THE INFLUENCE OF GENDER CATEGORIES ON OBJECT CONCEPTUALIZATION: A STUDY ON TURKISH SPEAKERS, FRENCH SPEAKERS, AND TURKISH-FRENCH BILINGUALS

by
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ABSTRACT

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In four studies, this thesis investigated how *grammatical gender* (GG) affects the explicit and implicit object conceptualization in Turkish speakers, French speakers, and Turkish-French bilinguals. Participants completed an Implicit Association Test (IAT), the Explicit Gender Attribution Task (EGAT) and the Gender Role Attitudes Scale. Turkish speakers were only affected by *conceptual gender* (CG). French speakers were affected by both GG and CG in the IAT, and CG only in the EGAT. Turkish-French bilinguals were affected only by CG in the IAT and both GG and CG in the EGAT. When French speakers completed the IAT under verbal interference, only the effect of GG was disrupted. Further, Turkish speakers with relatively strong "sexist" attitudes were affected by CG in the IAT. Relatively more sexist French speakers were affected by both CG and GG in the IAT, nevertheless, in the EGAT, CG affected more sexist participants, and GG affected more egalitarian participants. In the EGAT, CG affected more sexist bilinguals and GG affected more egalitarian bilinguals. These findings suggest that, even when the use of language is irrelevant, linguistic labels can be automatically activated and intervene with conceptualization. Also learning a GG language affects only the explicit object conceptualization in bilinguals. This research is also the first to show that gender role attitudes may modulate the influence of GG on object conceptualization.

ÖZET

CİNSİYET KATEGORİLERİNİN NESNE KAVRAMSALLAŞTIRILMASI ÜZERİNE ETKİSİ: ANA DİLİ TÜRKÇE VE FRANSIZCA OLAN KİŞİLER İLE TÜRKÇE-FRANSIZCA İKİ DİLLİLERİ ÜZERİNE BİR ÇALIŞMA

ELİF TUTKU TUNALI

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Anahtar Kelimeler: dilsel görecelik, dilbilgisel cinsiyet, dil ve düşünce, iki dillilik

Bu tez, *dilbilgisel cinsiyetin* (DC) açık ve örtük nesne kavramsallaştırması üzerindeki etkisini, ana dili Türkçe ve Fransızca olan kişiler ile Türkçe-Fransızca iki dillilerden oluşan bir örneklemle, dört farklı çalışmada incelemiştir. Katılımcılar Örtük Çağrışım Testi (ÖÇT), Açık Cinsiyet Atama Taskı (ACAT) ve Toplumsal Cinsiyet Rol Tutumları Ölçeği'ni tamamlamışlardır. Türkçe konuşucuları sadece *kavramsal cinsiyetten* (KC) etkilenmiştir. Fransızca konuşucuları ÖÇT'de DC ve KC'den, ACAT'ta sadece KC'den etkilenmişlerdir. Türkçe-Fransızca iki dilliler, ÖÇT'de sadece KC'den, ACAT'ta ise hem DC hem de KC'den etkilenmişlerdir. Fransızca konuşucuları ÖÇT'yi sözel becerileri meşgul eden bir görev eşliğinde tamamladığında, sadece DC'nin etkisinin bozulduğu gözlemlenmiştir. Ayrıca görece daha cinsiyetçi Türkçe konuşucuları ÖÇT'de KC'den daha fazla etkilenmiştir. Görece daha cinsiyetçi Fransızca konuşucular ÖÇT'de hem DC hem de KC'den etkilenirken, ACAT'ta daha cinsiyetçi Fransızca konuşucuları KC'den, daha eşitlikçi katılımcılarsa DC'den etkilenmiştir. ACAT'ta KC daha cinsiyetçi Türkçe-Fransızca iki dillierini, DC ise daha eşitlikçi iki dillileri etkilemiştir. Bu bulgular, task dil kullanımı gerektirmese bile dilsel etiketlerin otomatik bir şekilde aktive olup nesne kavramsallaştırılmasına müdahale edebileceğini göstermektedir. Ayrıca yabancı dil olarak edinilen DC'nin iki dillilerin sadece açık nesne kavramsallaştırmasına etki ettiği bulunmuştur. Bu çalışma aynı zamanda toplumsal cinsiyet rolü tutumlarının DC'nin nesne kavramsallaştırması üzerindeki etkisini değiştirebileceğini gösteren ilk çalışmadır.

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Dedication page
To my beloved family

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1. LITERATURE REVIEW

1.1 Linguistic Relativity

Does language affect the way people think? This question has been stimulating the discussion among philosophers, linguists, and psychologists for centuries. Late in the seventeenth and early in the eighteenth centuries the relationship between language and thought had started to grab the attention of European philosophers including John Locke, Denis Diderot, Johann Gottfried Herder, and Johann Georg Hamann (Lucy 1992, 1997). German philosopher Wilhelm von Humboldt argued that, if language plays a role in forming ideas, then it also shapes the ideas. Hence speakers of different languages see the world differently (Hussein 2012). Later, German-American anthropologist Franz Boas stated that language was a mirror that reflects thought and culture (Lucy 1992). Early in the twentieth century, with the works of American anthropological linguist Edward Sapir - who was the student of Boas - and his student Benjamin Lee Whorf, the relationship between language and thought began to take wider attention and become known as the *Sapir-Whorf Hypothesis* or *linguistic relativity* (Koerner 1992; Lucy 1997).

Sapir's ideas on language and thought were formed based on his observations and works on American Indian languages. Sapir suggested that

> "[T]he "real world" is to a large extent unconsciously built up on the language habits of the group. . . We see and hear and otherwise experience very largely as we do because the language habits of our community predispose certain choices of interpretation" (1929, 209).

Sapir argued that language has an active role in cognitive processes therefore, it shapes the perception of reality. He also considered language and culture as inseparable and argued that to understand one of them, the other one needs to be

understood, as well (Hussein 2012). Sapir may have coined the term *relativity* in his works, but it was Whorf (1956) who further improved the idea, formulated the hypothesis, and described empirical investigations in order to demonstrate his thesis (Lucy 1992, 1996). Although Boas and Sapir speculated about the impact of language on thought, Whorf was the first to try to demonstrate actual connections between the structural features of languages and thought (Lucy 1996). Whorf also provided the first empirical work of consequence from a contemporary standpoint.

While working as a fire prevention engineer, Whorf investigated a case in which a worker caused an explosion by throwing a cigarette into an "empty" gasoline drum. Whorf noticed that in English, "full" and "empty" are used to describe gasoline drums' liquid content. Although "empty" drums were more dangerous than the "full" drums, due to their conceptualization of "empty", workers perceived "empty" drums as less dangerous. This experience led him to conclude that the way a situation is encoded affects how people behave in certain situations (Carroll 1956). Later, through his works on American Indian languages, especially on Hopi, Whorf developed his views on the language and thought relationship. He compared Hopi's linguistic structure with structures of Standard Average European languages such as English, French, and German. He found that in Hopi some concepts, such as time, are expressed differently than those of European languages and reasoned that individuals' perception of concepts is affected by the language they speak (Carroll 1956; Hussein 2012). In one of his most cited passages, Whorf suggested that

> "Formulation of ideas is not an independent process, strictly rational in the old sense, but is part of a particular grammar, and differs, from slightly to greatly, between different grammars. We dissect nature along lines laid down by our native languages. The categories and types that we isolate from the world of phenomena we do not find there because they stare every observer in the face; on the contrary, the world is presented in a kaleidoscopic flux of impression which has to be organized by our minds— and this means largely by the linguistic systems in our minds" (Whorf 1956, 212).

