching and language policy.

Indeed, even though it is widely argued that language is an integral part of culture, the question remains as to whether it is culture or grammar that would explain the effects of gender on object categorization. Haertelé concluded her 2017 paper by writing that "when attributing masculine or feminine features to objects, apart from their grammatical gender, participants may also be guided by some confounding variables that were unaccounted for in the experimental design" (p. 9). To account for the variables in question, some scholars have intended to comprehend the problem (Beller et al., 2015; Ji et al., 2004) but to my knowledge, none of them managed to find a reliable experiment to do so.

With that in mind, an abundant body of evidence suggests a correlation between grammatical and conceptual gender and thus supports the idea that language affects cognition. However, most of this support comes from experiments whose methodology raised criticisms, tested the same kind of languages, or did not investigate early successive bilinguals.

Additionally, most of the studies mentioned tested participants only in their native language. Any differences in these comparisons can only show the effect of a language on thinking for that particular language. These studies cannot tell us whether experience with a language affects language-independent thought such as thought for other languages or thought in non-linguistic tasks.

In sum, the main debate in the field focuses on the extent and pervasiveness of the effect of language on cognition, and this thesis aims at bringing new elements of response to participate in this on-going debate. I will thus bring an answer as whether the grammatical gender of nouns has consequences for the mental representation of the corresponding entities in the world.

If Bassetti and Nicoladis (2016) remind us that "It is not unusual for social science research to yield inconsistent results, and research on bilinguals particularly so, due to the huge variation in the populations under study", they nuance that "if grammatical gender had no bearing on thinking, no effects would have been found. So, it is the case that we need to collect more evidence, and to try to identify factors that may modulate the effects of grammatical gender on thinking." (p. 6)

Accordingly, the two main questions we investigate here are the following:

1) How do French-Swedish simultaneous early bilinguals categorize nouns?
2) What, between language or culture, has the biggest impact on speakers' cognition?

Consequently, I designed an innovative experiment inspired by the seminal work of Sera et al. (1994, 2002) in which early French-Swedish bilinguals are asked to associate a voice that they hear to a picture. This experiment aims at activating the unconscious mental conceptualization bilinguals have about a sample of representative objects. Additionally, the task has been designed so that effects of culture can be unravel from effects of language. French-Swedish bilinguals have been chosen as they present two separate languages that possess two different dual grammatical gender distinctions, French distinguishing feminine from masculine grammatical gender and Swedish having no such distinction.

This thesis then adds on to the academical world with an original experiment aiming at solving this methodological issue as well as bringing new evidence shedding light on the potential variables influencing object categorization. Thus, using an innovative voice assignment task, this study manages to propose a deep investigation of the link between grammatical gender and object categorization in early successive bilinguals, while considering cultural factors through a voice-assignment task; a problem long evidenced in academics. This issue is evidenced by the ambiguous representations of grammatical gender effects on conceptual representations and also complicated by the fact that the vast majority of tasks used to investigate its effects are explicit and subject to the use of strategies.

Thus, this study explores the link between grammatical gender and cognition on a conceptual level. It investigates to what the mental representations of some items and their qualities, which are non-linguistic in nature, are due to. If the effect of language is limited to the semantic representations of that same language, the expectation is that there will be a significant difference in performance between the two languages for bilingual speakers. As another possibility, given that grammatical gender has only a limited conceptual motivation, it is possible that learning an ungendered second language foregrounds the arbitrary nature of gender assignment in the bilingual speakers' mother tongue and leads to a restructuring of semantic representations.

This thesis comprises five main sections. Section 2 defines the key elements necessary to discuss the research questions. In Section 3, the existing literature is discussed and analyzed. Section 4 presents the present study, as well as the predictions made to answer the research questions. Sections 5 and 6 outline the methods and different experimental designs used in the study, disclosing the input data. Section 7 presents the results and the statistical tests used to examine them. In Section 8, the results are discussed in relation to previous literature. Finally in Section 9, the results are concluded, before the limitations to be suggested in section 10.

2. THEORETICAL FRAMEWORK

This chapter aims at highlighting the key concepts that constitute the basis for the rationale behind this thesis.

2.1 GRAMMATICAL GENDER

In order to fully comprehend the theories on which this thesis builds on, the reader must have a good understanding of the grammatical genders of French and Swedish and mainly how they differ. The first section of the chapter will thus focus on that, starting with the French grammatical gender and ending with the Swedish counterpart.

2.1.1 French grammatical gender

In order to classify nouns, a lexical category that accounts for 54% of all French words (Séguin, 1969), the French language system recognizes two grammatical genders: masculine and feminine. In contemporary French, gender is considered to be a property of the noun which the noun transmits, via agreement, to other categories, namely the determiners, the adjective and sometimes the past participle, as well as to the pronouns which represent the noun (Härma, 2000). Amongst all nouns of modern French, about 58.4% would be of masculine gender (Séguin, 1969) and their repartition has long been considered as rather opaque and arbitrary. Indeed, in the French language, grammatical gender is said to be artificial, as opposed to English for example, where grammatical gender is said to be natural.

As a result, English codes natural gender primarily through lexical items (girl/boy or bride/groom for example) and through some pronouns (such as she/he and him–/her). English does not assign gender to all nouns that refer to animates (like doctor) or to nouns that refer to inanimate entities (like apple). Thus, grammatical gender in English is semantically motivated, which means that the gender of a word is determined by its meaning.

In French on the other hand, any entity, whether animate or inanimate has a gender that is most often grammatically motivated. Even in instances of which gender is semantically motivated, the information is grammatically marked by different cues, such as determiner or adjective agreement. Thus, ‘a lamp’ (*une lampe*) is feminine while ‘a switch’ (*un interrupteur*) is masculine, even though there is nothing intrinsically feminine or masculine about one or the other. Usually, this distinction is marked in the article qualifying the noun, which can explain why the gender of a noun is considered opaque: the grammatical gender of a noun is not marked in the morphology of the noun. According to Séguin (1969), only 10.5% of the grammatical gender of all the nouns match their natural gender, when this category applies.

However, even though French grammatical gender is regarded as arbitrary, some regularities can be observed. Certain endings are more typical for feminine grammatical gender such as *–ette* and others are more typical for masculine grammatical gender such as *–isme*. Thus, an exploitation of statistical relationships that exists between the ending of nouns and their grammatical gender would allow to determine correctly the gender of nouns in 84.5% of the nouns listed in the French dictionary (Tucker et al, 1977).

Moreover, according to Tucker, Lambert and Rigault (1977), native French speakers are able to assign the correct gender to nouns, both known and unknown one, starting at a very young age. They also theorize that this skill would be acquired through experience.

2.1.1.1 Exceptions

It is necessary to mention that even though there is no official authority that has its mission to rule the French language, there are two widely-spread and privately-owned French dictionaries – *Larousse* and *Robert* - that have popular recognition and that decide each year on the grammatical gender of new words. However, their authority needs to be nuanced by the wide influence of the *Académie française*, a national institution created in 1635 and whose historical mission[1] is to rule on the French language and to oversee its evolution.

As an example, illustrating the tensions existing between common usage and these institutions, we can mention the recent case of the noun 'Covid' It was quickly used as a masculine noun by a vast majority of the French-speaking community, until *l'Académie française* took a stance and decided it would be a feminine word. However, the population had already widely adopted 'Covid' as masculine, and as a consequence, it is defined as both masculine and feminine in the *Larousse* and *Robert* dictionaries. On a similar basis, the borrowed word 'wi-fi', ruled out to be masculine by the main dictionaries and *l'Académie française*, is in reality largely used as a feminine word in common usage.

Nonetheless, 'Covid' is not the only word of the French language that can be equally used as feminine or masculine without any orthographic modification. Other words, such as '*élève*' (pupil) are called hybrid words and can either be masculine or feminine depending on the sex of the referent. Other nouns, called epicene nouns, are used with only one grammatical gender regardless of the gender of the referent. For instance, '*une victime*' (victim), will always be feminine, even though the victim in question is a male (Ayoun, 2007). Both hybrid and epicene nouns are mainly used for human referents (Corbett, 1991; Larivière, 2001).

[1] For a critic of this institution, see Candéa & Veron, 2021.

Furthermore, there are three French nouns – amour, délice, orgue – considered as exceptions, which change gender according to number. That is to say, when used in their singular form, these words are masculine, but they become feminine when used in their plural form (Ayoun, 2007).

Finally, if native French speakers early on acquire mastery of grammatical gender, some nouns often constitute confusion. This mainly concerns words starting with an alveolar vowel *(après-midi, altere, alveole,* etc.) and for which gender is often source of confusion among speakers.

2.1.2 Swedish Grammatical gender

In many gender systems, including the Swedish one, there is a similar but still somewhat different opposition between form and meaning. There is a difference between lexical gender (utrum vs. neutrum, e.g., en stol 'a chair' - ett bord 'a table'), and referential gender (animate, comprising human beings and higher animals and further divided into masculine and feminine, vs. inanimate, e.g., en pojke 'a boy', en flicka 'a girl', en mask 'a worm'). Terms like grammatical gender and semantic gender have also been used, as the terms lexical and referential gender are somewhat misleading. However, both lexical gender and referential gender govern the same gender morphemes (Andersson, 2000).

That being said, the Swedish language recognizes two different grammatical genders that are marked in the article system in, e.g., determiners and adjectives. However, instead of following the distinction between masculine and feminine like French does, Swedish divides its nouns between neuter (also known as *neutrum* in Swedish) and common (*utrum* in Swedish). Thus, *utrum* gender is associated with -(e)n or zero and neuter with -(e)t. The main principles for gender agreement in Swedish are that: (a) noun phrase internal elements and predicate complements are *neutrum* according to the lexical gender of the head noun, and (b) anaphoric personal pronouns are either, for animates, masculine/feminine according to the sex of the referent, or, for inanimate, *neutrum* according to the lexical gender of the head noun of the antecedent noun phrase (Fraurud, 2000).

As for the way words are divided in each category, Josefsson (2005) states that "there are clear tendencies that neuter nouns denote unbounded and/or inanimate entities and common gender nouns denote bounded and/or animate referents, but there are no absolute rules" (p. 7). Andersson (1994) precises that there can be both semantic and morphological cues to indicate the grammatical gender of a noun but that even though regularities exist, they tend to be quite weak. There are e.g., semantic regularities like the fact that animates normally belong to *utrum* gender and formal regularities such that certain noun forming suffixes determine gender uniquely. However, "for the majority of nouns, there do not seem to be any simple ways of determining gender" (Andersson, p. 29).

Moreover, the sex of human and animal is often shown lexically, like in French. It is also noteworthy to mention that a number of nouns can take either gender, such as *borren/borret* (the drill) or *paraplyet/paraplyn* (the umbrella) (Holmes & Hinchcliff, 2003). Finally, some nouns can have different gender depending on the region in Sweden. Thus, *apelsin* (orange) and *lås* (lock) for instance, are either feminine or masculine depending on the part of Sweden a given speaker is from. Some other dialects of Swedish, such as those spoken in Nyland in Finland, have kept the old features of Swedish that included a three-gender system, especially among the older generation of Nyland inhabitants (Sandström, 2000).

2.2 THE LINGUISTIC RELATIVITY THEORY

With the grammatical context of our two test languages being outlined, the remainder of this chapter will focus on the theoretical framework of which this thesis is based on, starting with the linguistic theory.

The linguistic theory, also known as the Sapir-Whorf theory, states that language influences our thoughts and perceptions and that consequently, different languages mean different realities and different worldviews. According to Sapir (1929), language does not reflect reality but rather predominantly shapes it. He acknowledges the objective nature of reality, but since the perception of reality is influenced by our linguistic habits, it follows that language plays a major role in the cognitive process. In other words, according to him, (a) the language we speak and think in shapes the way we perceive the world and (b) the existence of various languages implies that people who think in different languages must perceive the world differently.

Later, Sapir's student Whorf (1961) drew on this theory developing a more radical view on the relationship between language and thought. While Sapir believed in an objective world, Whorf sees the latter as presented in a "kaleidoscopic flux of impressions which must be organized by the linguistic system in our minds" (Al-Sheikh Hussein, 2012). According to Whorf then, the world is something totally subjective. As he writes it, we are thus "introduced to a new principle of relativity, which holds that all observers are not led by the same physical evidence to the same picture of the universe, unless their linguistic backgrounds are similar, or can in some way be calibrated" (Carroll, 1956, p. 214). Whorf's theory is deterministic by essence in that according to him, a speaker of a given language can only perceive what their language allows them to or predispose them to perceive. In other words, according to him, a speaker's language controls their worldview. Consequently, speakers of different languages will have different worldviews.

Since Sapir and Whorf first stated their hypotheses, many linguists have drawn on the theory to both validate and invalidate it. Today, the majority of academics agrees that even though a speaker's mother tongue does influence cognition, it does not do so in such a deterministic

manner as established by Whorf. However, the degree to which it does remains an open question. This thesis aims at adding on the literature for this question.

2.3 CONCEPTUAL METAPHOR

In order to account for why speakers' cognition would be affected by the grammar of their native language, scholars have come up with different explanations. The most popular explanation is that needing to refer to an object as masculine or feminine may lead people to selectively attend to that object's masculine or feminine qualities, thus making these features more salient in their representation of the world. This is supported in other area of languages, such as color perception (Thierry et al., 2009) or time (Boroditsky et al. 2011).

According to Whorf (1961) and as it will be explained in more details in the literature review section of this thesis, if a language requires certain distinctions to be made because of its grammatical system, then the speakers of this language become conscious of the kinds of distinctions that must be referred to. For example, if a language, like French in this study, makes a distinction between masculine and feminine when defining nouns, then the speakers of this language will be more sensitive to this distinction in the real world.

This idea can be linked to the seminal work of Lakoff (1980) on conceptual metaphor. According to Lakoff (1980, p. 2),

> "The concepts that govern our thought are not just matters of the intellect. They also govern our everyday functioning, down to the most mundane details. Our concepts structure what we perceive, how we get around in the world, and how we relate to other people. Our conceptual system thus plays a central role in defining our everyday realities."

In other words, he suggests that if our conceptual system is largely metaphorical as he believes it is, then the way we think, what we experience, and what we do in our everyday life is actually a matter of metaphor.

In one of the examples he uses in his 1980 paper, he explains how in western societies, money is usually a metaphor for time (p. 5):

TIME IS MONEY

You're *wasting* my time.

This gadget will *save* you hours.

I don't *have* the time to *give* you.

How do you *spend* your time these days?

That flat tire *cost* me an hour.

I've *invested* a lot of time in her.

I don't *have enough* time to *spare* for that.

You *need to budget* your time.

Through this example, he shows how using verbs semantically related to money makes us think about and conceptualize time as something valuable, of which we only have a limited quantity.

According to him, such a metaphor, that we use in our daily lives, is usually used with abstract phenomena, and would translate our human need to understand those abstract phenomena in terms of something more concrete and palpable. As he wrote, "Metaphor is pervasive in everyday life, not just in language, but in thought and action" (p. 3).

Following this line of thought, if speakers of a language with a grammatical feminine/masculine distinction are to conceptualize inanimate objects as more masculine or feminine, it would be because they created a conceptual metaphor out of it. In other words, having something as abstract as grammatical gender, expressed in terms of something concrete like biological gender, would make speakers extend these biological properties into their representation of the inanimates in question. As such, the fact that *'a bed'* (un lit) is grammatically masculine in French would make speakers of French think about a bed as something more masculine and that would translate the human need of understanding abstract phenomenon in terms of concrete elements.