Linguistic relativity mainly proposes that languages can significantly differ from one another, and as a result, speakers of different languages perceive and conceptualize the world differently (Whorf 1956). In the first half of the twentieth century, Whorf's ideas took the attention of anthropologists and psychologists. However, Lucy (1992, 2016) suggested that some of these psychologists redefined Whorf's ideas in a way to fit them into their understanding of language categories. Early on, Roger Brown and Eric Lenneberg studied linguistic relativity, but they found Whorf's evidence

insufficient (Lucy 2016). Lenneberg (1953) suggested that, although Whorf's work showed that languages differ in how they describe certain events and concepts, it does not prove that these differences actually affect the perception of speakers of different languages. In his article *Cognition in Ethnolinguistic*, Lenneberg (1953, 463) argued that

> "To prove this, it would be necessary to show first that certain aspects of language have a direct influence on or connection with a given psychological mechanism, or at least that speakers of different languages differ along certain psychological parameters."

Feuer (1953) also criticized linguistic relativity as not being an empirical and scientific theory and argued that speakers of different languages do not perceive the physical world differently because perceiving the physical world is essential for survival

> "A common, universal, scientific mode of thinking manages to express itself in all languages. It is the linguistic aspect of the common struggle of men everywhere for survival in the midst of their environment." (96-97)

Brown (1976) later criticized Whorf for not collecting any nonlinguistic data yet implying differences in nonlinguistic cognition. Brown also divided the linguistic relativity concept into two versions as "weak" and "strong" (Bohnemeyer 2020), and he summarized Whorf's hypothesis as follows (Brown 1976, 128)

> "Whorf appeared to put forward two hypotheses:
>
> 1. Structural differences between language systems will, in general, be paralleled by non-linguistic cognitive differences, of an unspecified sort, in the native speakers of the language.
>
> 2. The structure of anyone's native language strongly influences or fully determines the worldview he will acquire as he learns the language."

Although neither Sapir nor Whorf mentioned *determinism*, Whorf's interpreters added this additional component to his doctrine (i.e., 2nd item; Kay and Kempton 1984). Because of the criticisms and inconclusive findings, linguistic relativity lost its popularity (Lucy 1992) and became neglected in the 1960s (Gumperz and Levinson 1991). After the rise of universalist views, many researchers came to argue that

language does not affect thought and even if it does, the effect is too small so can be ignored (e.g., Chomsky 1972; Pinker 1994; McWhorter 2014). The Universal Grammar which is associated with Chomsky suggested that languages originated from a universal set of principles (Chomsky 2000). Pinker (1994) explained Chomsky's view on language and cognition as: "According to Chomsky, a visiting Martian scientist would surely conclude that aside from their mutually unintelligible vocabularies, Earthlings speak a single language." (232)

The scholars arguing against linguistic relativity suggest that humans have innate, internal language or mentalese, and language only encodes the same universal concepts by using different grammatical structures or words. Hence, thoughts are independent of language (Pinker 1994). However, in the 1990s, Gumperz and Levinson (1991) claimed that the attitudes of psychologists, linguistics, and anthropologists began to change, and they started to have an intermediate position and recognize the linguistic and cultural effects. New studies in psychology and anthropology began to emphasize the importance of sociocultural factors, together with the universal basis. Currently, the stronger version of the Sapir-Whorf Hypothesis (i.e., linguistic determinism) does not have many supporters. However, evidence has shown that language affects thought under some conditions provided support for the weak version. One hypothesis regarding the weak version of linguistic relativity is *thinking for speaking* (Slobin 1996). The idea of *thinking for speaking* proposes that habitually encoded categories in a language direct its speakers to engage in thinking about those categories and language affects thoughts during this encoding process (Slobin 1996). Therefore, instead of focusing on the effect of language on nonlinguistic cognition, *thinking for speaking* concerns the effect of online language processing. Building up on the idea, Gleitman and Papafragou (2005, 2012) suggested the *language-on-language* effect and argued that language affects only linguistic cognition. The authors suggested that most of the cross-linguistic differences reported using nonlinguistic tasks cannot be taken as evidence for the effect of language on nonlinguistic cognition because even though the task requires no use of language, participants can strategically use language to enhance their performance.

Wolff and Holmes (2011) argued that the previously suggested dichotomous strong-weak distinction is insufficient to cover the entire picture, and based on the empirical findings, they grouped the effect of language on thought into three different categories with five sub-categories. The first effect Wolff and Holmes (2011) presented, *thinking before language*, refers to the thinking process prior to using the language. This effect includes Slobin's reformulation of Linguistic Relativity, namely *thinking for speaking*. Hence, this view suggests that language affects thought only when it is verbally encoded. The second category, *thinking with language* suggests that

nonlinguistic processes activate language and thinking occurs with language. This effect is found to diminish when the activation of language is blocked with methods like verbal interference. Verbal interference is a dual-task methodology that aims to busy the verbal rehearsal system with verbal interference so that it cannot be used to encode the nonlinguistic stimuli (Athanasopoulos and Casaponsa 2020; see Chapter 4 for more details about the verbal interference methodology). *Language as meddler*, its subcategory, covers the observed effect when linguistic codes get activated along with nonlinguistic processing, but the decision can be based either on linguistic or nonlinguistic codes. As the effect diminishes when the linguistic encoding is prevented, this subcategory suggests that language does not shape the nonlinguistic cognitive mechanism. The other subcategory, *language as augmenter*, on the other hand, suggests that for completing some tasks such as representing exact numbers for larger arrays language plays a crucial role because language offers new conceptual tools. The last domain in their classification, *thinking after language*, suggests that the frequent use of some linguistic features may direct attention to the properties of the world both in linguistic and non-linguistic contexts. Whereas the one subcategory, *language as spotlight*, suggests that language highlights some properties, the other one, *language as inducer*, refers that language may prime a schematic

1.2 Empirical Research on the Relationship Between Language and Thought

The effect of language on thought has been studied in different domains including color perception (e.g., Davidoff, Davies and Roberson 1999; Winawer et al. 2007), number concepts (e.g., Gordon 2004; Frank et al. 2008), spatial representations (e.g., Majid et al. 2004; Levinson et al. 2002), and time perception (e.g., Casasanto and Boroditsky 2008; Nuñez and Cooperrider 2013; de la Fuente et al. 2014). In this chapter, an overview of the studies on linguistic relativity will be given from Whorf to today.

1.2.1 Color

The early studies on language and thought were mostly conducted on how colors encoded in the language affect the color perception of its speakers. Brown and Lenneberg (1954) examined how the English color naming pattern affects memory for the colors. The researchers presented native English speakers with color chips

including twenty-four colors that are commonly labeled with a single word (e.g., yellow) or lie within boundary regions and thus require a phrase (e.g., a combination of a few color names; e.g., greenish blue). Their findings showed that colors with a single name are remembered more accurately. Based on the findings, the authors suggested that available color labels in a language affect the memory of those colors. They further argued that this effect of codability can be a general law, and this effect would apply to cross-cultural cases. Similarly, in a cross-linguistic study, Lenneberg and Roberts (1956) showed that, unlike English speakers, Zuni speakers in Western New Mexico who do not have two distinct categories for yellow and orange in their language had difficulty recognizing the difference between these colors. Later studies with English speakers (e.g., Lantz and Stefflre 1964), as well as non-English speakers (e.g., Spanish and Yucatec; Stefflre, Vales and Morley 1966), also reported the effect of color naming on memory. These early studies uniformly suggested that how colors are encoded varies between and within languages and the colors that are encoded in the language are recognized and remembered better (Lucy 1997).