2.4 DIFFERENT THEORIES ABOUT GRAMMATICAL GENDER EFFECTS

About the link between grammatical gender and cognition, Vigliocco et al (2005) have put words on the two main hypotheses animating the debate: the *sex and gender hypothesis*, and the *similarity and gender hypothesis*.

According to the sex and gender hypothesis, effects of gender would be strictly mediated by and dependent on establishing associations between genders of nouns and male- or female-like properties of referents. According to the similarity and gender hypothesis, the effect would instead come about as a byproduct of inferring meaning similarity from use in the same linguistic context. In other words, it defends the idea that there would be an association between grammatical gender and meaning. This theory is explored by Vigliocco et al (2005) where they argue that the major advantage of the similarity and gender hypothesis is that it can be used with any language, contrary to the sex and gender hypothesis that can only be used with languages presenting a dual feminine/masculine grammatical distinction.

In the sex and gender hypothesis, the association between the gender of the nouns and male- or female-like properties requires that speakers notice the relation between nouns referring to humans and sex of referents (an association that is present to varying degrees across languages; Corbett, 1991), which they can then generalize to other entities. In contrast, the similarity and gender hypothesis requires no association between grammatical and biological gender.

The sex and gender hypothesis predicts that the strength of gender-effects will differ across semantic categories within a language and will also differ across languages. In particular, effects of grammatical gender on meaning similarity should be greater within a language such as French for sexuated entities than for other types of entities. Moreover, effects of grammatical gender should be greater for languages with only two grammatical genders such as the romance languages. Indeed, the greater the association between the gender of nouns referring to humans and the sex of referents is, the more it can aid to strengthen the association and render it more generalizable. On the other hand, it will not be as obvious in languages with more than two genders and with less association between gender and sex of referents, such as German.

According to Cubelli et al. (2011) and following Vigliocco et al. (2008) who distinguished between conceptual and lexical–semantic representations, the gender effect may be located either at the level of prelinguistic knowledge or at the lexical level that provides access to semantic and syntactic information. Moreover, it seems that the greater the number of parts of speech (pronouns, adjectives, numerals, etc.) that require gender agreement with the nouns, the stronger the effects of grammatical gender tend to be.

While these are the two main theories currently debating on the potential link between grammatical gender and cognition, they are not mutually exclusive. For example, it is likely that the sex and gender hypothesis is true when it comes to human and animal referents while the similarity and judgement hypothesis is valid with unanimated entities.

This thesis explores the sex and gender hypothesis in that it looks at how speakers would potentially attribute female- or male-like properties to referents based on their grammatical gender. However, if this theory predicts that grammatical gender-effects are stronger when it comes to animated entities such as animals than it is with inanimate entities (i.e., objects), the present thesis examines whether it actually depends on the kind of objects selected, and more specifically of their cultural associations.

3. LITERATURE REVIEW

3.1 GRAMMATICAL GENDER AND COGNITION

3.1.1 Similarity and gender hypothesis

A number of empirical studies have investigated the possible correlation between grammatical gender and conceptual gender, and more specifically how the grammatical gender of nouns could lead speakers of a given language to conceptualize words sharing the same gender as semantically similar. The reason why or the specific cases in which these effects have been reported to occur are discussed in this section.

3.1.1.1 Effects of grammatical gender are due to online processing of the lexical information

Slobin developed the idea that grammatical gender could influence thought in his seminal works of 1991 and 1996. In these papers, he introduced the idea that in acquiring the grammar of a particular language, speakers come to adopt a particular framework for schematizing experience. What he means here is that the grammatical system also expresses meanings. These meanings are of a general sort, in contrast with the specific contents of lexical items. Thus, he proposes that "in acquiring a native language, the child learns particular ways of *thinking for speaking*" (p. 6). In order to prove his hypothesis, he gave a same picture to different children who are natives of different languages throughout the world. He asked them to describe the picture in question and he found that preschoolers do, indeed, give evidence of language-specific patterns of *thinking for speaking*, especially when it comes to the tenses and modes used to conjugate action verbs. According to him, such patterns have implications for the development of rhetorical style in each of the language. Thus, he suggests that "in acquiring each of these languages, children are guided by the set of grammaticized distinctions in the language to attend to such features of events while speaking" (p. 16).

He thus defines his theory of *thinking for speaking* as a "special form of thought that is mobilized for communication" (p. 5). He proposes to use these words instead of "thought and language" to mark the online process involved in speaking. In other words, he argues that the differences between the grammar of two given languages would trigger different "on-line organization of the flow of information and attention that to the particular details that receive linguistic expression". (p. 6) In sum, speakers of different languages would have to attend to and encode strikingly different aspects of the world in order to use their language properly. Put another way, "*thinking for speaking*" means that languages require speakers to attend to certain aspects of a scene, such as temporal and spatial details, depending on what information their language requires. This thesis explores this hypothesis by investigating a different area of language than verbs, that is,

grammatical gender. Accordingly, the task designed here is tailored to highlight effects of grammatical gender.

In the same line of research, Cubelli et al. (2011) investigated the influence of grammatical gender on category membership judgments. They presented English, Italian and Spanish speakers with pairs of pictures of objects belonging to different semantic categories (such as mammals, birds, vegetables, buildings, etc.) and asked them to decide whether the two presented objects belong to the same semantic category, measuring reaction times. Responses to gender-consistent pairs were significantly faster for Italian and Spanish speakers, but not English speakers. They repeated the same experiment but with articulatory suppression (participants constantly saying 'blah, blah, blah' during the procedure) and they found that it negated the effect. Therefore, they concluded that the absence of the effect in English, coupled with the modulation of the effect in Italian and Spanish as a function of the gender of individual items, rules out the possibility that other semantic properties are responsible for their results. They argue that the gender effect is located at the lexical level and that to accomplish the task, the lexical representations associated with the stimulus objects are accessed. However, if they proved that the similarity and gender hypothesis is true only on a lexical level, they let the question open as whether deeper conceptual associations could exist.

3.1.1.2 Evidence for an influence of grammatical gender on similarity judgements

Subsequently, Vigliocco et al. (2005) used a different paradigm to prove the theory that grammatical gender can be related to thought. The rationale behind their study is that words that have similar syntactic and morphophonological properties, such as grammatical gender, also tend to have similar meaning. In other words, two grammatically feminine words would be used in the same linguistic context, which in turn would be used in a different linguistic context than two grammatically masculine words. Indeed, words with the same gender require gender agreement with determiners, adjectives, and pronouns in sentences. In this view, gender effects would not depend on establishing associations between grammatical and conceptual gender but rather on general aspects of similarity. To verify this theory, Vigliocco et al. (2005) presented Italian and English native speakers with triplets of images and asked them which two ones were the most similar in one set of experiments. They found that Italian speakers would significantly more often rate two pictures to be similar when they share the same grammatical gender than English speakers, but only for animal names i.e., animates. This was confirmed in a second experiment in which slip of the tongue concerning artifacts were more likely to share (Italian) gender with the target than errors made for animals. Additionally, they found that the difference between Italian and English was greater for the category of animals than it was for artifacts. These results,

that grammatical gender effects occurred for animals but not for artifacts was replicated in Polish by Maciuszek, Polak and Swiatkowska (2019).

Finally, Vigliocco et al. (2005) replicated their first experiment but replaced the item names with pictures to avoid direct implication of lexical knowledge. They found no effect of Italian grammatical gender in the picture judgments, either for animals or for artifacts, in contrast to Experiment 1 in which language-specific effects of Italian gender for animals was observed. They concluded that conceptual knowledge may not be affected by linguistic knowledge and that "language-specific gender effects for words from the same semantic category may vary as a consequence of structural differences between languages" (p. 9)

However, they argue that their results support a constrained version of the sex and gender hypothesis, according to which effects of gender can emerge only if the language affords a high degree of correspondence between gender of nouns and sex of human referents, and such effects only arise for referents for which sex is relevant. According to them, these results are compatible with the sex and gender hypothesis in that the gender effect does not generalize beyond entities for which sex is a semantically relevant property, consistent with the notion that the effect is mediated by an association between gender of nouns and male- or female-like aspects of meaning. For them, if this effect had been mediated by more general mechanisms according to which increased semantic similarity is observed for words that are similar on any linguistic dimension, as stated by the similarity and gender hypothesis, the effects would have been observed both for animals and artifacts. However, it can be argued that it might simply be the choice of artifacts that led to these results and not merely the fact that they were artifacts – by opposition to animates. Indeed, participants could have used any strategy to solve the puzzling task at stake i.e., grammatical gender might not have been the most salient aspect of the artifacts chosen. In sum, it could be argued that their experiment proves more the similarity and gender hypothesis than the sex and gender hypothesis unlike what they state. Accordingly, if they proved that speakers of a given language are influenced by grammatical gender and that this linguistic feature make them see some objects as more or less similar, it does not prove that they extend the grammatical feminine/masculine distinction into the conceptualization of the associated objects.

As mentioned earlier, in an innovative experiment, Maciuszek, Polak and Swiatkowska (2019) found that grammatical gender effects were weaker with artifacts than with animals. They also found grammatical gender is activated implicitly. They used a modified version of the *Implicit Association Test* (IAT) in which Polish participants were asked to classify series of verbal stimuli into two categories, such as good/bad or artistic/political. In a series of trials in which the matching of these categories is manipulated, what is measured is the strength of the association

between an object and its evaluation. In this experiment then, they manipulated the grammatical gender of words with names belonging to either a corresponding or inconsistent biological sex (men or women). Results indicate that categorizations in consistent series (when masculine nouns are grouped together with masculine names, and feminine nouns with feminine names) turned out to be easier and faster than in inconsistent series. According to the authors, these results indicate that during a semantic categorization task, grammatical gender is activated implicitly and therefore validate the similarity and gender hypothesis.

With a similar experimental design as Vigliocco et al. (2005), Ramos and Roberson (2011) asked speakers of Portuguese and English to rate the similarity in meaning between pairs of words from the same semantic category. They found that overall, English and Portuguese speakers perceive the semantic relationship for the items presented to be similar. They also tested participants in a "better-likeness" task in which Portuguese and English participants were asked to select which of the two alternatives ''goes best'' with the target among triads of objects. They separated it in two different trials, one in which participants were seeing images of items, and one with only the word. If they found no reliable differences between Portuguese and English speakers' better-likeness judgements for pictures, results showed that Portuguese speakers were marginally more influenced by gender with word than with picture stimuli.

3.1.2 Sex and gender hypothesis

3.1.2.1 Literature gap

Sera et al. (1994) reported supporting evidence for the correlation between grammatical and conceptual gender. This cross-linguistic study explored the role of grammatical gender in the categorization of inanimate objects by English and Spanish, adult and children, monolinguals; and is crucial for this thesis as the main experiments are based on theirs. They had to categorize pictures of objects as either male- or femalelike by using a voice-assignment task, which consisted of attributing imagined men's and women's voices to pictures of items. Results showed that the judgments of the Spanish speaking participants matched Spanish grammatical gender, i.e., they classified the depicted objects according to their grammatical gender in Spanish. English-speaking participants', however, did not follow the same pattern.

If Sera et al. (1994) confirmed that the grammatical gender system of a language (Spanish in this case) does influence how speakers of this language categorize objects in the real world, they argue that the largest predictor of object categorization is not grammar but the natural and artificial distinction between objects that exists in the world. In other words, their findings indicate that objects naturally existing in the world (such as 'apple' or 'feather') are more likely to be conceptualized as feminine by both Spanish and English speakers, whereas artificial objects ('helicopter' or 'arrow' for example) are more likely to be conceptualized as masculine. They

also found that this artificial/natural distinction was a bigger predictor in categorization for speakers of English than grammatical gender was for speakers of Spanish, suggesting that grammatical classifications are overlapping on conceptual ones. Put another way, their findings lean towards a strong influence of culture on object conceptualization, especially for speakers of a language that does not have a grammatical feminine/masculine distinction, such as English. They also found that English speakers' attribution of male and female voices to inanimate objects was reliably consistent with the assignments made in the Spanish language. They concluded that Spanish grammatical gender assignments were correlated with features of objects associated with males and females by speakers of English. Nonetheless, as evidenced by the results of their Spanish-speaking group, grammatical gender and hence language, does play a role in object conceptualization.

Sera et al. (2002) undertook a similar study using the same experiment as Sera et al. (1994) but with different group of participants. They wanted to know if across French, German, Spanish and English speakers – speakers of four languages with different grammatical gender systems - would classify nouns differently. They found that the judgments of Spanish and French speakers varied systematically and predictably with variations in gender assignments across the two languages but that the German grammatical gender system does not influence classifications among German speakers in the same way the Spanish and French systems do. Ramos and Roberson (2011), in a similar experiment, replicated these findings but with Portuguese speaking participants. If they concluded that gender effects would arise in a greater extent with languages having only two grammatical genders, Maciuszek, Polak and Swiatkowska (2019) argued otherwise. According to the later, "number of grammatical genders is of lesser importance than the linguistic context at a syntactic level, and the multitude of gender markers."(p. 15)

However, and despite yielding some significant results, the experiments in Sera et al. (1994, 2002) present a major caveat concerning the experimental design. As highlighted by Vigliocco et al. (2005), their studies could have incited participants to use some strategies to answer the task instead of their intuition. Because participants were explicitly asked to classify words according to male or female properties, speakers could use grammatical gender in a conscious manner to solve the task. Consequently, the observed effect would appear in Spanish and French – as it did – but it cannot be excluded that participants used grammatical gender consciously, especially since they did not use distractors or fillers that could have led participants into thinking the study was about something else. As for the results yielded by the German participants, even if they would have strategically assigned a female or male voice to characters based on gender for words with masculine or feminine gender, this could not be done for the neuter words, thus leading to a null result.

3.1.2.2 Early works

The idea that the grammatical system of a language would influence its speaker's representation of the world is however not recent and takes its roots in the work of Whorf and Sapir and has been since argued over and developed by many researchers. One of the first scholar to explicitly link grammatical gender to thought was Ervin in 1962. She intended to prove that grammatically masculine and feminine nouns carry connotations of masculinity and femininity. She presented nonsense words to Italian speakers and ask them to rate them according to different factors. For example, participants had to choose if a word was referring to something strong, weak, good, bad, and so forth. The rationale behind this experimental design is that the judgments of the nonsense words would be generalized from judgments of nouns with animate referents. However, Palvidou and Alvanoudi (2014) point out that such studies "have been criticized on several grounds. For one, semantic differential tests reveal at best something about speakers' knowledge of grammatical gender rather than about their thinking of the world as 'male' or 'female' since participants were asked to judge words' (cf. Sera et al. 2002). For another, these studies yield an unclear pattern of results (cf. Vigliocco et al. 2005)". A further problem, in their opinion, "lies in the association of the adjectives employed in the scales with properties of femininity and masculinity: as long as the criteria for this association are not explicated, such scales remain pretty arbitrary, simply reflecting gender stereotypes" (p. 110).

In order to counter the above-mentioned issues, Palvidou and Alvanoudi (2014) designed a modified version of the tasks used by Mills (1986), Flaherty (2001), and Sera et al. (2002), with the difference that instead of asking participants to match a voice with a picture, they had to match a name to a picture. Participants were speakers of Greek and German, two languages with a three-grammatical gender system. They found that grammatical gender correlates with the sex attributed to depicted items even in the case of a three-gender language. They also found that this correlation is not restricted to the semantic category of animals, but also holds for inanimate objects, which goes against the findings reported by Vigliocco et al. (2005) and Sera et al. (2002).

As mentioned above, this type of experimental design was first used by Mills in 1986. She asked children and adults, German and English speakers to give a proper name to toys, both animals and objects. She found that overall, German speakers, both children and adults, would rely on grammatical gender to assign a name to a toy i.e., a male name for a toy referring to a masculine noun. German and English speakers behaved differently so she concluded that the language of the participants was leading to the discrepancies observed. The children showed that they were influenced in the choice of sex by the gender of the noun, but also by their own sex, in that the youngest children also gave the toys a sex which agreed with their own sex. This tendency decreased in the older children and adults. However, despite being interesting, it can be argued

that these results cannot lead to strong conclusions since participants were only tested on ten items, a rather small sample.

Similarly, Konishi (1993) asked the following question: “In languages with grammatical gender, does the gender assigned to a noun carry connotative meanings of femininity and masculinity?” (p. 521) To answer his question, he asked native German and Spanish speakers to rate objects according to three factors: evaluation (e.g., "good-bad"), potency (e.g., "weak-strong"), and activity (e.g., "slow-fast"), with potency being the main factor of focus. All words were of opposite gender in Spanish and German. Results indicated that objects that were grammatically masculine in the respective language of the participants tested were significantly judged higher in potency than feminine objects.

3.1.2.3 Recent developments

In 2017, Haertlé overtook a study on the link between grammatical gender and cognition in a similar fashion as Sera et al. (1994, 2002). She argues that in her experiment design, the category of gender was implicit. According to her, “this made it possible for the attribution of masculine or feminine features to objects to be conceptual, and not cued by their grammatical gender” (p. 5). However, it can be argued that this is not actually the case as she explicitly asks her participants to attribute a male or female voice to the objects presented to them, rendering the question of gender obvious to them. Nonetheless, she found that grammatical gender was a bigger predictor than the distinction between natural/artificial items in voice assignment. Thus, a majority of participants matched a feminine voice with a word of feminine grammatical gender, and the other way around with words of masculine grammatical gender.

Confirming the above-mentioned conclusions, Boroditsky and Shmidt (2000) found that people do include gender in their conceptual representations of inanimate objects, and also that people’s ideas about the genders of objects are strongly influenced by the grammatical genders assigned to these objects in their native language. To come up with this conclusion, they taught some native speakers of German, English and Spanish proper names for objects (e.g., an apple may have been called “Patrick”). Then, they tested participants on their memory for these object-name pairs. Findings show that the Spanish and German group remembered object-name pairs better when the gender of the proper name given to an object was consistent with the grammatical gender of the object name in their native language. While these results are interesting, the question of to what extent and by which mechanism grammatical gender affects cognition remains unanswered.

In their 2003 study, Phillips and Boroditsky argued that the grammatical genders assigned to objects by a language influence people’s mental representation of objects. In order to verify their hypothesis, they showed some Spanish and German participants unlabeled pictures of different

gender in Spanish and German together with a picture of a male or female humans and asked them to rate how similar/unsimilar the pictures were. They found that participants identified a greater similarity between people and objects of matching gender than between people and objects of non-matching gender. These results were replicated even with verbal interference, which is to say, when a computer played an audio-stream of randomly generated English letters and that participants had to repeat each letter aloud as it was played. This was interpreted as evidence that grammatical gender does indeed influence the way speakers think about objects, and that is true even when participants do not subvocally name the objects. According to the authors, because the responses were given in English and were influenced by the grammatical gender of the native language, these findings point to the notion that conceptual information is shaped by gender, with some semantic features (i.e., the solidity in the case of referents of masculine nouns) becoming more salient or overrepresented.

Maciuszek, Polak and Swiatkowska (2019) replicated Sera et al. (1994, 2002) studies relying on an imagined-voice assignment task, but with a relatively larger pool of Polish speakers (50 participants). They found that grammatical gender did influence judgement of both inanimate and animate nouns, and both when participants were only presented with the written words or the picture of the item in question.

In sum, studies on the link between grammatical gender and cognition point towards different directions. If many studies report findings validating effects of grammatical gender, at least to some extent, others did not reach such conclusions. This is the case of Montefinese, Ambrosini and Roivainen (2019) who concluded that grammatical gender does not influence the judgment of word affective features in Italian and German speakers. However, the extent to which grammatical gender would influence cognition does remain opaque. According to the different studies mentioned in the present thesis, it seems to heavily depend on the kind of task participants have to solve, their language background as well as the choice of words used in the tasks.

3.2 Is it language or is it culture?

Sapir was convinced that there is a close relationship between language and culture so that one cannot be understood and appreciated without knowledge of the other. Thus, researchers working within the framework of linguistic relativity commonly argue that it is difficult to separate cultural effects from linguistic effects in experiments testing the relationship between language and cognition (cf. e.g., Lucy 1992). With a feature of language such as grammatical gender, and with a language with a feminine/masculine grammatical gender such as French, the question of culture arises. Indeed, how can one be sure that a speaker of French would categorize ‘a dress’ -

which is a grammatically feminine object in French – as female because of its grammatical gender and not because a dress is a culturally feminine item to them?

Regarding grammatical gender, Ervin (1962) was one of the first to state that "within a given culture, we can predict systematic contrasts in meaning between masculine and feminine words with no animate referent"(p. 6), suggesting thus a strong correlation between culture and thought. Accordingly, in an early experiment, Mills (1986) asked some German and English speakers to rate the femaleness and maleness of a set of ten toys representing both animals and inanimates. She found that grammatical gender did not agree in every instance with the male- or femaleness of its referent. She concluded then that "gender, as a language classification system, offers the possibility to the speaker of classifying reality in this way, if it is appropriate to do so" (p. 140).

In their 2003 study, Philips and Boroditsky intended to bring new elements in the ongoing debate about the place of culture in grammatical gender effects. They taught some native English speakers about the soupative/oosative distinction in the fictional Gumbuzi language. Participants were shown pictures of males and females along with many inanimate objects and were taught which would be considered soupative and which oosative in Gumbuzi. The soupative/oosative distinction always corresponded to biological gender (all females were in one category and all males in the other) but also extended to inanimate objects. After participants had mastered the oosative/soupative distinction, they rated the similarity of each person-object pair. They found that participants rated person—object pairs more similar when they were consistent in gender. According to them, this result suggests that the effects of grammatical gender on object representations can be produced in the absence of culture. However, it can be argued that the experiment was designed in such a way that grammatical gender was the only salient feature participants knew about this fictional language and that consequently, it is likely that they used this feature as a cue to solve the task. In fact, Mickan et al. (2014) replicated their study but could not replicate their findings.

In the same line of thought, Sera et al. (1994) concluded from their research that participants would match more frequently feminine adjectives or voices to natural items, such as 'apple' or 'feather', by opposition to masculine adjectives and voices to manufactured items such as house or door. However, it can be argued that it is the choice of the items themselves rather than the fact that they belong the 'nature' or the 'artifact' category that led participants to judge them as either masculine or feminine-like. Indeed, we can easily imagine that a bull, which would belong to 'nature' semantic category would be more frequently attributed masculine properties than a dress which would belong to the 'artifact' semantic category. Thus, if a feather has been given

feminine properties, it might very well be because of the cultural beliefs held by the participants in questions and not simply because it comes from nature.

3.2.1.1 Recent attempts at untangling culture from grammatical gender effects

Recently, Haertelé (2017) partially replicated Sera et al. (1994) study but did not reproduce the same results. On the contrary, she found no differences in the frequency with which feminine features were attributed to nouns that referred to natural objects and artifacts. Haertelé's results bring support to the hypothesis that the choice of words tested in studies about grammatical gender, as well as their individual cultural connotations, is more important than their belonging to a semantic category such as 'nature' and 'artifact'.

In an attempt to explicitly untangle gender effects from cultural effect, Forbes et al. (2008) also partially replicated the study of Sera et al. (2002), with both French and Spanish grammatical gender. They interestingly identified four factors that covary with Spanish grammatical gender: conceptual kind, an item's appearance (angular or linear), whether it is typically used by males or females, and its density (dense or not dense), but could not identify the same factors with the results of their French participants. They concluded that the effects of Spanish grammatical gender could not be distinguished from the covariates, and hence theorized that it might be because Spanish grammatical gender may not be as arbitrary as French grammatical gender. Consequently, since effects of language cannot be disentangled from effects of culture in Spanish, it seems appropriate to tailor an experiment specifically for the French language since effects of language and effects of culture can be set apart in this language.

Later on, Nicoladis and Foursha-Stevenson (2012) asked the question whether culture would play a part in object categorization, in addition to language. They gave adults and children name of objects and asked their Canadian English-speaking participants to classify them as either boys or girls. They found that monolingual speakers of English have biases for classifying objects as boys and girls. However, they noted that 'boys' was chosen significantly more often that 'girls', so they nuance their conclusion in that this boy bias could come from the default in English to the masculine. However, their studies present many caveats. The pool of participants was very limited (14 participants), as well as the sample of objects (sixteen), making it difficult to draw some generalizations. Moreover, they tested speakers of English, a genderless language, rendering the task of untangling effect of grammar from effects of culture impossible.

More recently, Beller et al. (2015) went on with the idea of untangling grammar effects from culture. To do so, they asked Norwegian speakers of *Bokmål* and *Nynorsk*, the two official written

languages of Norway, to participate in an experiment similar to the one used by Sera et al. (1994). The advantage of this linguistic set up is that users of Bokmål and Nynorsk live within the same country and often within the same region and consequently share the same culture. Additionally, the two languages do not encode grammatical gender in the same way: one uses the same distinction as in Swedish and the other distinguishes between feminine, masculine and neuter. The nouns presented to their participants were entities from three categories: animates, allegorically used nouns and artefacts, which were further classified as gender congruent, neutral or gender incongruent. They found very weak effects of language compared to effects of culture, and the difference between groups was also rather small. However, they precise that the participants they recruited were, for the most part, from the same region and that this population is usually relatively fluent in the two variants, thus rendering effects of gender weaker. Moreover, they simply asked their participants which variants they preferred, without controlling for proficiency. Hence, it can be argued that all their participants are speakers of the same languages, with eventually different level of proficiency, thus explaining the rather small between-languages effect found. Moreover, they based the masculine or feminine connotations of the objects used on their assumptions only, without further test on participants, thus rendering the experiment relatively arbitrary.

In sum, the literature aimed at untangling effects of grammar from effects of culture is relatively limited and present many methodological caveats. However, it is worth noting that overall, results tend towards a stronger impact of culture than grammar on object conceptualization.

3.3 BILINGUALS AND GRAMMATICAL GENDER

The literature on bilingualism and grammatical gender effects is rather limited and presents mixed results. However, one observation emerging from these studies is that proficiency in each of a bilingual speaker's languages, age of acquisition of the second language, the extent of overlap between languages with respect to the phenomenon under study, and the nature of the experimental task play an important role, accounting for the differences in the obtained results.

3.3.1 Effects of grammatical gender are weaker in bilinguals than monolinguals

In 2007, Bassetti conducted a study on the effects of grammatical gender on object categorization in Italian– German bilingual children in comparison to monolingual Italian children. The nouns used in their experiment represented the stimuli objects and had opposite grammatical gender in Italian and German. The experimental set-up was similar to the one created by Sera et al. (1994, 2002) and the results showed that Italian–German bilingual children were not influenced by Italian grammatical gender - unlike the monolingual Italian children, whose voice assignments

were congruent with Italian grammatical gender. The author concluded that "[W]hen the two languages of a bilingual represent a specific aspect of reality differently, the bilingual may develop different concepts from a monolingual" (p. 251).

Bassetti (2014) elaborated on his 2007 paper and found that bilingual young adults of languages with two grammatical gender systems considered their first language grammatical gender assignments as more arbitrary than monolinguals, whereas the latter tended to justify the native gender assignments of nouns of entities (animals, abstract concepts, natural kinds and artefacts) in terms of masculine and feminine connotations of the referent. This result applied both to simultaneous early bilinguals and to instructed learners in the early stages of second language learning, although the former considered gender mostly a quirk of grammar, and the latter considered it mostly a reflection of cultural differences. In the same line of research, he found that Italian–German bilingual adults were less affected by native gender assignments than Italian monolinguals when rating animals on a semantic differential task measuring potency (e.g., strong–weak).

Finally, according to Bassetti and Nicoladis (2016), a reason explaining why grammatical gender effects are weaker in bilingual speakers might be that bilinguals may realize that gender assignments are semantically arbitrary or may differ from monolinguals in habitual thought because they have to refer to the same entity with one gender in one language and another gender in the other language. This idea is supported by Phillips and Boroditsky (2003), who, while arguing why speakers would associate meaning with grammatical gender, forward the idea that since most children grow up learning only one language, and therefore not bilinguals, "they have no opportunity to perform the comparative linguistics necessary to discover the seemingly arbitrary nature of grammatical gender assignment. For all they know, the grammatical genders assigned by their language are the true universal genders of objects" (p. 2). However, the question remains about those children who grew up learning several languages containing different version of the same reality at once, or in the present study, different grammatical gender system.

Boutonnet et al. (2012) also explored this question. They tested English- Spanish bilinguals, as well as English and Spanish monolinguals as control groups, in a semantic categorization task on triads of pictures while measuring Event-Related brain Potentials (ERPs). To counter potential effects of native language, the task was all in English. Participants were asked to press a button when the third picture of a triad belonged to the same semantic category as the first two, and another button when it belonged to a different category. The researchers manipulated the task so that in half of the trials, the grammatical gender of the third picture name in Spanish had the same grammatical gender as the first two, and the opposite grammatical gender in the other half.

Results did not show any significant effects of grammatical gender, except for the group speaking Spanish. However, participants were late bilinguals and the main conclusion drawn by the authors revolved around the fact that participants showed unconscious access to grammatical gender in a context requiring no access to such information, as displayed by ERPs' results. Thus, the question of bilingualism effects remains open.

3.3.2 Effects of grammatical gender on bilinguals are modulated by proficiency

Forbes et al. (2008) replicated the study of Sera et al. (2002) but with different combinations of English, French, and Spanish bilinguals, both early and late learners. They found that patterns of classification of English/French bilingual that were more fluent in English than French resembled that of English monolinguals for grammatically French items; but that the French/English bilinguals that were more fluent in French classified pictures largely alongside French grammatical gender. In other words, the English/French bilinguals' classifications were indistinguishable from those of English monolinguals. Thus, their findings suggest that French grammatical gender affects categorization, but only for speakers whose first language is French.