With their study in which 98 languages were examined, Berlin and Kay (1969) demonstrated that there are universal basic color terms that are encoded in many languages. Further, early in the 1970s, with a series of cross-cultural studies, Rosch (once known as Rosch Heider; 1972, 1973, 1975) found no evidence for the effects of color codability on memory. Dani speakers in New Guinea and English speakers, for example, were found to perform similarly in a memory task, although Dani lacks some color labels that English has. On the contrary, using a different paradigm Kay and Kempton (1984) showed that color labels in the language affect color perception. Whereas English has two distinct labels for blue and green, Tarahumara, a Uto-Aztecan language in Northern Mexico, does not make such a distinction. Instead, they use *siyóname* to refer to both blue and green. English and Tarahumara speakers were presented with three color chips and asked to judge the difference between them. The researchers found that, compared to Tarahumara speakers, English speakers tended to exaggerate the difference between colors in different lexical color categories (i.e., green and blue). The researchers argued that perhaps the reason for this difference is not that they perceive the color categories differently but because English speakers used color labels as a strategy - a strategy that is not available for Tarahumara speakers - to solve the task. In their following experiment, Kay and Kempton (1984), aimed to prevent English speakers from using labeling as a strategy, and instead of presenting the stimuli as a pair of three, they presented colors as two pairs of two. For example, instead of presenting blue, green, and greenish blue together and asking participants to decide, they first presented green with greenish blue. Then, they presented blue with greenish blue. And they asked participants

to judge how greenish blue differs from green and blue. They found that the effect of color labels on color perception diminished. The researchers concluded that although the differences in the languages can affect color perception, as it diminished after language use was blocked, the effect is not absolute. Thus, language does not shape nonlinguistic color perception. Rather, the online use of color labels during the task affects the performance.

In a more recent study, Winawer et al. (2007) found that speakers of Russian, which has two separate labels for different shades of blue (*goluboy* [light blue] and *siniy* [blue], showed the category advantage and discriminated light blue from dark blue faster. The performance of English speakers, on the other hand, did not change depending on the category. Roberson, Pak and Hanley (2008) reported a similar difference among Korean speakers. Korean makes a distinction between yellowish green (*yeondu*) and green (*chorok*), whereas English labels both colors as green. In the study, ten color patches were spaced around a fixation cross, and participants were instructed to indicate whether the different color is on the left or right side of the fixation cross. They found that Korean speakers discriminated between categories faster when the different color was displayed in the right visual field (RVF; that projects to the left hemisphere which was reported to involve linguistic tasks) than when they were displayed in the left visual field (LVF). Similarly, English speakers were found to discriminate between color categories (e.g., green vs. blue) faster than within categories (e.g., different shades of blue), when the color was displayed in the RVF (Gilbert et al. 2006; see also Zhong et al. 2018; Zhou et al. 2010). This faster between category distinction in the RVF diminished when the task was completed under verbal interference, but not visual interference, suggesting that language intervenes between color perception. Mo and colleagues (2011) also reported the lateralization effect using ERP. They observed greater visual mismatch negativity (vMMN) for between-category colors that were displayed in the RVF but not in LVF. Taken together, these findings suggest that early in color perception, language modulates color discrimination through the online use of language.

1.2.2 Spatial Frame of Reference

Spatial frame of reference (FoR) is another domain in which scholars conducted a number of cross-linguistic investigations influential to the field. An egocentric (i.e., relative) FoR that represents the location of objects relative to the viewer's body is mainly used by speakers of English and other Indo-European languages. Other languages use the allocentric (i.e., object-centric) FoR that represents the location of

objects in relation to each other. And some of these allocentric reference languages, including Guugu Yimithirr and Tzeltal use the geocentric (i.e., absolute) FoR that represents the location of objects based on the cardinal directions (Henrich, Heine and Norenzayan 2010; Wolff and Holmes 2011; Majid et al. 2004). Levinson (1996) examined whether the speakers of Dutch and Tzeltal differ in their reasoning on spatial references. After Dutch and Tzeltal speakers were shown some objects, the arrays were rotated 180 degrees and they were asked to recognize and remake the same array. Whereas Dutch speakers used the egocentric strategy to solve the task, Tzeltal speakers relied on the geocentric strategy. The author suggested that how languages encode FoR affects nonlinguistic spatial reasoning.

Later, Li and Gleitman (2002) raised the issue that the experiments were conducted in different environments (laboratory vs. outdoors), and perhaps not the differences in the language but the environments may have led to the differences in the performance. The researchers, then, tested the performance of English speakers on the same tasks in different settings. They found that in outdoor settings, English speakers tended to use the geocentric FoR to complete the task. Levinson and colleagues (2002), on the other hand, argued that Li and Gleitman (2002) oversimplified the task (e.g., presented participants with three items instead of four and no delay before the task). And in their replication of Li and Gleitman (2002)'s study, Levinson and colleagues (2002) found that the participants' reasoning did not differ in the outdoor or indoor setting, and they favored egocentric FoR in both. Haun et al. (2011) used a task with 90 degrees instead of a 180 degrees rotation to allow participants to use any of the three FoR. They compared the performance of elementary school children whose native languages are either Dutch or –Akhoe Hai||om, a language that is spoken in Northern Namibia and favors the geocentric FoR. For reducing subvocal rehearsal, they manipulated the complexity of the task. They found that regardless of the complexity of the task, whereas Dutch-speaking children preferred to use egocentric strategies, –Akhoe Hai||om speakers favored the geocentric strategies. In a more recent study, Li and Abarbanell (2018) replicated their findings with English- and Tzeltal-speaking children of the same age. However, different from that study, in their following studies, Li and Aberbanell (2018) examined how those speakers behave on non-open-ended-tasks (i.e., tasks that do not require participants to consider the experimenter's intention). When the Tzeltal-speaking children were given instructions without left/right terms that they had difficulty with understanding, they came to adopt the egocentric strategies. Overall, the authors suggested that habitual encoding of FoR in language might make some concepts more salient for the speakers and affect their preferences. However, this effect is not strong enough to restructure how speakers of different languages conceptualize spatial relationships.

Even though FoR is one of the most studied domains in the scope of linguistic relativity, scholars have not reached a consensus on the extent to which the way FoR is encoded in the language affects spatial cognition.

1.2.3 Number

As different languages have different number systems, whether the number system in the language affects the number representations has been studied in the scope of linguistic relativity. The Pirahã have limited number words: *hói* (falling tone = one), *hoí* (rising tone = two), and *aibaagi* or *aibai* (many; Gordon 2004). Gordon (2004) tested Pirahã speakers' number discrimination abilities by using a variety of matching tasks. In the tasks, the researcher put a number of items on his side of the table and asked the Pirahã speakers to do the same. Although they performed relatively well when there were up to two or three items, their performance dropped when there were around eight to ten items. Therefore, not having a number system limited the exact numerical calculation of Pirahã speakers. Using a similar task as Gordon (2004), Frank et al. (2008) examined whether having a variety of vocabulary for number words enhances memory for exact cardinalities or numbers pose a stronger effect on cognition and create the concepts of exact quantity. They replicated that the performance of Pirahã speakers decreased, as the number of items increased. They also found that although they did not have the exact vocabulary in their language, Pirahã speakers still could perform the matching task with large numbers of items. However, when the task required additional cognitive skills (e.g., remembering the set and transferring it across space), their performance dropped. Frank and colleagues (2008) argued that language does not create the concepts but rather it works as a cognitive tool to enhance mental representations of concepts.

Spaepen et al. (2011) examined whether the difficulties these people have are because they do not have a number system in their language or just because their culture does not require an exact number to be encoded. The researchers tested the numerical abilities of Nicaragua home signers who are members of a numerate culture and use gestures to communicate about the numbers but do not have a linguistic model for numbers. Although they performed well on target sets of one, two, and three, after three items, their performance significantly dropped. They were able to approximate the target set but they could not match the exact numbers. Therefore, people whose language does not have a linguistic model for numbers have difficulties with generating exact numbers for sets with more than three items, even when they live in a numerate culture. Thus, studies in the number domain so far suggest that

the representation of a number set greater than three items is not universal but rather is developed with the number system in the language.