They concluded then that:

> "Grammatical gender may function as an unconscious heuristic for bilinguals, when asked to make non-linguistic gender attributions. In the absence of motivation or training to do otherwise, bilinguals' default assumptions about gender attributions are reliably biased by the grammatical gender of the first language they learned to speak." (p. 8)

However, they also stated that "the age of self-reported proficiency in their second language did not affect bilinguals' performance on the grammatical attribution task" (p. 7) which comes to contradict their findings. Moreover, a major caveat in their study is that they did not report any of their participants as being balanced bilinguals, nor did they elaborate on their proficient bilingual speakers' linguistics background. Consequently, their pool of participants appears to be constituted of proficient second language learners rather than of actual early and/or balanced bilinguals, thus weakening their findings. Furthermore, the 3 studies mentioned above were based on the experiment developed by Sera et al. (1994, 2002) and consequently, the same criticism applies: the question of gender being made so explicit, it might very much be that the results yielded are due to participants using grammatical gender to solve the puzzling task rather than them digging into unconscious mental representation.

3.3.3 The language in which bilinguals perform the task influences the results

Meanwhile, Kousta et al. (2008) investigated how strong language effects on cognition are when it comes to bilinguals. They wondered to what extent late bilingual speakers develop semantic representations that are congruent to their second language and to what extent semantic representations in the first language are affected by learning a second language. To do so, they asked monolingual Italian and monolingual English speakers, as well as bilingual Italian–English speakers to name pictures of common land animals presented at a fast rate. The aim of the task was to elicit semantic substitution errors. The rationale behind this study is that if language affects non-linguistic cognition, then bilinguals are expected to behave in the same way in both their languages and not to differ from monolingual Italian speakers.

They found that bilingual Italian–English speakers produced more gender-preserving errors when they were carrying out the task in Italian than when they were carrying out the task in English. They also found that the proportion of gender-preserving errors for bilingual speakers did not differ significantly from either the monolingual English data or from the monolingual Italian data. In other words, their results suggest that Italian–English speakers' performance was significantly different in each of their languages, thus demonstrating relativity in their semantic representations. However, if they proved that the similarity and gender hypothesis is tied to the language in which participants are tested, they do not say anything about the sex and gender hypothesis in which effects of grammatical gender would occur at a conceptual level. In order to test this hypothesis, the present thesis will test its participants in a more neutral language, English.

Additionally, findings from Costa et al. (2003) indicate that the two languages of a bilingual work independently when it comes to grammatical gender. In other words, the findings of their study indicate that access to the gender feature of one language is independent from the gender value of the translation word in the language in which the task at hand is performed. These findings are confirmed by Sato et al. (2013) who reported evidence that bilinguals construct mental representations of gender associated with the language of the task they are engaged in, changing representations as they swap languages. However, the question remains unanswered as to whether this extends to conceptual values, such as femineity and masculinity.

To sum up, results are not consistently found. According to the different research on grammatical gender and thinking in bilinguals that compose the literature on the topic, two main findings can be noted. First, knowledge of more than one language may reduce the effects of grammatical gender on thinking in bilinguals, compared with monolingual speakers of the same language, and this applies to both simultaneous early bilinguals and later learners. Second, the effects of bilingualism depend on the language combination involved. Indeed, positive effects of bilingualism are found in those with two grammatical gender languages, who show weaker effects of native language's gender assignments on items that have opposite assignments in the

two languages. Moreover, no effects of bilingualism have been found in native speakers of a grammatical gender language whose second language has no grammatical gender. Finally, native speakers of a language with no grammatical gender who learnt a grammatical gender language may show effects of the grammatical gender of the second language. In sum, whether grammatical gender affects thinking or not seems to depend on various factors, including above all task, but also participants' age and amount of exposure to the grammatical gender language, among others.

3.4 FRENCH AND SWEDISH COMBINATION

When it comes to design a study about grammatical gender, the question of the language/s to test arise early on. As such, French appears to be an interesting language to use. In addition to the fact that French has a grammatical masculine/feminine distinction that can be translated in a real-world metaphor by giving male/female properties to inanimate objects, French seems to have an opaquer way of attributing grammatical gender than its neighboring romance language, Spanish. Indeed, according to the findings of Sera et al. (2002) and Forbes et al. (2008) Spanish grammatical gender distinction may be more "natural" than the grammatical gender assignments made in French. In their study, they found that French participants (as well as German and English) would tend to categorize inanimate entities similarly to Spanish participants and according to Spanish grammatical gender. According to them, this is evidence that Spanish grammatical gender is not entirely arbitrary and would follow some kind of semantic division. French appears then to be a relevant language to use in the present study as grammatical gender effects on cognition will consequently be obvious enough to be separated from cultural effects.

Furthermore, the use of the French language requires resort to a wide variety of gender markers. According to the sex and gender hypothesis, the more a language requires gender markers, such as in verb or adjectives agreements, the more salient this feature of language become to its speakers and the more likely it is that effect of grammatical gender would arise. Thus, using French bilinguals in this experiment appear to be especially appropriate to elicit some gender effects. In many studies, languages with a dual grammatical feminine/masculine distinction have been used interchangeably. However, it might be that grammatical gender effects vary across languages more than assumed, and that for effects to arise, the salience of grammatical gender needs to be made by more than simply the article preceding the word i.e., be through verbal and adjective agreements as well.

Additionally, most studies on grammatical gender effects have been done with a combination of a grammatical gendered language with English, and a natural gender language. Swedish, on the other hand, and similarly to French to some extent, has a dual grammatical gender distinction.

However, the latter does not rely on a feminine/masculine distinction. In other words, the category of gender is not empty and yet does not translate into real-world features, unlike masculine/feminine that can be translated into biological sex. Consequently, it will be interesting to know whether such a set up would play a role when combined with French, since this study is the first to use this specific language combination in an experiment about grammatical gender.

4. THE PRESENT STUDY

The existing literature present an abundant body of evidence suggesting a correlation between grammatical and conceptual gender and thus supports the idea that language does affect cognition. However, as past studies have focused on cross-linguistic comparisons of monolinguals, no clear evidence of whether relationships between grammatical gender and thinking are effects of language or of culture. Also, some effects of grammatical gender may be due to *thinking for speaking* rather than showing effects of language on thinking. This presents a literature gap where these aspects can be tested by asking bilinguals to perform tasks in a second language that does not have grammatical gender. If grammatical gender has effects when bilinguals are tested in English, this cannot be explained as '*thinking for speaking'*. Finally, if knowledge of more than one language decreases the effects of grammatical gender, such a result would have practical implications for language learning and teaching and language policy.

If grammatical gender is a salient-enough aspect of language to impact cognition, then it will lead speakers of a given gendered language to categorize nouns accordingly. However, it might be that other aspects of the speaker's environment play a role in object conceptualization, such as culture. As a consequence, it might be that speakers are more influenced by culture than language when conceptualizing inanimate objects carrying some cultural load but would follow grammatical gender in the absence of such a cultural load. In the present study, as grammatical gender is under study, the 'cultural load' will consist of stereotypically feminine or masculine objects.

When it comes to bilinguals, grammatical gender effects might depend on amount of exposure to, and use of a given gendered language.

With that in mind, the two research questions that this thesis aims at answering followed by my predictions will be presented below:

1. ***How do French-Swedish simultaneous early bilinguals categorize nouns?***

It is expected that all bilingual participants will assign a voice congruently with grammatical gender on 'neutral objects' trials and will assign the voice congruently with cultural gender on 'culturally loaded' trials. However, it is expected that these results to be modulated by the amount of exposure/use to one or the other language. In other words, it is expected that participants with a higher exposure to Swedish will show lower effects of grammatical gender and conversely, participants with a higher exposure to French will show higher grammatical gender effects, for 'neutral objects' trials. It is expected that all participants will perform similarly in 'culturally loaded' trials.

2. What, between language or culture, has the biggest impact on speakers' cognition?

The theory is that it depends on the linguistic feature under scrutiny and on the language chosen. In the case of grammatical gender then, it is expected that culture will have a wider influence than grammatical gender on those words that carry a strong cultural connotation. However, for the culturally neutral words, it is expected that grammatical gender will be the biggest predictor of voice assignment.

Additionally, the question as to whether the mixed results obtained across experiments in the literature on the topic are due to the choice of words tested will be addressed. It will be argued that yes it does. If some studies intended to classify nouns between natural and artificial, or animate and inanimate, they did not mention performing any further selection on the type of items tested. For example, within the category of 'artificial' item, 'dress' and 'hammer' might have been mixed together while it can be argued that these items carry strong stereotypical associations that might be stronger than grammatical gender. It can be argued then that the distinction between culturally loaded versus culturally unloaded is a more valid choice to test grammatical gender effects.

In order to answer the above-mentioned research questions, the present thesis introduces an innovative experiment. Inspired from Sera et al. (1994, 2002), the main tasks here consist of a voice-assignment task in which early French-Swedish bilingual participants hear a voice, either masculine or feminine, and associate it to the picture of an item. In addition to the distractors, in both experiment, there are two conditions: condition 1 with feminine voices and condition 2 with masculine voices. In the first experiment, participants get to choose between two pictures, a grammatically feminine one and a grammatically masculine one. If their knowledge of French does implicitly influence their object categorization, then they will mostly pair the items with the congruent voices i.e., feminine voice with grammatically feminine item for example. In the second experiment, participants get to choose between four pictures of items: two that are culturally feminine and two that are culturally masculine, with grammatical gender being either congruent or incongruent. If their linguistic knowledge of French is the biggest predictor of object categorization, then they will match the voices congruently with the grammatical gender of the items depicted on the pictures, regardless of their cultural associations. If however culture turns to be a bigger predictor of object categorization than language, then participants will match the voices congruently with items of same cultural load i.e., a feminine voice with a culturally feminine object for example, regardless of the grammatical gender of the item.

Moreover, two ratings prior to the main experiments described above were included in the present thesis. The first rating tested native French speakers and native Swedish speakers on their view

concerning the cultural load of the items presented on the pictures of the main experiments so as to dispatch them in either experience 1 or experience 2 accordingly. The second rating ensures that the voice samples used in the main experiment are perceived as respectively masculine and feminine by a sample of French and Swedish native speakers.

5. RATINGS

As this thesis aims to study the influence of grammatical gender and cultural stereotypes, the use of words and voices need to be clearly chosen and calibrated to ensure that no unexpected noise is impacting the results. Therefore, to minimize this risk and increase the validity and reproducibility of the study, two ratings were conducted prior to the main experiments, with the first focusing on objects cultural stereotypes and the second focusing on voices perception. As a consequence, the participants, materials, procedure, and results of these studies will be presented in the following section.

5.1 RATING 1: OBJECTS JUDGEMENT

5.1.1 Participants

Two pools of participants took part in this experiment. The first pool consisted of 30 native speakers of French, amongst which 24 identified as women and 6 as men. The second pool consisted of 30 native speakers of Swedish amongst which 18 identified as women, 11 as men and one as non-binary. All participants grew up and lived most of their lives in Europe, either in mainland France or in Belgium for the French-speaking group, or in Sweden for the Swedish-speaking group. All participants received an information sheet about the experiment prior to it and also signed a consent form (see Appendix C).

5.1.2 Materials

The materials for this experiment consist of a total of 60 images that were shown to participants. Half of the images represent items that are grammatically feminine in French and the other half represent items that are grammatically masculine in French. Pictures were carefully chosen based on clear consideration regarding connotation. For example, items such as *car* or *boat* were excluded based on their connotation in English. Indeed, those words are often personified and referred to as *she* as opposed to *it* as inanimates usually are in English. Also, objects that could have different labels following different grammatical gender patterns were excluded. For example, ‘bike’ can be translated in French by either ‘une byciclette’ or ‘un vélo’. These kinds of items were thus no good fit for the purpose of the experiment. The pictures are all icons and clip art pictures taken from Iconfinder. For the purposes of this study, all the nouns that have been selected do not follow natural gender. Moreover, and in order to set aside the cultural

division between natural and human-made objects pointed out by Sera et al. (1996) and Haertlé (2017), only artifacts were included in the present thesis, at the exception of 'flower' and 'unicorn'. However, it can be argued that since 'flower' has been judged as culturally feminine by both groups and is also grammatically feminine, this will not impact the experiment. As for 'unicorn', it can be argued that participants would not conceptualize it as an animal since it is mystical and hence as never been see alive by any of the participants. Then, it is more likely that they will imagine it as an artefact (e.g., a figurine) or a cartoon character.

The survey was given in two versions, depending on participants' mother tongue: one written in French and the other one in Swedish and was thus given to participants depending on their mother tongue.

5.1.3 **Procedure and design**

In this experiment, participants had to state if French or Swedish was their native language and communicate their perceived gender. Then, they were shown pictures of items (see appendix B) and write the name of the item shown with its article (e.g., a chair), in their respective mother tongue. The instruction was as follows: "According *to the society you live in, would you rather say this object is a feminine attribute, a masculine attribute or a neutral attribute? (Ex: do you see a jewel as something for girls, for boys or equally usable by both gender?)*".

This task was aimed at controlling two things: the first was to make sure that the pictures were not ambiguous in what they represent and that participants would agree on its grammatical gender. This is important, first of all, to make sure that all participants agree that it was a drawing of a glass and not of a paper bin for example. The threshold for inclusion in the study established here was 75%, that is to say that 23 participants out of 30 should give a given picture the same name.

Secondly, when it comes to the pool of native French speakers, it was important to make sure that it is wide knowledge among them what would the grammatical gender of an item be. Indeed, in French, *afternoon* (après-midi) for example, can either be masculine or feminine. With this check, the aim was to avoid any possible confusion and variables that could impact the results of the main experiments.

The second aim was to understand what cultural gender participants associate to each item. Even though assumptions can be made about what would be considered stereotypically feminine, masculine or neutral, this needed to be empirically tested.

5.1.4 **Results**

Results indicate some clear cultural tendencies on words, and overall, both groups tend to agree on the neutrality, femininity and masculinity of the items presented to them. Despite some small

differences between the two groups, overall, both the Swedish and French native participants had a similar idea of the cultural connotation of the items presented to them. The details of the cultural representation associated to each word, for the French group, the Swedish group and for the two groups together are presented in Figure 1, 2 and 3 respectively.

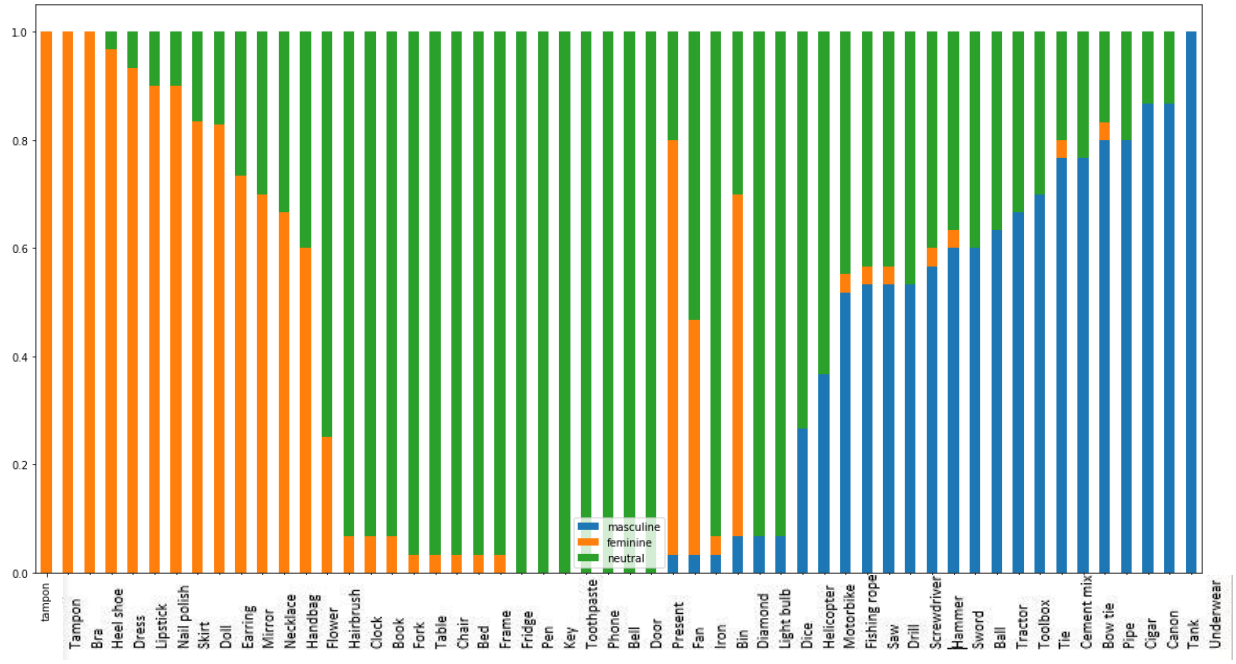


Figure 1 : Cultural association of items as rated by the French group

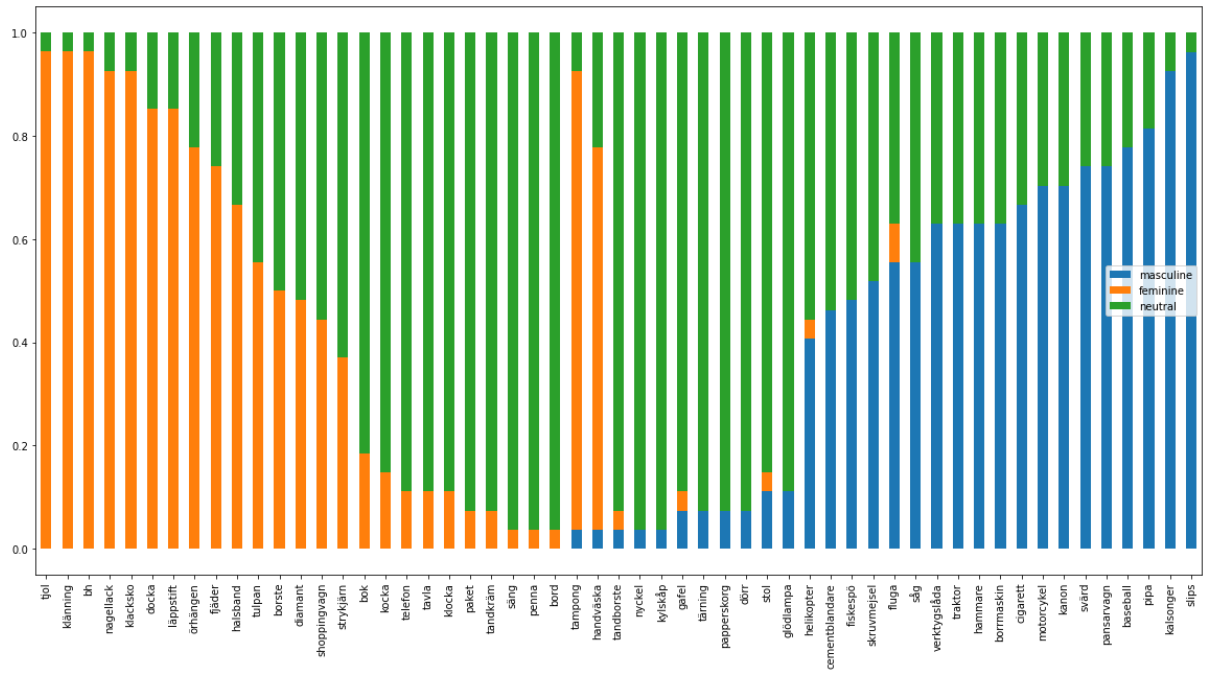


Figure 2 : Cultural associations of items as rated by the Swedish group.

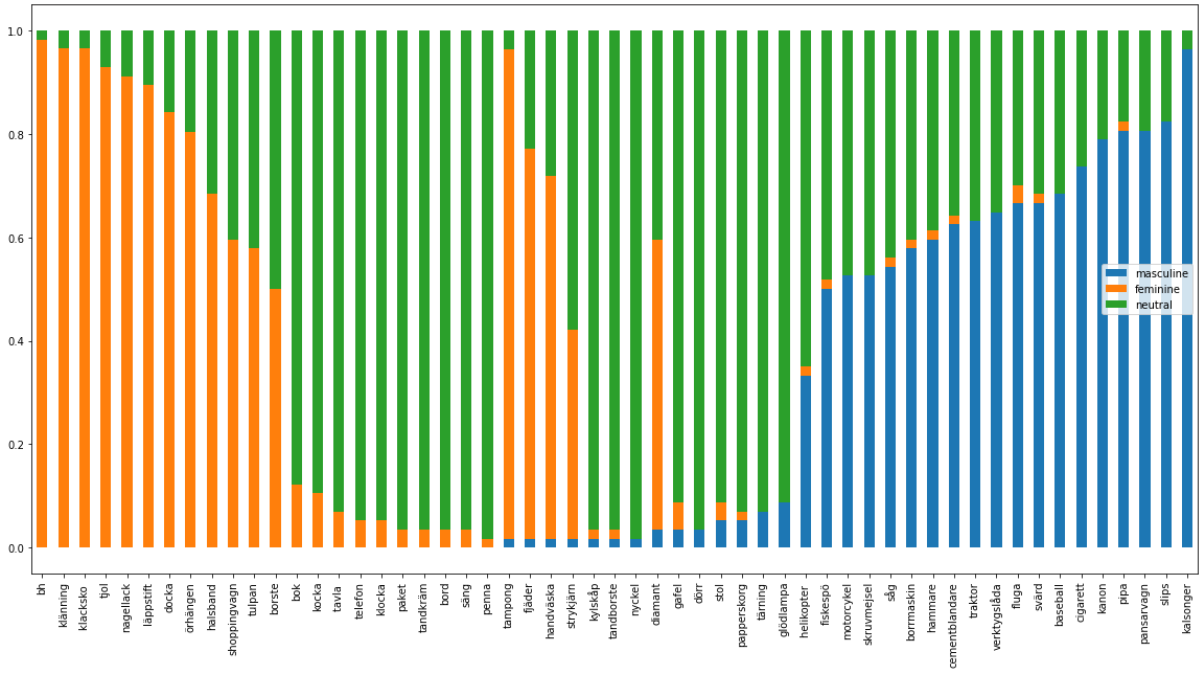


Figure 3 : Cultural association of items as rated by the French and Swedish group together.

5.1.5 Discussion

The analysis of the data reveals that the French and Swedish participants of this experiment have a similar perception of what items tend to be culturally more feminine, masculine, and neutral. There is of course no such thing as Culture with a capital C since each and every one seems to have its own definition of what it means and what is included in it or not. Moreover, culture is linked to groups, which can be gathered according to geography, religion, gender, age, etc. This thesis is not a work on culture, but rather focused on narrowing down its concept to gender stereotypes on a selection of items. For the very specific case of focus, it seems than French and Swedish, being both western Europeans, share a similar understanding of gender norms. This pre-experiment then provides us with a list of words that can be used for the main experiments. The items that have been judged the most neutral will be those used in Experiment 1 while the items that have been judged the most feminine and masculine will be used in Experiment 2.

5.2 RATING 2: VOICE JUDGEMENT

5.2.1 **Design and procedure**

Participants in this experiment were taken from the same pool as the one from Rating 1. This is not a problem since the results of the two ratings are not linked. As such, 30 native French speakers and 30 native Swedish speakers answered a survey. In this survey participants were asked to judge 10 voice samples. Half of the samples were from female speakers and the other half from male speakers. The voices have been recorded in Korea and are from ten different native Korean speakers. Five of them are from biologically male speakers and the other five are from biologically female speakers. Nonetheless, this rating aims at confirming that the voices are

perceived as either male or female. The rationale behind this language choice is that it is considered unlikely to be known from participants of the main experiments. To ensure that this requirement was fulfilled, the main experiments started by asking participants if they had knowledge of Korean. Using a language unknown to participants has the advantage to activate the language processing area of the brain without the understanding of it (Díaz et al., 2008). Thus, participants in the main experiments were able to recognize if the voice sounded more masculine or feminine, without being distracted nor influenced by its meaning.

All the recordings displayed the same sentence:

(1) 안녕, 난 오늘 기분이 좋아! 너는 어때? 쨋든, 담에 또봐!

Hello, I'm in a good mood today! How about you? Anyway, see you next time!

I decided to use the same sentence all along the experiment in order to control and reduce as much as possible the influence of external factors. Participants were asked to rate the voices on a scale from 1 to 6 depending on how masculine or feminine they considered the voices to be, 1 being very feminine; 2: quite feminine; 3: somewhat feminine; 4: somewhat masculine; 5: quite masculine and 6: very masculine. I deliberately choose not to include a neutral possibility so as to force participants to make a choice.

5.2.2 Results

Unsurprisingly, voices were rated by participants alongside the same gender as the participants providing the voice samples identified themselves as.

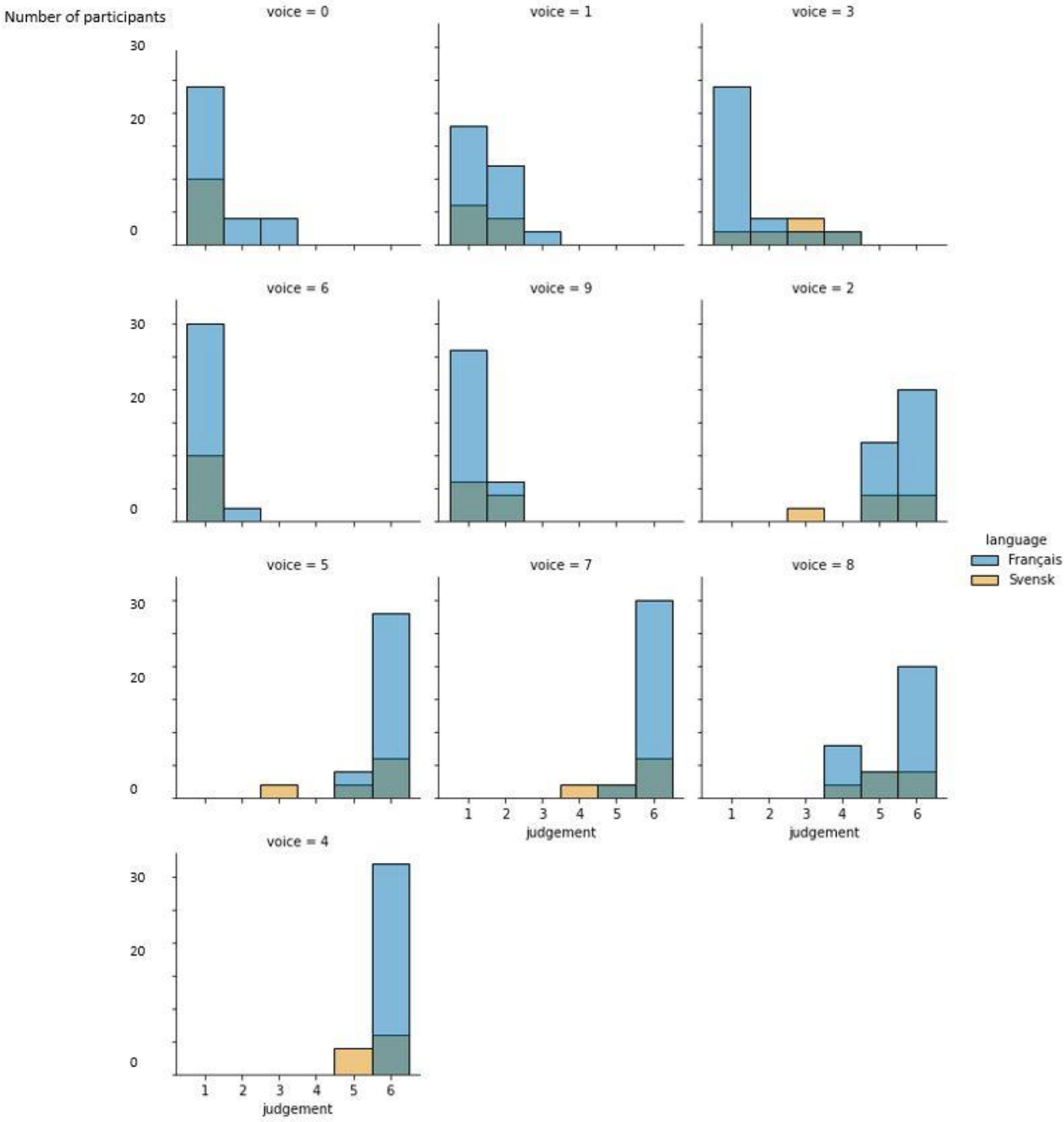


Figure 4: Rating of masculinity and femininity on the voice's samples.

6. MAIN EXPERIMENTS

Based on the experiment designed by Sera et al. (1994, 2002), the two main experiments of the present study asked bilingual participants to associate a picture to a voice. In the first experiment, participants have to choose between two culturally neutral pictures, while in the second one they have to choose amongst four culturally loaded pictures. The rationale behind these configurations is that in the absence of cultural clues, i.e., Experiment 1, speakers might rely on grammatical gender to solve the task while in the presence of cultural clues, i.e., Experiment 2, grammatical gender might no longer be the most salient feature of the item and won't predict grammatical gender.

6.1 EXPERIMENT 1: CULTURALLY NEUTRAL ITEMS

6.1.1 Participants

22 participants took part in this experiment. They were all adults, between 19 and 63 years old, with an average of 33.3 years. They all reported growing up in a French-Swedish bilingual context. The details of the participants are given in table 1, in the section presenting the results of the background questionnaire. The number of 22 has been decided based on previous studies on grammatical gender effects in bilingualism that used a pool of 20 participants (Bassetti, 2007 and Bassetti 2014). These studies proved to have a sufficient number of participants in order to yield significant results.

Participants were recruited through different ways: Facebook groups such as French in Stockholm '*les français de Stockholm*' or Swedes in Paris '*Svenskar i Paris*', or French-Swedish bilingual schools of Stockholm such as '*l'école du coin*' and '*l'école buissonière*'. All participants received an information sheet about the experiment prior to it and also signed a consent form (see Appendix C).

6.1.2 Materials

20 different images were used in this experiment, and are the ones rated as culturally neutral in Rating 1. Additionally, 20 images were added and used as fillers to distract participants from the real goal of the experiment. The number of pictures was chosen to be substantial enough in order to get significant results and but still short enough for participants to be willing to answer the survey. These images were paired with the 10 voice samples described in Rating 2, that is to say, 5 recordings of feminine voices and 5 recording of masculine voices, both from native Korean speakers. Participants therefore heard each of the voice more than once. As such, items were separated into two conditions: in condition 1, the voices heard were feminine, and in condition 2 they were masculine.