1.2.4 Time and Space

Languages, also, vary in how they encode time-related metaphors. In one of the earliest studies, Boroditsky (2001) examined whether talking about time differently causes speakers of different languages to think about it differently, too. In English, time is expressed only with horizontal terms (e.g., before, behind, forward). In Mandarin, on the other hand, both horizontal and vertical terms (*shàng* [up] and *xià* [down]) are used for expressing time. Boroditsky (2001) found that English speakers were faster to answer the time questions (e.g., March comes earlier than April) after the horizontal prime. However, Mandarin speakers were faster to answer after being primed with vertical stimulus. Also, after English native speakers were trained to talk about time with vertical terms like Mandarin speakers, their response patterns were found to be similar to Mandarin speakers. In another study, Casasanto and colleagues (2004) examined whether how languages encode time affects the way their speakers think about time and space. Whereas English and Indonesian encode time using distance terms (e.g., a long time), Spanish and Greek express time with quantity metaphors (e.g., *mucho tiempo* [much time]). With a series of studies, Casasanto et al. presented English, Indonesian, Spanish and Greek participants with lines and containers and they were instructed to attend to its duration (i.e., how long it was presented) and its spatial displacement (for the containers, their water level). For the line task, English and Indonesian speakers' time estimations were affected by the distance metaphors in their language. They tended to judge lines traveling a longer distance as presented longer compared to the lines that traveled a shorter distance. No such effect was found for Greek and Spanish speakers. For the container task that asked for the quantity, on the other hand, Greek and Spanish speakers' time estimations were affected by the volume of the containers. Greek and Spanish speakers thought containers with much water were presented for a longer time, unlike English and Indonesian speakers. As this effect emerged even in a nonlinguistic task, the authors suggest that language affects nonlinguistic conceptualization.

1.2.5 Motion Events

Different languages encode motion in different ways. In the satellite-framed languages, such as English and German, the main verb conveys the manner (e.g., run, walk, jump). The satellite-framed languages express the path through the practices (e.g., in, down, up). In verb-framed languages, including Spanish, Greek, and Turkish, on the other hand, the main verb expresses the path of the motion (e.g., exit, enter). These languages express manner through separate elements such as adverbial expression (e.g., exit flying; Talmy 1985; Slobin 1996, 2003, 2006). Early studies showed that speakers of manner languages like English and speakers of path languages such as Spanish differ in how they describe the motion events (e.g., Slobin 1996; Naigles et al. 1998). Additionally, whereas English speakers were found to expect novel verbs to the manner of the motion, Spanish speakers tended to interpret novel verbs as referring to the path of the motion (e.g., Naigles and Terrazas 1998). Also, in a study, Papafragou, Massey and Gleitman (2002) compared the performance of English and Greek speakers on a production and memory task. Although the two groups differed in how they encoded the motion events (i.e., English speakers mainly used manner verbs, whereas Greek speakers mostly used path verbs), they did not differ in the memory task (see also Gennari et al. 2002 for comparison on Spanish and English speakers). Later, Papafragou, Hulbert and Trueswell (2008) examined English and Greek speakers' memory for motion events by using an eye-tracker. They found that the eye movements of these groups differed only when participants were asked to describe the events. Particularly, participants paid more attention to the aspects that are not encoded in their native languages. The researchers interpret this "reverse Whorfian effect" as the allocation of attention to the aspect that was more novel to them, and they had not linguistically encoded. However, the effect was found only for the verbal task hence this study suggests that language affects cognition only when the stimulus is linguistically encoded.

Languages also differ in how they encode the aspect of a motion. Aspect languages, like English, express an event in progress without mentioning the endpoint (e.g., a person is walking). In non-aspect languages, such as German and Swedish, the same event is expressed with the endpoint (e.g., a person walks to a house; Athanasopoulos and Bylund 2013). Speakers of aspect and non-aspect languages were found to attend to the different aspects of the motions with speakers of non-aspect languages attending more to the goal or endpoint of the motion (e.g., von Stutterheim et al. 2012). However, Athanasopoulos and Bylund (2012) showed that differences among speakers of different languages disappear when linguistic encoding of the motion is blocked. In a series of studies, the researchers compared the verbal descriptions

and nonverbal similarity judgments of English and Swedish speakers on goal-oriented motion events. In the verbal encoding task, different from English speakers, Swedish speakers mentioned the endpoint of the event more. For the similarity judgments, participants were presented with a [-endpoint] video (i.e., low level of goal orientation) and a [+endpoint] video (i.e., high level of goal orientation), and a target video with an intermediate level of goal orientation. Participants were either shown each video one by one (Memory-based condition) or all videos at the same time (online condition) and asked to indicate which of the videos are more similar to the target video. Whereas English and Swedish speakers differed in their similarity judgments in the memory-based condition, no significant difference between the groups was found in the online similarity judgment condition. When the participant took the same memory-based task under verbal interference, the difference between the groups diminished. Therefore, language was found to affect linguistic but not non-linguistic cognition. Another study in which English speakers were asked to judge the similarity between the target video and the videos with high and low goal orientation showed that when linguistic encoding is not blocked, English participants find it easier to learn low-end point patterns (English-like) better (Athanasopoulos and Albright 2016). However, this effect diminished under verbal interference. In addition, Flecken and colleagues (2015) recorded ERPs of German and English speakers while they were performing an event-picture matching task. Not English speakers but German speakers showed greater P3 amplitudes, reflecting attentional processing, and target detection, in the end-point match condition. As the participants attended the motion that was consistent with the habitual encoding of the motion in their native language, the researchers suggested that language modulates non-verbal visual perception.

In summary, the relationship between language and thought has been studied in a variety of domains with different research methods. The empirical findings mainly suggest that language affects the way people think. However, research so far does not provide consistent evidence on the degree of this effect. Whereas some researchers found that the effect of language diminished when the verbal encoding is prevented, others reported that the conceptualization of speakers of different languages differs from one another even in the nonlinguistic tasks. Hence, the question of whether language affects thought has evolved to under which conditions and to what extent language influences thinking. The current thesis empirically investigates these new questions focusing on grammatical gender, another critical domain that has captured the considerable interest of scholars throughout the earlier and contemporary history of the language-thought interaction research.

2. GRAMMATICAL GENDER

2.1 Grammatical Gender Systems

Hockett defines *gender* as "classes of nouns reflected in the behavior of associated words" (Hockett 1958, 231). Although the term gender evokes associations about biological sex for most people today, the term gender derives from *genus* (Latin) and *gendre* (French), referring to "kind" and "sort" (Corbett 1991). In the twentieth century, the term gender began to be used in relation to biological sex and refers to the socially-constructed characteristics of men and women. In linguistics, however, the term gender has been used to describe classes that divide nouns based on their common features. Hence, linguists discussing gender may mean not only male and female classes, but also classes such as animals and minerals (Deutscher 2010). In this paper, I specifically focus on the distinction between *feminine*, *masculine*, and *gender-neutral*.

Languages differ in their gender systems, and they can be divided into three groups: *genderless languages*, *natural gender languages*, and *grammatical gender languages* (Stahlberg et al. 2007). Languages like Turkish, Finish, Persian, and Japanese are genderless languages, and they do not have any gender distinction either for nouns or for personal pronouns. In genderless languages, sex is expressed through lexical means only (e.g., in Turkish *erkek* [man, male], *kadın* [woman, female]). Since language itself does not force its speakers to make a sex-based distinction at the syntactic level, the reference to sex is relatively uncommon in genderless languages. Natural gender languages, such as English, use gendered pronouns (e.g., *she* for women, *he* for men), but they do not use grammatical gender to mark the nouns, lexical means are used to express sex-based distinctions. Grammatical gender languages, such as Spanish, French, Russian, Italian, Arabic, and Hebrew, both have gendered pronouns and assign a gender to the nouns regardless of if they have a biological sex. In grammatical gender languages, sex is expressed in

different grammatical forms such as articles, suffixes, and lexical means (Stahlberg et al. 2007). Grammatical gender languages usually attribute two or more gender categories to their nouns. While languages like French, Italian, and Spanish have two grammatical genders, feminine and masculine, German, Russian, and many other languages have three gender categories: feminine, masculine, and neuter (Corbett 2013).