6.1.3 **Procedure and design**

This experiment is inspired by Sera et al. (1994) where participants were given a form with similar instructions: "W*e would like to recreate a situation that might well occur in real life where movie makers need to assign voices to characters. We already have recorded the voices but have not decided yet who is going to interpret them. Can you listen to the following voice samples in the video clip and help us choose who do you think the voice corresponds best to?".*

However, in order to address the criticism made by Vigliocco et al (2005) about the direct reference to gender or linguistics in Sera et al. (1994), participants first had to listen to a voice and then select the chosen picture. Thus, participants were simply asked to match a voice with a picture, without needing to read anything nor consciously think about gender.
Participants were thus given the choice between two culturally neutral images, one with masculine grammatical gender in French, the other with feminine grammatical gender. Participants had to make this decision in a total of ten questions.

In addition to the 20 items presented to participants, 20 distractors questions to prevent them from understanding the aim of the experiment were included and shared into 10 additional questions. To divert attention from grammatical gender, both items presented with a given voice in the distractor questions were of same gender in all ten questions. However, as the distractor items were not used in the analysis, they did not undergo Rating 1.

This task was administrated to all participants in English, so as to limit language effects and reduce the number of variables as much as possible. According to a number of studies (Athanasopoulos, 2001, quoted in Athanasopoulos, 2006 and Cook et al. 2006, Kousta et al. (2008)), it is entirely possible that the language in which instructions are given play a role in the type of responses given in seemingly non-linguistic tasks. Indeed, results of the above-mentioned studies show that bilingual speakers who are instructed in their first language deviate from monolingual norm - suggesting that the language of instruction plays a crucial role in so-called non-linguistic tasks. With the use of English as language of instruction, direct interference from French or Swedish is avoided. Thus, if participants decide to match the voices according to the grammatical gender of the objects in French, it would only be because of implicit use of French.

6.2 EXPERIMENT 2: CULTURALLY LOADED ITEMS

6.2.1 **Participants and procedure**

The participants are the same as in Experiment 1, as well as the procedure. In fact, experiment 1 and 2 were answered by participants in a unique form, together with the background

questionnaire explained in the subsequent section. As such, 22 French-Swedish simultaneous early bilinguals took part in this experiment. As in Experiment 1, participants heard a voice, either masculine or feminine, and had to match it with a picture. The instruction was also the same.

6.2.2 **Materials**

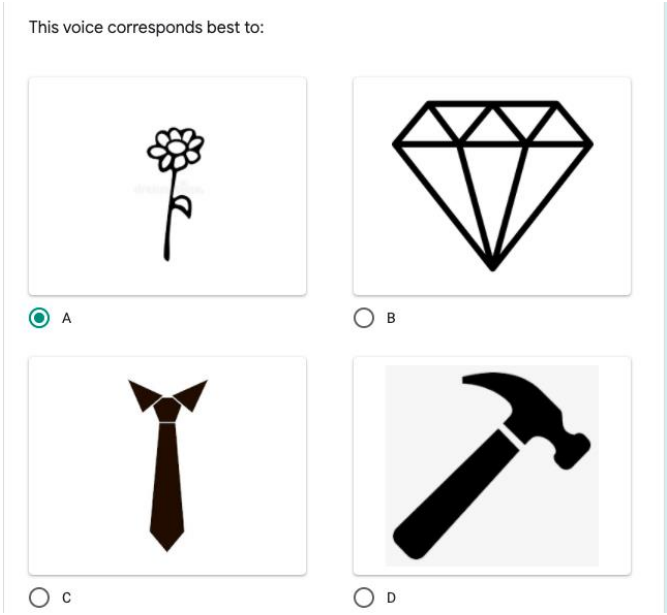
40 different images were used in this experiment, and they are the ones rated as culturally feminine or masculine in Rating 1. Additionally, 40 images were added and used as fillers to distract participants from the real goal of the experiment. The number of pictures was chosen to be in line with the 31 images used in Sera et al. (1994). These images were paired with the 10 voice samples described in Rating 2, that is to say, 5 recordings of feminine voices and 5 recording of masculine voices, both from native Korean speakers. Participants therefore heard more than once each of the voices. As such, items were separated into two conditions: in condition 1, the voices heard were feminine, and in condition 2 they were masculine. For the distractor questions, half were of same grammatical gender and the other half of similar cultural association.

Thus, with each voice, participants were given the choice between four images. Two of them were culturally feminine, and the other two culturally masculine, according to Rating 1. Additionally, pictures were carefully selected so that half of them were grammatically feminine in French and the other half grammatically masculine. In other words, two items were congruent in that their grammatical gender matched their cultural gender, and the two others were incongruent in that their grammatical gender in French did not match their cultural gender. Participants had to make this decision in a total of ten questions. Here is a summarized view of the options the participants had:

Participants hear the voice, either masculine or feminine.
Question This voice corresponds best to:
A. Culturally feminine – Grammatically feminine B. Culturally feminine – Grammatically masculine C. Culturally masculine – Grammatically feminine D. Culturally masculine - Grammatically masculine

Summary of the different options participants got in condition 2

Additionally, below is an example illustrating how it was seen by participants:



Example of a configuration participants had in Experiment 2

This set-up was designed to further address the criticism made to Sera et al. (1994, 2002). Indeed, since it was argued that their choice of items and their division between artificial and natural categories was not optimal to confirm and infirm grammatical gender effects, this thesis takes a different approach. As such, items here were chosen to highlight effects of grammatical gender and set them apart from potential cultural effects.

6.3 BACKGROUND QUESTIONNAIRE AND FRENCH TEST

The final experiment of this thesis comprises a background questionnaire. It collected information about the participants' gender, age and linguistic background. Participants were asked about the languages that they know, and more specifically about the context in which they learned the language (where, when, how, how well).

Finally, a short French vocabulary test was given to participants. The images from Rating 1 – the ones also used in the main experiments– were shown to participants and they were asked to name the object displayed on the picture with its article. This was aimed at making sure participants were proficient enough in French to perform in the experiment, and more importantly that they knew the gender of items. As such, the instructions of this part were given in French. Note that given that Swedish is not a grammatically gendered language, this was not deemed necessary for Swedish proficiency.

Altogether, the main experiments, including the background questionnaire and French test took approximately 30 minutes to complete. Note that different versions of the form were given to different participants so that the order in which the voices were displayed varied across participants. Thus, the experiment was pseudo-randomized.

7. RESULTS

7.1 STATISTICAL ANALYSIS: LOGISTIC REGRESSION AND T-TEST

The results of both Experiment 1 and Experiment 2 were analyzed using three separate tests. First, the effects of the gender of the voice is used to predict the probability of grammatical gender; second, the effect of having spent more time in one of France and Sweden on the probability of being successful in matching the same gender of the voice to the same grammatical gender is tested; and third, the probability of choosing items of female grammatical gender when hearing a voice, respectively a female or male.

EXPERIMENT 1

Test	Statistical test	Test method	Items tested
1	$grammatical\ gender_i = \beta_0 + \beta_1 \times \boldsymbol{voice\ gender_i} + \varepsilon_i$	Logistic regression	Culturally neutral items
2	$Success\ of\ matching\ grammatical\ gender\ to\ same\ gender_i\ of\ voice = \beta_0 + \beta_1 \times \boldsymbol{country\ spent\ most\ time\ in_i} + \beta_2 \times \boldsymbol{strongest\ language_i} + \varepsilon_i$	Logistic regression	Culturally neutral items
3	$H_0: P(Female\ grammatical\ gender \mid Female\ voice) = P(Female\ grammatical\ gender \mid Male\ voice)$	T-test	Culturally neutral items

EXPERIMENT 2

Test	Statistical test	Test method	Items tested
1.1	$grammatical\ gender_i = \beta_0 + \beta_1 \times \boldsymbol{voice\ gender_i} + \varepsilon_i$	Logistic regression	Culturally loaded items
1.2	$cultural\ gender_i = \beta_0 + \beta_1 \times \boldsymbol{voice\ gender_i} + \varepsilon_i$	Logistic regression	Culturally loaded items
2.1	$Success\ of\ matching\ grammatical\ gender\ to\ same\ gender_i\ of\ voice = \beta_0 + \beta_1 \times \boldsymbol{country\ spent\ most\ time\ in_i} + \beta_2 \times \boldsymbol{strongest\ language_i} + \varepsilon_i$	Logistic regression	Culturally loaded items
2.2	$Success\ of\ matching\ cultural\ gender\ to\ same\ gender_i\ of\ voice = \beta_0 + \beta_1 \times \boldsymbol{country\ spent\ most\ time\ in_i} + \beta_2 \times \boldsymbol{strongest\ language_i} + \varepsilon_i$	Logistic regression	Culturally loaded items
3.1	$H_0: P(Female\ grammatical\ gender \mid Female\ voice) = P(Female\ grammatical\ gender \mid Male\ voice)$	T-test	Culturally loaded items
3.2	$H_0: P(Female\ cultural\ gender \mid Female\ voice) = P(Female\ cultural\ gender \mid Male\ voice)$	T-test	Culturally loaded items

Where, β_0 is the intercept, β_1 and β_2 are coefficients (real numbers) and ε is the error term, for each observation *i*. P denotes probability. All independent variables used are binary variables that take the value as in the below table:

Variable	**Present variable (variable = 1)**
Grammatical gender	Masculine grammatical gender
Cultural gender	Masculine cultural gender
Voice gender	Masculine voice
Country spent most time in	France
Strongest language	Swedish

The difference between the two experiments is that for the first experiment, culturally neutral items were used, whereas in the second experiment culturally loaded items were used. What denotes a culturally neutral and loaded item is decided and explained in the Rating sections. The second difference between the two experiments is that in the second, the test is also performed with the cultural gender as the dependent variable whereas for the first experiment only the grammatical gender is examined.

The statistical methods chosen to analyze the three tests were parametric logistic regression for the first two tests, and a parametric t-test for the third test. These methods will briefly be presented below.

Logistic regression

Logistic regression is a statistical analysis method used to predict a binary outcome, such as grammatically feminine or masculine, and culturally feminine or masculine in our case, based on observations of a dataset. It is thus predicting the probabilities of the dependent variable taking the binary value 1 (e.g., culturally masculine), by analyzing its relationship with one or more independent variables. For example, in the first test, the logistical regression examines the probability of the grammatical gender being deemed female (=0) by the participant (i), based on gender of the voice.

$$grammatical\ gender_i = \beta_0 + \beta_1 \times voice\ gender_{\boldsymbol{i}} + \varepsilon_i$$

For the statistical method of logistic regression to work there are some assumptions that need to hold true. That is, (1) the dependent variable is binary, (2) all observations are independent of each other, (3) there is no multicollinearity among the independent variables. This means that the independent variables should not be correlated with each other, and (4) there is a linear

relationship between independent variables and the logit of the dependent variable. These have all been deemed to hold true for the two first tests under both experiments.

T-test

The t-test is used for the third test under both experiments. As the population variance is unknown, the sample is assumed to follow the student's t-test distribution. The tests in both experiments are similar in nature but differ slightly depending on the experiment. For clarity, only the test in the first experiment will be presented here, as the test in the second experiment follows the same method.

Given a random sample of n observations with the mean of the dependent variable being $\bar{x}$, the standard deviation being σ and the population being normally distributed with a mean of zero, the random variable t follows the student´s t-distribution with (n-1) degrees of freedom as:

$$t_{n-1} = \frac{\bar{x}_i - 0}{s/\sqrt{n}}$$

where $\bar{x}_i$ denotes the sample difference in probability between choosing a female grammatical gender when hearing a female voice and choosing a female grammatical gender when hearing a male voice. Given the hypothesis of this being separated from zero, the null hypothesis is rejected if:

$$t_{n-1} = \frac{\bar{x}_i - 0}{s/\sqrt{n}} > t_{n-1,\alpha}$$

where, α denotes the significance level.

On top of these three tests, additional tests were performed to assess the robustness of the results. These were focused on including the different voices and seeing how they potentially could be impacting the dependent variables.

7.2 Results of Experiment 1

The results for all three tests will be presented below. The results for the first two tests were statistically analyzed using the logistic regression add-in in Excel. The results for the third test were analyzed using the Excel add-in Data analysis toolpak.

Test 1

Dependent variable: Grammatical gender

	Coefficient	Standard error	p-value
Intercept	0.13	0.19	0.50
Voice gender	0.14	0.27	0.72

Table 2: Results of the logistic regression of Experiment 1.

The model p-value = 0.62, chi-square = 0.25 and R-square = 0.00.

As seen in the table above, no significant evidence can be found that the gender of the voice is able to predict how the participants chooses the grammatical gender of the item.

Test 2

Dependent variable: Success of matching grammatical gender to same gender of voice

	Coefficient	Standard error	p-value
Intercept	-0.08	0.24	0.75
Country spent most time in	0.08	0.31	0.79
Strongest language	-0.07	0.31	0.83

Table 3: Results of the logistic regression of Experiment 1, with outside factors considered.

The model p-value = 0.90, chi-square = 0.21 and R-square = 0.00.

Similar to the first test, neither the country in which they spent the most time in (France = 1) nor being stronger in any of the languages (Swedish = 1) were able to predict efficiently how French-Swedish bilinguals would match pictures to a voice.

Test 3

	Mean	Variance	p-value
P (Female gram. gender | female voice)	0.45	0.05	0.99
P (Female gram. gender | male voice)	0.45	0.06	

Table 4: Results of the t-test in Experiment 1.

In the third test, the means for both assigning a female grammatical gender to an item is the same regardless of hearing a male or female voice. As the variance is similar as well, the p-value lands at 0.99 indicating that no significant difference between hearing the two voices can be found. Thus, results show that participants did not significantly use grammatical gender to solve this puzzling voice-assignment task. See Appendix D for the descriptive table.

Other tests

Additionally, to assess the robustness of the test, a logistic regression was run controlling for the impact of the different voice types (since 10 different voices were used), but all voices showed insignificant results, indicating that no specific voice was driving the results more than the other. However, worth bearing in mind is that the sample of each voice was relatively low (n~3).

7.3 RESULTS OF EXPERIMENT 2

In Experiment 2, participants were seeing objects presenting a cultural load, thus adding another parameter to the experiment. The results for all three tests will be presented below, separated by grammatical and cultural dependent variables. Similar to the first experiment, the

results for the first two tests were statistically analyzed using the logistic regression add-in in Excel and the results for the third test were analyzed using the Excel add-in Data analysis toolpak. Below follow the results for all three separate tests.

Test 1

1.1 Dependent variable: Grammatical gender

	Coefficient	Standard error	p-value
Intercept	0.00	0.19	1.00
Voice gender	0.15	0.27	0.57

Table 5: Results of the logistic regression of Experiment 2, with grammatical gender.

The model p-value = 0.57, chi-square = 0.33 and R-square = 0.00.

Similar to experiment 1, there is no significant evidence that that the gender of the voice is able to predict how the participants chooses the grammatical gender of the item.

1.2 Dependent variable: Cultural gender

	Coefficient	Standard error	p-value
Intercept	-1.34	0.23	0.00
Voice gender	2.49	0.32	0.00

Table 6: Results of the logistic regression of Experiment 2, with grammatical gender.

The model p-value = 0.00, chi-square = 71.10 and R-square = 0.23.

Here we see a significant increase of 2.49 for voice gender. This indicates that when hearing a masculine voice, there is a significant higher probability that the participant will deem the item as culturally masculine.