The exact origin of the grammatical gender system is unknown, and the link between the grammatical gender and the noun is often not systematic. The assignments of genders to nouns vary among different languages. For example, whereas the word sun is masculine in Spanish (*sol*) and French (*soleil*), its counterpart is feminine in Italian (*barca*) and neuter in Czech (*slunce*; Cubelli et al. 2011). The differences between the gender systems of languages (e.g., genderless languages, grammatical gender languages) and the different patterns of gender assignment among the grammatical gender languages (e.g., assigning different genders to the same object) raise the question of whether habitual grammatical gender attribution to nouns affects the conceptualization of inanimate objects without biological sex (Samuel, Cole and Eacott 2019; Basetti and Nicoladis 2016).

2.2 Grammatical Gender in French

French is one of the grammatical gender languages in which all nouns have a gender assigned, covering all types of referents regardless of them being animate, inanimate, concrete, or abstract. The semantic component of this gender assignment is weak – whereas the grammatical gender assignments of some animate nouns are based on biological sex (e.g., a female noun *soeur* [sister] is a feminine word, whereas a male noun *frère* [brother] is a masculine noun), the majority of nouns are assigned a gender arbitrarily (e.g., while *une chaise* [chair] is a feminine word, a semantically similar word, *un tabouret* [stool], is masculine; Sidhu, Pexman and Saint-Aubin 2019). As Corbett (1991) cited, Séguin (1969) reported that only 10.5% of all French nouns have semantically motivated gender (e.g., animate nouns being assigned grammatical gender consistent with their biological gender). According to Ayoun (2010, 120), at least three types of gender are expressed in French:

> "(a) semantic or inherent gender (i.e., biological gender),
>
> (b) morphological gender which surfaces at the word level (e.g., américain 'American-msc', américaine 'American-fem' or nerveux 'nervous-msc',

> nerveuse 'nervous-fem' originating from the same lexical entry but with different morphological forms),
>
> (c) syntactic gender, that is, relational gender between phrasal constituents used in syntactic concord (e.g., determiner and noun or noun and adjective). One may add referential gender for épicènes: nouns which may be used with either gender depending on their referent (e.g., un/une artiste 'an-msc/an-fem artist-msc-fem')"

The French grammatical gender system is binary, meaning that nouns are assigned either feminine or masculine gender. In French, gender is expressed through lexical means and articles. The forms of the definite article (*le/la*) and the indefinite article (*un/une*) are changed according to the gender of the nouns. Similarly, the adjectives (*petit/petite*) are also divided into two gender categories (Krenca, Hipfner-Boucher and Chen 2020). The majority of grammatical gender rules are phonological endings (Tucker, Lambert and Rigault 1977) and the final syllable of the word indicates the grammatical gender of about 85 percent of the most frequently used words (Ayoun 2007). Although there are many exceptions to this rule, words with a phonetically consonant final syllable are mostly feminine, whereas words with a vowel final syllable are mostly masculine (Ayoun 2007).

2.3 Gender in Turkish

Turkish is a genderless language with no grammatical gender distinction, and it often does not even require its speakers to indicate the gender of a person. Unlike English, a natural gender language, in Turkish, the third person pronoun does not encode gender (e.g., *o* refers to he, she, and it; *onun* refers to his, hers, and its). Also, the majority of nouns referring to people and occupations do not exhibit gender information (e.g., *polis* is used to refer to both male and female police). Turkish exhibits gender through lexical means. This lexical gender is used for sex-based distinctions. Examples include *kız* (girl) vs. *oğlan* (boy), kinship nouns such as *abla* (older sister) vs. *ağabey* (also written as *abi*; older brother), as well as terms of address such as *Hanım* (Mrs., Ms.) vs *Bey* (Mr.; Braun 2001).

However, Turkish has borrowed some gender-indicating suffixes from other languages. For example, the *-e* suffix is used for the feminine version of originally Arabic nouns referring to a person (e.g., *müdür* [male manager], *müdüre* [female manager]; Braun 2001). Suffixes such as *-es*, *-öz*, and *-ör* are used for exhibiting gender in nouns that are borrowed from Western languages (especially from French;

e.g., *host* [male hostess] *hostes* [female hostess]. Also, the suffix *-içe* which has Slavic origin is used for feminine versions of the nouns (e.g., *kral* [king] vs. *kraliçe* [queen]; Kerimoğlu and Doğan 2015). Nevertheless, these gender-indicating suffixes did not cause systematic grammatical gender distinction to emerge in Turkish (Braun 2001).

2.4 Grammatical Gender and Cognition

The arbitrary gender assignment found in grammatical gender languages has led researchers to wonder whether the grammatical gender of a noun evokes gender-related associations in its speakers. Indeed, grammatical gender has become a common domain to examine the assumptions of linguistic relativity. Boroditsky (1999) argued that, compared to other domains of investigation that rely heavily on sensory experience (e.g., color), abstract domains can be affected by language more. By considering the arbitrary assignments of grammatical gender, Boroditsky and Schmidt (2000) suggested grammatical gender as an extremely abstract domain in which the effect of language on thought is more likely to be detected. Some earlier studies examined the relationship between grammatical gender and thought (e.g., Ervin 1962), but it was around the 2000s when systematic research on this relationship began (see Basetti and Nicoladis 2016 for a review). In this chapter, I will first introduce the earlier research concerning whether the grammatical genders of nouns affect the conceptualization of their referents. These studies showed that grammatical gender affects object conceptualization, but these findings were not consistent, and these studies mostly used *semantic differential tasks* which are prone to the strategic use of language. I will then focus on the contemporary methods to study the relationship between grammatical gender and thought and discuss the factors including the nature of the task (e.g., linguistic vs. nonlinguistic) and the gender system of the grammatical gender language (e.g., two-gender system vs three-gender system) that have been reported as affecting this relationship.

2.4.1 Early research on Grammatical Gender and Cognition

One of the earliest studies on the relationship between grammatical gender and thought was conducted at the Russian Psychology Institute in 1915 (Reported in Jakobson 1966). Researchers asked 50 participants to personify the days of the week. Participants personified Monday, Tuesday, and Thursday as a man, and Wednesday, Friday, and Saturday as a woman. When they were asked why, most

participants could not explain why they personified the days in the way that they did. The researchers argued that it might be because of the grammatical gender of the days, because in Russian, Monday, Tuesday, and Thursday are grammatically masculine whereas Wednesday, Friday, and Saturday are grammatically feminine. In another study, Ervin (1962), used a semantic differential task in which Italian-English bilinguals were presented with nonsense words ending with the masculine (*-o*) or the feminine (*-a*) suffix. The researcher informed the participants that people can guess the meaning of the words from their sounds and asked them to guess the characteristics of things referred to by the words (e.g., good or bad; strong or weak). The study found that participants had a tendency to evaluate nonsense words with the feminine ending as prettier, weaker, and smaller – stereotypically feminine features. Also using a semantic differential task, Clarke et al. (1981) investigated the noun object perception in speakers of English (natural gender language) and Arabic (grammatical gender language). The study reported that only the object conceptualization of Arabic speakers (not English speakers) was affected by the grammatical genders of those nouns in Arabic.

Importantly, not all early studies found the effect of grammatical gender on the perception of nouns. For example, Hofstatter (1963) examined how culture (northern Europeans vs. southern Europeans) and/or grammatical gender affect the perception of nouns such as the sun and moon (cited in Konishi 1993). Although the sun and moon have different grammatical genders in German and Italian, the two concepts were perceived as quite similar by speakers of these two languages. Similarly, using a semantic differential task mentioned earlier, research with speakers of Hebrew, another grammatical gender language, reported that Hebrew speakers did not differ from English speakers in their response patterns and their object perception was affected by the conceptual gender of the noun, not by the grammatical gender (Guiora and Sadi 1978). The authors suggested that the assignment of meaning is universal and the variances in the gender system of languages do not have any strong impact on it.

Although most early studies focused on reporting whether or not grammatical gender affected the perception of inanimate concepts, some critical theoretical and methodological advancements were also made. Mackay and Konishi (1980) and Mackay (1986) examined the use of gender pronouns in English-speaking children and found that, whereas fictional characters that evoke stereotypically masculine traits (e.g., power and courage) are personified with "he", characters with stereotypically feminine traits (e.g., passivity and weakness) are personified with "she" (Mackay and Konishi 1980; Mackay 1986). Based on these findings, the authors argued that grammatical gender can be a form of personification and conveying attitudes re-

garding the referent noun (Mackay and Konishi 1980; Mackay 1986). According to this argument, different languages use different genders for the same objects because cultures and/or languages highlight different attributes of the same objects. For example, because the sun is masculine in French but feminine in German, the word can evoke stereotypically masculine associations for French speakers and it can evoke stereotypically feminine associations for German speakers. Thus, whereas French speakers perceive the sun as powerful, German speakers may conceptualize it as nourishing and warm (Mackay 1986).

Konishi (1993) identified not controlling for denotations of the nouns and gender being too overt in the task as some of the methodological problems of earlier studies. To overcome the problem, Konishi (1993) controlled for denotation of the noun by using words with different grammatical gender across languages. The author presented German and Spanish speakers with words that have opposite genders in German and Spanish, and asked participants to judge the potency (i.e., a feature that is related to masculinity) of the words on a scale of 1 to 7. The study found that speakers of both languages rated that words of masculine grammatical gender in their own language were relatively high in potency. Although Konishi (1993) did not directly argue that the grammatical gender of a word affects the conceptualization of the word, the author suggested that the grammatical gender of a word carries connotations of femininity and masculinity. Later, Konishi (1994) also presented Spanish and German speakers with a list of nonwords. Unlike Ervin (1962) that used masculine or feminine word endings, Konishi used masculine (*el* in Spanish, *der* in German), feminine (*la* in Spanish, *die* in German), and neuter (*das* in German) forms of the definite articles to mark the grammatical gender. Participants rated the words in terms of evaluation (e.g., good vs. bad), potency (e.g., weak vs. strong), and activity (e.g., slow vs. fast). Whereas German speakers judged words with masculine articles higher in potency, the grammatical gender of the article did not have any significant effect on Spanish participants. These cross-linguistic studies made a methodological contribution through careful controlling of stimuli and a theoretical contribution by suggesting that grammatical gender may not affect all grammatical gender languages equally.

In summary, early studies mostly used the semantic differential task but the findings of these studies were not consistent (Cubelli et al. 2011). Further, tasks like the semantic differential task have been criticized because they may enhance the strategic use of grammatical gender by requiring participants to make explicit and subjective associations between genders and nouns (Boroditsky, Schmidt and Phillips 2003). By reducing the salience of language and gender in the tasks, later studies aimed to overcome the methodological problems of the earliest studies and investigated the

effect of grammatical gender in a more implicit manner.

2.4.2 Recent Research on Grammatical Gender and Conceptualization

Late in the 20th century, researchers began to use *gender attribution tasks* (e.g., voice attribution and sex attribution tasks), in which participants were asked to attribute a gender to the objects. Gender attribution tasks soon became the most common method to study the influence of grammatical gender on object conceptualization (see Samuel, Cole and Eacott 2019 for a review). Studies using this methodology mostly found that individuals attributed gender to the objects in a way that was consistent with the grammatical gender assignments of the nouns in their native language (Basetti and Nicoladis, 2016; Samuel, Cole and Eacott 2019).

In their now-classic study, Sera, Berge and del Castillo Pintado (1994) compared the gender assignment patterns of Spanish and English speakers on a *sex attribution task*. In this task, participants saw pictures of natural (e.g., fish, fire) and artificial (e.g., helicopter, telescope) objects with or without their labels. Half of the object had feminine, and the other half had masculine gender in Spanish. Participants were instructed to choose the biological sex that each of the stimuli made them think of. The main finding was that the grammatical gender of the objects in Spanish affected the gender classification of the Spanish speakers, but not English speakers. This effect was stronger for natural items than artificial objects, and for objects that were presented with their labels than presented as only pictures. Importantly, the authors considered that, by explicitly asking participants to classify objects as a woman or a man, they might have led participants to attribute the sex based on the grammatical gender of the noun. Thus, they argued that the findings may not reflect the effect of grammatical gender on cognition but show the grammatical gender knowledge of Spanish speakers. To rule out this possibility, they used a *voice attribution task* in their following experiment. In this voice attribution task, there were no explicit references to gender, and participants were asked to assign either a man's voice or a woman's voice the same objects as the previous experiment. The findings in the sex attribution task were replicated using the voice attribution task: the object classification of Spanish speakers, but not of English speakers, was affected by the Spanish gender system even when the task did not explicitly refer to grammatical gender. Sera, Berge and del Castillo Pintado (1994) argued that the difference between Spanish and English speakers cannot be due to cultural differences because, if it was only about cultural differences, the labels would not have made any difference in the response pattern of Spanish speakers. The authors also argued that the

influence of grammatical gender cannot be explained through the systematic use of grammatical gender because, if that was the case, the object categories (natural vs artificial) would not have affected the response patterns as they would have applied the similar strategy to all objects. Similarly, Flaherty (2001) found that, when Spanish and French speakers are asked to (1) attribute a female or male name to objects or (2) mark them as a male or female, the responses matched with the grammatical gender of objects. Later, using the gender attribution methodology, several studies reported that speakers of grammatical gender languages, including French (Sera et al. 2002), Portuguese (Ramos and Roberson 2011), Polish (Maciuszek, Polak and Świątkowska 2019), Italian and Lithuanian (Vernich, Argus and Kamandulytė-Merfeldienė 2017), attributed gender to objects in a way that was consistent with the grammatical gender assignments in their native language.

Using sex attribution tasks, even though studies consistently found that speakers of two-gender languages (e.g., French, Spanish) assign genders to objects in line with grammatical gender, the studies with the speakers of three-gender languages found inconsistent findings. For example, Sera and colleagues (2002) found that the grammatical gender of objects did not affect the gender assignment patterns of German speakers. The authors argued that one reason for German speakers not to be affected by grammatical gender in the same way as French and Spanish speakers may be the neuter gender in German. On the contrary, in a more recent study, Pavlidou and Alvanoudi (2019) found the effect of grammatical gender on gender assignments of Greek and German speakers (i.e., language with a three-gender system). In another interesting study, Beller et al. (2015) compared the speakers of two different Norwegian dialects to control the possible effect of culture on object conceptualization. While one dialect has common gender and neutral categories, the other dialects have three categories: feminine, masculine, and neuter. The authors found that speakers of the dialects with a three-gender system had a tendency to attribute genders to objects in accord with their grammatical gender. However, this grammatical gender effect was not as strong as stereotypical associations of the objects in the culture: the effect did not emerge for all objects. Thus, although findings are inconsistent, so far, using sex attribution tasks, research showed that the effect of grammatical gender is stronger for speakers of two-gender languages than three-gender languages.