Test 2

2.1 Dependent variable: Success of matching grammatical gender to same gender of voice

	Coefficient	Standard error	p-value
Intercept	-0.21	0.24	0.40
Country spent most time in	-0.04	0.31	0.90
Strongest language	0.21	0.31	0.50

Table 7: Results of the logistic regression of Experiment 2, with grammatical gender outside factors considered.

The model p-value = 0.71, chi-square = 0.69 and R-square = 0.00.

Similar to Experiment 1, no significant effects can be found for neither the country spent most time in (France = 1) nor being stronger in any of the languages (Swedish = 1) on the success of matching the grammatical gender to the gender of the voice. This indicates that the choice of culturally loaded or not loaded items does not yield any impact in this sample.

2.2 Dependent variable: Success of matching cultural gender to same gender of voice

	Coefficient	Standard error	p-value
Intercept	1.34	0.30	0.00
Country spent most time in	0.17	0.38	0.66
Strongest language	-0.39	0.37	0.29

Table 8: Results of the logistic regression of Experiment 2, with culture and other factors.

The model p-value = 0.34, chi-square = 2.14 and R-square = 0.01.

When examining the same independent variables, i.e., Country spent most time in and Strongest language, no significant impact is found on the success on trying to match the cultural gender to the same gender of the voice. We cannot see any impact between the two.

Test 3

3.1 Grammatical gender

	Mean	Variance	p-value
P (Female gram. gender | female voice)	0.46	0.04	0.16
P (Female gram. gender | male voice)	0.55	0.04	

Table 9: Results of the t-test, with grammatical gender, in Experiment 2.

Similar to Experiment 1, no significant difference in impact on assigning an item to be female when hearing a female and a male voice can be found. Worth mentioning though is that the p-value is significantly lower here (0.16 vs 0.99) indicating that there might be a difference in assigning grammatical gender when there are culturally loaded items compared to neutrally loaded items. Nonetheless, no significant difference can be proved. See Appendix D for the descriptive table.

3.2 Cultural gender

	Mean	Variance	p-value
P (Female cult. gender | female voice)	0.79	0.06	0.00
P (Female cult. gender | male voice)	0.22	0.08	

Table 10: Results of the t-test, with cultural gender, in Experiment 2.

When examining the difference probability of assigning an item to be culturally feminine when hearing a female and a male voice a significant difference can be found. In the above table a there is a significant higher probability of assigning an item to be culturally feminine when hearing a female voice compared to when hearing a male voice. See Appendix D for the descriptive table.

7.4 RESULTS OF THE BACKGROUND QUESTIONNAIRE

The results of the background questionnaire and of the French test are expressed in the participants' nomenclature in Table 11. In total, 6 participants reported being equally fluent in

both French and Swedish, 13 participants reported having spent the majority of their lives in Sweden, while 2 of them spent the same amount of time in both countries.

Table 11: Answers from the background questionnaire

Participants	Age	Balanced bilingual? (self-reported)	Strongest language (self-reported)	Current country of residence	Country where spent the most time	French proficiency score /60
1	30	No	French	Sweden	Belgium	60
2	63	Yes	N/A	Sweden	Equal	60
3	28	No	French	France	France	59
4	39	Yes	N/A	Sweden	Sweden	60
5	47	No	French	France	France	60
6	23	No	French	Sweden	France	60
7	23	No	French	France	Sweden	58
8	24	No	French	France	Equal	59
9	27	No	Swedish	Sweden	Sweden	48
10	30	No	French	Italy	Sweden	60
11	37	No	Swedish	Sweden	Sweden	59
12	28	No	Swedish	Sweden	Sweden	35
13	45	No	French	Sweden	Sweden	60
14	46	No	English	Switzerland	Switzerland	59
15	37	Yes	N/A	Sweden	Sweden	60
16	24	Yes	French for literature	France	France	60
17	26	No	Swedish	Sweden	Sweden	58
18	30	Yes	N/A	Sweden	France	60
19	19	No	Swedish	Sweden	Sweden	59
20	28	No	Swedish	Sweden	Sweden	55
21	38	Yes	N/A	Sweden	Sweden	57
22	40	No	Swedish	Sweden	Sweden	58

Results of the French test

Finally, 10 of the participants performed optimally at the French test, and all of them performed above the median score which would have been 30/60, thus ensuring that they knew the name of most of the items tested in French. French proficiency scores for each participant are displayed in table 1. In this part of the survey, participants had to give the name of the 60 items used in the analysis. For an item to be counted as correct, participants had to give the correct name and the correct article for a given noun. However, some items, such as ‘frame’ were called by participants either ‘un tableau’ or ‘un cadre’ in French. Despite being different, these two words refer to same thing and are both of masculine gender, so both answers were accepted. Similarly, ‘fridge’ was called either ‘un frigo’ or ‘un réfrégirateur’ in French, and as they both referred to the same thing and had both a masculine grammatical gender, they were also counted as correct. However, other item such as ‘ball’ were translated as either ‘un ballon’ and ‘une balle’. Despite referring to the same item, they differ in grammatical gender. ‘Un ballon’ being the expected answer, ‘une balle’ was counted as a mistake. Spelling errors were

not counted as a mistake. Most of the occurrences that were counted as mistakes were actually blank answers i.e., occurrences in which participants did not provide an answer.

8. DISCUSSION OF THE RESULTS

In the voice-assignment tasks introduced in the present thesis, French-Swedish bilingual participants heard a feminine or a masculine voice and had to match it with a picture by imagining that they were characters in an animated movie. In this section, the results of Experiment 1 and Experiment 2 are discussed in light of the literature on the topic.

8.1 DISCUSSION OF THE RESULTS OF EXPERIMENT 1

In the first experiment, participants could choose between 2 items, one grammatically feminine and the other grammatically masculine, both having been judged as culturally neutral in Rating 1. No significant results were found indicating that participants did not rely on grammatical gender to associate a picture of an item with a voice of a specific gender. As such, this means that the bilingual participants of this study were not influenced by French grammatical gender when hearing a voice. Results suggest then that grammatical gender is not a factor leading bilinguals to conceptualize nouns that do not carry a cultural load as more feminine or more masculine.

These results are consistent with previous findings encountered in the literature on bilinguals (Bassetti, 2007; Boutonnet et al., 2012). As such, different hypotheses could explain these results. The first one would be that grammatical gender effects found in the literature on monolinguals are due to the online processing of the language, or in other words due to the phenomenon known as *thinking for speaking* (Slobin, 1991). As such, having the task being conducted in English, a language native to none of the participants, the effects of French grammatical gender could not be extracted. As stated by Cubelli et al., 2011:

> "object categorization is a language-mediated task and that the effect of grammatical gender on categorization is indirect: It occurs not because gender is an intrinsic part of conceptual representation, thus increasing the semantic similarity of the objects with congruent names, but because object categorization requires the processing of lexical representation and depends on the level of activation of the objects' names" (p.457).

According to this view, we are not obliged to postulate that language shapes the conceptual representations of objects. Rather, it is that language intervenes while the task is being performed. In this light, it can be conjectured that the participants of this study did not quietly verbalize the items names in French when seeing the pictures. A way of unveiling the reason of grammatical

gender effects would be to administrate the same pool of participants the same experiment, but this time in French and in Swedish. If grammatical gender effects are found under this condition, then we would have proof that participants were '*thinking for speaking*' and that effects are modulated on a lexical level and not a conceptual level. This theory would be in line with the findings of Kousta et al. (2008), Costa et al. (2012) and Sato et al. (2013) that the language in which bilinguals perform the task have a strong influence on the results.

Moreover, if Slobin (1991) and Cubelli et al. (2011) argue that effects of grammar are situated at the lexical level only, Boroditsky and Schmitt (2003) and Maciuszek, Polak and Swiatkowska (2019), when looking at the sex and gender hypothesis, argue that effects of grammar would occur at a conceptual level as well. However, the results of the present study tend to show that if such effects would be situated at a conceptual level, they would not be engrained strongly enough to overcome effects of language.

Another hypothesis would be in line with the theory developed by Bassetti and Nicoladis (2016). According to them, the very fact that participants are bilingual would explain the weak effects of grammatical gender. For them, bilinguals may unconsciously realize that gender assignments are semantically arbitrary. Indeed, French and Swedish encode grammatical gender in two different ways. As such, the same item can be grammatically feminine in French while being grammatically neuter in Swedish. Consequently, bilinguals have to early on refer to the same entity with one gender in one language and another gender in the other language. This idea is supported by Phillips and Boroditsky (2003), who, while arguing why speakers would associate meaning with grammatical gender, forward the idea that "since most children grow up learning only one language, they have no opportunity to perform the comparative linguistics necessary to discover the seemingly arbitrary nature of grammatical gender assignment. For all they know, the grammatical genders assigned by their language are the true universal genders of objects" (p. 2). In this line of thought then, it could be that since bilinguals consider grammatical gender as a non-relevant aspect of language, this feature is not salient enough for them to form deeper conceptual connections.

A third theory would be that the task was efficient enough to lead away participants from using grammatical gender as a way to solve the task. It has been argued (Vigliocco et al., 2005), that in most of the tasks used in previous experiments (especially in Sera et al., 1994, 2002), that making explicit allusions to gender would stir participants to use grammatical gender as a strategy. In this experiment, any direct reference to masculine or feminine had been removed so that participants only heard a voice and saw pictures, instead of having to explicitly name 'masculine voice' or 'feminine voice' when asked what items participants would associate them with. As such, it might be that the grammatical effects found in the previous literature on the topic were

only due to the explicit use of gendered words rather than deeper conceptual associations triggered by grammatical gender. This theory would be confirmed by what Samuel, Cole and Eacott who point out in their 2019 review of studies on Grammatical gender and linguistic relativity. According to them, voice's choice and sex assignment tasks, such as in the present thesis, form the backbone of support for relativity. As they state, with the inclusion of this kind of task:

> "About a third (32%) of the data were classified as support, relative to a no-support rate of 43% and a mixed-support rate of 24%. If we consider the possibility that publication biases mean that fewer null results make it to publication, it may be that even this support rate is an overestimate." (p. 1780).

In this light, it might very well be then that the supporting evidence found in this kind of study in the past was due to the active use of grammatical gender as a strategy. A way to find out if this is the case would be to replicate this experiment and monitor participants while they do the experiment with some EEG and see if an N400 is elicited. Then we would have proof that they did or did not subvocalize the name of the items. Indeed, there is Event Related Potential (ERP) evidence that grammatical gender is activated automatically during picture sorting tasks (Boutonnet, Athanasopoulos, & Thierry, 2012).

Finally, a fourth theory that would account for the lack of grammatical gender effects in the present experiment could be due to the choice of items. In the context of the similarity and gender hypothesis, Vigliocco et al. (2005) and Ramos and Roberson (2011) reported that effects of grammatical gender were found only, or at least to a greater extent on human referents and animals, but not or at least not as much on artifacts. However, the present study only used artifacts, which could have been a factor explaining the lack of effects found.

8.2 Discussion of the results of Experiment 2

In the second experiment, participants could choose between 4 items, two grammatically feminine and two grammatically masculine, all of them having been judged as culturally feminine or culturally masculine in a pre-experiment. Results indicate that cultural gender was a large predictor of voice assignment. As such, participants heavily relied on the cultural association of the items presented to them to make a voice choice. Moreover, similarly, to Experiment 1, the proportion with which they congruently matched pictures of a given grammatical gender to the voices heard was not statistically significant.

The results are inconsistent with those presented by Haertelé (2017) and Philips and Boroditsky (2005) who showed that the effects of grammar were larger than the effects of culture. A hypothesis that would account for this discrepancy would be due to the cultural categories used

in the above-mentioned studies. Indeed, Sera et al. (1994; 2002) introduced the idea that 'natural' and 'artifact' would be the categories according to which participants would classify items, 'natural' bearing female connotations and 'artifact' with male ones. If Haertelé (2017) and Philips and Boroditsky (2005) did not replicate the findings of Sera et al. (1994, 2002) -that culture is a strong predictor of object categorization-, it could be for many reasons. However, here, only the choice of items will be discussed.

In the studies mentioned in the previous paragraph, the cultural categories were only based on assumptions and not carefully checked like it was in the present study. As such, a hypothesis is that the items presented to participants here had stronger cultural connotations than the ones presented in other studies. Having been rated by monolinguals as culturally feminine or culturally masculine, the items on the pictures in this study carry endorsed cultural information that could have made cultural gender the most salient feature of the item. Thus, if we follow the hypothesis introduced in the discussion of Experiment 1 that effects of grammatical gender are modulated by the language in which the task is given; the task being in English here, any information contained at the lexical level that would be salient in French would disappear. As a consequence, deprived of lexical information, participants would have relied on conceptual ones to solve the task at hand.

Another hypothesis explaining these results could be due to the choice of words used in previous experiments. Indeed, it could be that the items used in the previous literature had feminine or masculine cultural connotations that happened to also match with their grammatical gender, as this was the case in Spanish (Sera et al., 2002). As such, it might be that by a fortunate hazard, studies bringing supporting evidence for the influence of grammar gender on cognition, just happened to use items whose cultural gender matched their grammatical gender. Consequently, it would mean that no effects of grammatical gender were found and that it was only effects of cultural gender.

8.3 General discussion

To answer the research questions asked in the present thesis we can then conclude that:

1) How do French-Swedish simultaneous early bilinguals categorize nouns?

   According to the results obtained in the experiment of this thesis, it seems that bilingual speakers do not rely on grammatical gender, whether the name of the items presented to them bear cultural connotations or not. However, it seems that when presented with items bearing cultural connotation, this feature being salient enough, participants categorized nouns accordingly.

2) What, between language or culture, has the biggest impact on speakers' cognition?

   According to the results displayed in the present thesis, it seems that culture is the biggest predictor of object categorization and that it thus has a larger impact on the speaker's cognition than language would. However, the results found here are far to be generalizable to all speakers. To start with, the participants tested here were bilinguals, which is a factor that has been proven to reduce effects of grammatical gender. Secondly, the term 'bigger' would need to be defined more precisely. Since it could happen that effects of grammar are modulated by '*thinking for speaking*', then the task being held in English, a language not native to the participants, it might be that language does not affect cognition on a conceptual level, but simply on a lexical one. As such, a possibility is that that culture has a bigger impact on cognition when speakers are thinking in a second or third language, but that language would still be a bigger predictor when speakers think in their native gendered language.

Additionally, I wondered if the mixed results obtained across experiments in the literature on grammatical gender were due to the choice of words tested in the different studies on the topic. If the results of these experiments tend towards proving that the choice of words used in experiments about grammatical gender is a key element, a definite conclusion cannot be drawn at this point. As theorized above, it might be that items used in the previous literature had feminine or masculine cultural connotations that happened to also match with their grammatical gender, however, there is no way to prove it unless asking participants to culturally rate the objects used in the previous studies.

9. CONCLUSION

To sum up, the present thesis tested early French-Swedish bilinguals on their object's conceptualization. In an innovative experiment, participants were asked to decide with what kind of item's picture a given feminine or masculine voice would be best paired to by imagining that the items represented in the pictures in question were cartoon movie animated characters. By asking participants this question, what was really tested was how feminine or masculine they conceptualized some items to be, and if this would tend to match the grammatical or rather the perceived cultural genders of the items depicted. Results show that when tested in English, French-Swedish bilinguals do not exhibit effects of grammatical gender while on the other hand, they exhibited effects of cultural gender.