As mentioned above, Sera, Berge and del Castillo Pintado (1994) suggested that the voice attribution task can remove explicit references to sex and concluded that their findings cannot be explained by the use of grammatical gender as a strategy. Nevertheless, other researchers argued that the voice attribution task still has explicit reference to gender as it requires sex-based decisions (e.g., Vigliocco et al. 2005;

Cubelli et al. 2011; Bender, Beller and Klauer 2018). Vigliocco et al. (2005), for example, argued that since the voice attribution task explicitly asks participants to classify stimuli based on female-male properties, participants still could consciously use the grammatical gender of the nouns to categorize the objects. To assess the influence of grammatical gender on conceptual representations of the nouns in a more implicit manner, Vigliocco et al. (2005) used a *similarity judgment task*. In the similarity judgment task, native speakers of English, Italian and German were presented with three nouns and asked to choose which two of the three nouns were more similar in meaning and asked on what they based their judgments. Although none of the participants indicated that they used grammatical gender to complete the task, the grammatical gender of the nouns was found to affect the similarity judgments of Italian speakers but only for the natural stimuli (e.g., animals) and only when the nouns were presented verbally. In addition, grammatical gender did not affect German speakers' judgments. The researchers concluded that the influence of grammatical gender depends on factors related to language (i.e., the effect is limited to languages with the two-gender system), tasks (linguistic tasks), and stimuli (natural objects). Using a similar methodology, on the other hand, Degani (2007) reported that grammatical gender did not significantly affect how speakers of Spanish (a grammatical gender language with a two-gender system) rated the similarity of noun pairs. But Ramos and Roberson (2011) obtained similar findings as Vigliocco et al. (2005) with Portuguese speakers. The authors first asked Portuguese speakers to rate the similarity of noun pairs and reported that participants rated similarity between pairs consisting of nouns with different grammatical gender lower. Later, they used a task with no overt gender reference. Participants were presented with a triad of objects (either word or picture) and asked to decide which of two "goes best". They reported a weak effect of grammatical gender which was marginally stronger in the verbal than in the picture version of the task. The authors suggested that the effect of grammatical gender depends on the task requirements and the effect is stronger in the linguistic task with an overt gender reference.

Later, using a similar methodology, Cubelli et al. (2011) examined the effects of grammatical gender on object categorization in a series of studies. In their Experiment I, the performance of Italian and English speakers was compared on a *category decision task*. Participants were presented with picture pairs consisting of semantically related or unrelated nouns. Half of the pairs matched in grammatical gender (gender congruent condition), and the other half did not (gender incongruent condition). Their results showed that whereas semantic relatedness affected the response patterns of both English and Italian speakers, it was only the Italian speakers' response rate that was affected by the grammatical gender. Particularly, Italian

speakers were faster to answer in the gender congruent than incongruent trials. In Experiment II, they compared the performance of Italian and Spanish participants in the same task with the stimuli that have opposite grammatical gender in these languages. They replicated the finding of Experiment I and reported significant effects of semantic relatedness and gender congruency for both Italian and Spanish speakers. In Experiment III, to examine the involvement of the lexical system, they added an articulatory suppression task (see Chapter 4 for a more detailed explanation of the verbal interference). Spanish-speaking participants were asked to repeat "blah blah blah" while they were taking the category decision task. The effect of grammatical gender concurrency, but not semantic relatedness disappeared under the articulatory suppression. Considering these findings, the authors suggested that grammatical gender indirectly affects semantic processing meaning that grammatical gender does not affect the conceptual representation. Rather, grammatical gender is automatically activated even when the task requirements do not require it, and language intervenes with the object categorization.

Therefore, so far studies that used semantic similarity tasks showed that objects sharing the same grammatical gender are perceived as more similar, and grammatical gender is automatically activated even when the information is unrelated. However, the findings of similarity judgment tasks were criticized as not providing evidence about whether speakers of grammatical gender languages conceptualize objects as more feminine or masculine because of their grammatical gender. It is argued that sharing the same grammatical category, not the same sex-related associations, might be the reason for participants to rate those objects as similar (e.g., Samuel, Cole and Eacott 2019; Cook 2006).

Another method for examining the implicit effect of grammatical gender on object conceptualization was suggested by Boroditsky and colleagues (e.g., Boroditsky and Schmidt, 2000; Boroditsky, Schmidt and Phillips 2003). Boroditsky and Schmidt (2000) criticized the studies with monolingual speakers for only showing the effect of language when they are thinking in that language. To examine how speaking a language with grammatical gender affects language-independent thought (e.g., thinking in another language, nonlinguistic thinking), they tested native speakers of Spanish and German in English. They asked their participants to learn twenty-four object-name pairs and then, they assessed their memory for the pairs. The grammatical gender of the objects was opposite in Spanish and German, and they matched with the gender of the name in a half of the trials and did not match in the other half (e.g., apple-Alexander). Both Spanish and German speakers remembered the pair better when the grammatical gender of the object in their native language and the gender of the name matched. Since the effect of grammatical gender was persistent

even when the task was in English, the researchers suggested that the effect of grammatical gender on thinking is not language-specific and grammatical gender of the objects strongly affects how people conceptualize objects. Phillip and Boroditsky (2003), also, reported that Spanish and German speakers rated the object-person pairs more similar when the grammatical gender matched with the sex of the person. This effect is persistent even when the task was performed in English and even under verbal interference. In a more recent study, Semenuks and colleagues (2017), for reducing the strategic use of grammatical gender, asked native speakers of languages with grammatical gender -French, German, and Romanian- to generate three adjectives for English nouns. Grammatical gender did not affect participants' first adjective choice, but its effect emerged with the second adjective. Considering that the effect was reported in an English task that does not explicitly direct participants to think about gender, the authors suggested that grammatical gender affects object conceptualization. However, since the effect was observed in the second but not the first adjective, they concluded that the effect of grammatical gender is not strong enough to affect participants' judgments when they need to respond rapidly and when there are other perceptual or conceptual cues. Nevertheless, using the same design, Mickan, Schiefke and Stefanowitsch (2014) failed to find the significant effect of grammar gender on the adjective choices of German and Spanish speakers, although the task was in their native language. Since other research groups failed to replicate the findings, the effect that is obtained through such implicit studies is considered unstable (e.g., Bender, Beller and Klauer 2018).

Other studies that examined the relationship between object conceptualization and grammatical gender with bilingual participants also reported inconsistent findings. For example, Kousta, Vinson and Vigliocco (2008) presented Italian-English speakers with pictures at a fast rate and asked them to name them either in English or Italian. Semantic substitution error analysis showed that grammatical gender affects error patterns of Italian-English bilinguals only when the task was given in an Italian-speaking context. Since the performance of bilinguals changed depending on the language they took the task in, the researchers concluded that grammatical gender does not have any influence on nonlinguistic conceptual representations. In a series of studies, on the other hand, Sato and Athanasopoulos (2018) showed that grammatical gender affects French-English speakers' object conceptualization even when the task was in English. They used objects with conceptual gender as stimuli. Whereas half of each conceptual gender group consisted of grammatically feminine object pairs, the other half consisted of grammatically masculine pairs. The pairs were presented to participants one by one and after each pair, participants were shown female and male faces and asked whether the objects they saw made them

think of the corresponded face. Although conceptual gender affected both groups' response rates, only French-English speakers responded faster when the grammatical gender of the objects and the target face matched. For assessing whether grammatical gender affects perception even when the information is not necessary, in Study II, they used objects for priming gender. In this study, participants were presented with neutral faces and asked to decide which one of the two traits (female trait: charming; male trait: realistic) describes the face better. Similar to Study I, before the face, participants saw the object pairs. Whereas conceptual gender of the object significantly predicted the gender of the trait for English speakers, it did not predict for French-English speakers. However, French-English bilinguals were faster to assign female traits to face after seeing an object with feminine grammatical gender. The researchers suggested that grammatical gender modulates conceptual representations, even in a task that does not require it. However, contradicting to Semenuks and colleagues (2017) who suggested the effect of grammatical gender is not rapid, Sato and Athanasopoulos (2018) proposed that grammatical gender has an automatic, immediate, and robust effect on conceptualization, as seeing the object only for a short time was enough to activate grammatical gender categories.