To conclude then, this research aimed at exploring in more depth the relationship between language and thought in bilinguals, and more specifically how much of thought is shaped and influenced by language, by opposition to culture. Thus, it contributes to the literature on the linguistic relativity hypothesis thanks to the creation of a new experiment, designed to untangle the effects of grammatical gender from the effects of cultural gender at a conceptual level.

In future research, it would be relevant to submit the same experiment displayed in this thesis to French and Swedish monolinguals so as to compare their results with the bilinguals of this study. This would give us indications as to whether the effects observed in the present thesis are due to language effects or only to chance. Also, it would be interesting to repeat this experiment in the native languages of the participants, i.e., both in French and Swedish, in order to account for the influence of the language on the results. If effects were found when tested in French, it would bring strong evidence in favor of effects due to *'thinking for speaking'*.

In 1993, Konishi was asking "whether the gender of a word influences the perception of femininity or masculinity of a referent, or whether historically a particular word was assigned a gender because of its attributes, or whether cultural influences have in the past or present had an influence." Nearly 30 years have passed since then, a lot of studies on the matter have been realized, and yet, we are still far to have elucidated the question.

10. LIMITATIONS

The purpose of this section is to problematize the study and discuss potential issues regarding the scope and research design of the study. To start with, in Rating 1 - in which participants were asked to judge the cultural association of some items- even though they were asked to rate them according to what they think the society in which they live would say, it is in practice complex to control for the honesty of their answers. The debate on gender equality being very present in both Sweden and France, it can be argued that there is still a remaining gap between what people wish they would think and feel, and what they actually unconsciously think and feel about what would be more feminine, masculine or neutral. As such, the results of Rating 1 are to be considered accordingly with this remark.

Moreover, it is worth noting that in practice, balanced bilinguals who are equally comfortable in both of their mother tongues are relatively hard to find, thus accounting for the predominance of non-balanced bilinguals in this study. Even though in the main experiment participants were asked to name some objects with their article, this does not prove how fluent they are in French, and we have no indication either of their Swedish level. The fact that they are balanced bilinguals or not is only self-reported. As such, a replication of this study in which participants are tested in their two native languages in depth would strengthen the result of the present thesis.

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12. APPENDIX A

Translation of the instructions given to the participants in Rating 1

According to the society you live in, would you rather say this object is a feminine attribute, a masculine attribute or a neutral attribute? (Ex: do you see a jewel as something for girls, for boys or equally usable by both gender?

In French : *Selon la société dans laquelle vous vivez, diriez-vous que cet objet est plutôt un attribut féminin, masculin ou neutre ? (Ex : voyez-vous un bijou comme quelque chose pour filles, pour garçons ou comme quelque chose que tout le monde utilise ?)*

In Swedish*: Enligt samhället du bor i, skulle du säga att objektet är feminint, maskulint, eller neutralt? (T.ex. tycker du att ett smycke är något du typiskt associerar med kvinnor, män, eller båda/inga/annat?)*

13. APPENDIX B

Table 12: Words used in the main experiments

	Grammatically Feminine	Grammatically Masculine
Culturally Neutral	Une porte *A door* **En dörr** Une horloge *A clock* **En klocka** Une brosse à dent *A toothbrush* **En tandborste** Une chaise *A chair* **En stol** Une fourchette *A fork* **En gaffel** Une clef *A key* **En nyckel** Une table *A table* **Ett bord** Une cloche *A bell* **En ringklocka** Une ampoule *A lightbulb* **En glödlampa** Une poubelle *A bin* **En papperskorg**	Un livre *A book* **En bok** Un lit *A bed* **En säng** Un téléphone *A phone* **En telefon** Un canapé *A sofa* **En soffa** Un dentifrice *A toothpaste* **En tandkräm** Un crayon *A pen* **En penna** Un réfrigérateur *A fridge* **Ett kylskåp** Un cadre *A frame* **En ram** Un dé *A dice* **En tärning** Un cadeau *A gift* **En gåva**
Culturally Feminine	Une fleur *A flower* **En blomma** Une robe *A dress* **En klänning** Une licorne *A unicorn* **En enhörning** Une pince à cheveux *A hairclip* **Ett hårspänne** Une poupée *A doll* **En docka** Une brosse à cheveux *A hairbrush* **En hårborste** Une boucle d'oreille *An earing* **Ett örhänge** Une chaussure à talon *A heelshoe*	Un diamant *A diamond* **En diamant** Un rouge à lèvre *A lipstick* **Ett läppstift** Un sac à main *A purse* **En handväska** Un collier *A necklace* **Ett halsband** Un fer à repaser *An iron* **Ett strykjän** Un vernis à ongle *A nailpolish* **En (burk) nagellack** Un soutien-gorge *A bra* **En BH** Un éventail *A fan*

	En klacksko Une jupe *A skirt* **En kjol** Une pince à épiler *A tweezers* **En pincett**	**En solfjäder** Un mirroir *A mirror* **En spegel** Un tampon *A tampon* **En tampong**
Culturally Masculine	Une cravate *A tie* **En slips** Une canne à pêche *A fishing rod* **Ett fiskespö** Une moto *A motorbike* **En motorcykel** Une épée *A sword* **Ett svärd** Une bétonnière *A cement mixer* **En cementblandare** Une pipe *A pipe* **En pipa** Une scie *A saw* **En såg** Une boîte à outil *A tool box* **En verktygslåda** Une clef à molette *A wrench* **En skiftnyckel** Une perceuse *A drill* **En borr**	Un marteau *A hammer* **En hammare** Un canon *A cannon* **En kanon** Un hélicoptère *A helicopter* **En helikopter** Un cigare *A cigar* **En cigarr** Un nœud papillon *A bow tie* **En fluga** Un ballon de rugby *A rugby ball* **En rugbyboll** Un tracteur *A tractor* **En traktor** Un char *A tank* **En pansarvagn** Un tournevis *A screw driver* **En skruvmejsel** Un caleçon *An underwear* **Ett (par) kalsonger**

Distractor items

Grammatically feminine x20	Grammatically masculine x20	Culturally feminine x10	Culturally masculine x10
Une bougie *A candle* **Ett ljus** Une pelle *A shovel* **En spade** Une souris *A mouse* **En mus** Une écharpe *A scarf* **En halsduk** Une sucette A *lolipop*	Un rateau *A rake* **En kratta** Un seau *A bucket* **En hink** Un ordinateur *A computer* **En dator** Un clavier *A keyboard* **Ett tangentbord** Un arbre *A tree*	Une serviette hygiénique *A period pad* **En binda** Un aspirateur *A vacuum cleaner* **En dammsugare** Un balai *A broom* **En kvast** Une théhière A *tea pot* **En tekanna** Une crème	Une couronne *A crown* **En krona** Un ballon de football *A football* **En fotboll** Un rasoir *A shaver* **En rakhyvel** Une brique *A brick* **En tegelsten** Un portefeuille *A wallet*

En klubba	**Ett träd**	*A cream*	**En plånbok**
Une enveloppe	Un chargeur	**En kräm**	Une carte de crédit
An envelop	*A charger*	Une couche	*A bank card*
Ett kuvert	**En laddare**	*A diaper*	**Ett kreditkort**
Une assiette	Un bonbon	**En blöja**	Un billet
A plate	*A candy*	Un tablier	*A banknote*
En tallrik	**En godis**	*An apron*	**En sedel**
Une cuillère	Un timbre	**Ett förkläde**	Une manette de jeux
A spoon	*A stamp*	Un chariot à course	*A game remote*
En sked	**Ett frimärke**	*A shoppingtrolley*	**En spelkontroll**
Une caméra	Un verre	**En kundvagn**	Un char
A camera	*A glass*	Une machine à laver	*A tank*
En kamera	**Ett glas**	*A washing machine*	**En pansarvagn**
Une échelle	Un fouet	**En tvättmaskin**	Un bulldozer
A ladder	*A whisk*	Un plumeau	*A bulldozer*
En stege	**En visp**	*A duster*	**En bulldozer**
Une bouteille	Un camion	**En dammvippa**	Un bois
A bottle	*A truck*		*Antlers*
En flaska	**En lastbil**		**Ett (par) horn**
Une statue	Un coussin		
A statue	*A cushion*		
En staty	**En kudde**		
Une valise	Un bureau		
A luggage	*A desk*		
Ett baggage	**Ett skrivbord**		
Une ceinture	Un drapeau		
A belt	*A flag*		
Ett skärp	**En flagga**		
Une montre	Un chapeau		
A watch	*A hat*		
En klocka	**En hatt**		
Une agrafeuse	Un arrosoir		
A stapler	*A watering can*		
En häftapparat	**En vattenkanna**		
Une (paire de) jumelles	Un parapluie		
A (pair of) binocular	*An umbrella*		
En kikare	**Ett paraply**		
Une carte	Un trombone		
A map	A *paper clip*		
En karta	**Ett gem**		
Une calculatrice	Un thermomètre		
A calculator	*A thermometer*		
En miniräknare	**En termometer**		
Une glace	Un écouteur		
An ice-cream	*A (pair of) Headphones*		
En glass	**Ett (par) hörlurar**		

14. APPENDIX C

Stockholm University

INFORMATION SHEET

Title of the Study: ***Does the language we speak influence our thinking more than culture?***
Marie Fournier, Stockholm University (mafo4870@student.su.se)

1)Information about the project and how research subjects are selected

I am a master student at the Centre for Research on Bilingualism (Stockholm University), and I would like to ask you if you would be willing to participate in a study called *Does the language we speak influence our thinking more than culture?* The purpose of the study is to examine what are the potential factors influencing our thinking process.

You have been selected to participate in this study based on a number of criteria, such as your age and your language background. You have been asked to participate because you have been in contact with me, replied to an advertisement, or received information about the study in any other way. The research principal (*Forskningshuvudman*) of the project is Stockholm University.

2)What does participation in the study involve?

If you provide your informed written consent, you will first complete a voice assignment task, where you will be asked to listen to short audio recordings and match a given voice to a picture. Then, you will have a language background questionnaire and finally a short test of French.
Altogether, the task takes approximately 30 minutes to complete.

3)How to learn about study results

The results will be presented at my Master thesis defense. No data will be linked to your name.

4)Participation is voluntary

Participation in this study is completely voluntary. At any time, you can choose to no longer participate, and you do not need to say why. If you choose to no longer participate, this will not affect your relationship with the researchers in the project, with the Multilingualism Lab, or with the Centre for Research on Bilingualism. If you no longer wish to participate, you must notify the person in charge of the project (Marie Fournier, see contact details below). Please, feel free to ask any questions that you may have about this study at any point by emailing the researchers or the research assistants in the project (see contact details below).

5)How your personal data will be processed

If you choose to participate in the study, the project will use some information about you, such as your age and your language background. This information will be collected in the online survey--. Information that can be linked to you in this way is considered personal data in accordance with the EU General Data Protection Regulation 2016/679 (GDPR). The

project needs to process such personal data because it is necessary in order to achieve the aims of the research.

Stockholm University is the controller of this processing of personal data. The legal basis for the processing of personal data is that it is necessary for the performance of a task carried out in the public interest, according to the EU General Data Protection Regulation, Article 6 (1).

After pseudonymizing the personal data, it will not be transmitted to a third country. In order for the project to be carried out, the researchers in the project will be given access to the data. This includes the principal investigator and collaborators, and the research assistants in the project. Unauthorized persons will not be able to access the data.

When the project is completed, data that have been collected and processed within the project will be saved for at least 10 years from the completion of the project. If the material is judged to be of long-lasting value, it will be archived and preserved for the future, as per the Archives Act (*Arkivlag* (1990:782)). All archived personal data will be pseudonymized.

According to the EU General Data Protection Regulation (GDPR) and national supplementary legislation, you have the right to:

- withdraw your consent at any time, without affecting the lawfulness of the processing that occurred in accordance with your consent before it was withdrawn.
- request access to your personal data.
- have your personal data rectified.
- have your personal data erased.
- have the processing of your personal data restricted.

In certain circumstances, the EU General Data Protection Regulation and supplementary national legislation allow for derogations from these rights. For instance, the right to access your data may be restricted due to requirements for secrecy, and the right to have your data erased may be limited due to rules concerning archiving.

If you wish to invoke any of these rights, you should contact the researcher responsible for the project (Marie Fournier, see contact details below) or the data protection officer at Stockholm University (dso@su.se).

If you are dissatisfied with the way your personal data are processed, you have the right to file a complaint with the Swedish Authority for Privacy Protection (*Integritetsskyddsmyndigheten*). Information about this can be found on its website (imy.se).

8)Contact Information

The researcher responsible for the study/project and for the handling of all information regarding participants and data is:

Marie Fournier
Centre for Research on Bilingualism, Department of Swedish and Multilingualism (Stockholm University)
mafo4870@student.su.se

The data protection officer at Stockholm University is:
Björn Gustavsson (bjorn.gustavsson@su.se)
University lawyer, Office of the President
dso@su.se

Thank you for your help!
Marie Fournier

CONSENT FORM

CONSENT to participate in the study *Does the language we speak influence our thinking more than culture?*

- I have read and understood the Information Sheet for the study called ***Does the language we speak influence our thinking more than culture?***
- I have been given the opportunity to ask questions about the study and these have been answered to my satisfaction.
- I understand that I may keep a copy of the Information Sheet.
- I understand that participation in this study is completely voluntary and that I can withdraw at any time without having to give an explanation.
- I understand that the results of the study will be reported and published in pseudonymized form in academic journals, book chapters, and conferences.

☐ I consent to participating in the study called ***Does the language we speak influence our thinking more than culture?*** as described in the Information Sheet.

☐ I consent to the processing of my personal data for the study ***Does the language we speak influence our thinking more than culture?*** as described in the Information Sheet.

Signature ----------

Name (in capitals) ----------

Date ----------

15. APPENDIX D

Table 13: For Experiment 1, percentage of time participants decided to associate a masculine or feminine voice with a grammatically feminine or masculine item, with standard deviation.

		Female Voice		Masculine Voice	
French-Swedish simultaneous early bilinguals(n=22)		Grammatically feminine item	Grammatically masculine item	Grammatically feminine item	Grammatically masculine item
	Mean	45%	55%	45%	55%
	Standard Deviation	0.22	0.22	0.24	0.22

Table 14: For Experiment 2, percentage of time participants decided to associate a masculine or feminine voice with a grammatically feminine or masculine item, with standard deviation.

		Female Voice		Masculine Voice	
French-Swedish simultaneous early bilinguals(n=22)		Grammatically feminine item	Grammatically masculine item	Grammatically feminine item	Grammatically masculine item
	Mean	46%	54%	55%	45%
	Standard Deviation	0.20	0.20	0.20	0.20

Table 15: For Experiment 2, percentage of time participants decided to associate a masculine or feminine voice with a culturally feminine or masculine item, with standard deviation.

		Female Voice		Masculine Voice	
French-Swedish simultaneous early bilinguals(n=22)		Culturally feminine item	Culturally masculine item	Culturally feminine item	Culturally masculine item
	Mean	79%	21%	22%	78%
	Standard Deviation	0.25	0.25	0.28	0.28

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