All the studies mentioned thus far investigated the grammatical gender-object conceptualization relationship with behavioral measures. Bounette, Athanasopoulos and Thierry (2012) raised the reliance on fully behavioral measurements as the greatest limitation of the previous studies. They argued that explicit tasks, such as semantic similarity, or voice attribution, that used linguistic stimuli cannot distinguish the effect of explicit or strategic use of grammatical gender (e.g., inner speech, lexical access) from the unconscious and automatic effect of it. To assess spontaneous access to grammatical gender, they took neurological measurements, while participants were taking a semantic similarity task adapted from Cubelli et al. (2011). English monolinguals and Spanish-English bilinguals were tested in English. Participants saw pairs of object pictures with the same grammatical gender and belonging to the same semantic category. Then, they were presented with a third object picture that either has the same or different grammatical gender. Participants were asked to press "yes" if they think that those three pictures belong to the same semantic category and "no" if they think the opposite. Unlike Cubelli et al. (2011), they did not find any effect of gender congruency or semantic relatedness on the behavioral measure (i.e., reaction times). However, semantic relatedness was found to have a priming effect on N400 ERP amplitude in both groups. N400 was less negative for the semantically related pairs, compared to unrelated pairs. Additionally, LAN amplitudes were found to be more negative when the grammatical gender of the third picture did not match the grammatical gender

of the pair. This effect was found only for Spanish-English bilinguals, not English monolinguals. Therefore, the findings showed that even when grammatical gender did not affect the conceptualization at the behavioral level, it was semantically retrieved during the task, although the task itself did not require it. The researchers concluded that grammatical gender is automatically reached when people are asked to make judgments about the semantic relationship (object categories). In a recent study, Sato, Casaponsa and Athanasopoulos (2020) also reported the automatic and unconscious access to the grammatical gender. Sato, Casaponsa and Athanasopoulos (2020) adapted Sato and Athanasopoulos' (2018) experimental paradigm and recorded event-related potentials (ERPs), while French-English bilinguals and native English speakers answered whether the object on the screen makes them think of a female or male. The grammatical and conceptual genders of the objects were either matched or mismatched (e.g., Necktie [*cravate*] is grammatically feminine but conceptually male). At the behavioral level, they found only the effect of conceptual gender. Both groups answered faster when the conceptual gender of the object matched the sex of the face. However, grammatical gender concurrency was found to affect ERP components of French-English bilinguals. Particularly, gender incongruent trials caused greater negativity in N300 and N1, and gender congruency caused greater modulation in P2/VPP. The observed activations in the regions related to attentional facilitation (N1) and facial encoding (P2/VPP) lead researchers to suggest that the grammatical gender of the objects caused French-English bilinguals to have some expectations about the target face. Therefore, independent of the task requirements, grammatical gender unconsciously activated and modulated object conceptualization.

Thus, although not many studies used neural measures to examine the influence of grammatical gender, so far, neural measures provide evidence for the automatic and immediate activation of grammatical gender in the bilingual population. Importantly, the behavioral results of these studies were not consistent with the previous studies. As previously mentioned, the influence of grammatical gender is observed mostly in the explicit tasks, and the tasks that were used by Bounette, Athanasopoulos and Thierry (2012), and Sato, Casaponsa and Athanasopoulos (2020) all explicitly asked participants to make judgments about the objects. Although both studies showed that grammatical gender was automatically activated during the task, neither of them found that this automatic activation affects people's explicit judgments about the objects. Sato, Casaponsa and Athanasopoulos (2020) explained this lack of effect in the behavioral measure through a top-down mechanism (see Lupyan 2012). The authors suggested that early in perception, grammatical gender modulated attention, and after it is no longer active, just as English speakers did,

French-English bilinguals used conceptual gender to complete the task.

Most of the studies in the field investigated the relationship between grammatical gender and conceptualization either using a methodology that requires participants to explicitly make a judgment or reduces explicit reference to gender but still does not prevent the use of grammatical gender as a strategy (Bender, Beller and Klauer 2016a). To reduce the strategic use of language, some researchers have recently begun to explore this relationship by using time-sensitive implicit measures. Bender, Beller and Klauer (2016a, 2016b, 2018) examined the implicit effect of grammatical gender, using a linguistic version of the *Extrinsic Affective Simon Task* (EAST). In the EAST, participants are presented with some nouns referring to biological sex (e.g., presented in black) and objects (e.g., presented in blue or green). One sex and one color are assigned to the same key. Participants respond by pressing the key that maps to the presented noun. For example, participants were asked to press the right key for words indicating a female (e.g., aunt) and words in green color, and the left key for words indicating a male (e.g., uncle) and words in blue color. When a feminine object shares the same key with the female sex, the trial was considered gender congruent, and gender incongruent when a feminine object shares the same key with the male sex. They reported that German speakers found gender congruent trials easier to categorize (Bender, Beller and Klauer 2016b). This effect was stronger for the animate nouns, compared to inanimate nouns and allegories, and only found in accuracy, not in reaction time. In the following experiment, they used allegories that differ in their grammatical gender and gender associations (e.g., "*Frühling*" [spring] is grammatically masculine but associated with the female sex). They found that when the grammatical gender and gender associations of the noun matched, participants found it easier to categorize. The effect was found in both reaction time and accuracy for animate nouns but only in accuracy for the allegories. Taking these findings together, the authors suggested that the implicit effect of grammatical gender is observed only when the biological and grammatical gender of the nouns were congruent. The authors argued that the congruency effect is due to conceptual associations of the referents of the allegories, instead of their grammatical gender (Bender, Beller and Klauer 2016a, 2016b). Further, using the same task but with nouns that have conceptual gender, and either feminine and masculine or neuter grammatical gender in German, Bender, Beller and Klauer (2018) attempted to examine the effect of grammatical gender by teasing it apart from conceptual associations. They found that grammatically neutral objects produced a gender concurrency effect as strong as grammatically gendered objects. The authors suggested that what leads to the gender congruency effect is not the grammatical gender of the objects, but rather their conceptual associations.

In a more recent study, Maciuszek, Polak and Świątkowska (2019), on the other hand, used a modified *Implicit Association Test* (IAT) to examine whether grammatical gender affects the implicit object categorization of Polish speakers. Participants were asked to associate the names of conceptually neutral objects with a female or male name. The study reported that native Polish speakers were more accurate and faster when the grammatical gender of the object and the biological gender of the name matched. The study demonstrated that grammatical gender affects implicit conceptualization even when the information is irrelevant to the task. The implicit tasks are suitable to reduce the strategic use of language as participants are not asked to make a gender-based decision yet they are not very common in the field and only the linguistic versions of them were used. The patterns of the studies, however, are not consistent. Even though grammatical gender was found to affect participants' responses whereas Bender, Beller and Klauer (2016a, 2016b, 2018) attributed this effect to conceptual associations of nouns, Maciuszek, Polak and Świątkowska (2019) reported the significant effect of grammatical gender with conceptually neutral objects. Thus, the implicit effect of grammatical gender has not been understood yet.

The effect of grammatical gender on object conceptualization has been studied by using a variety of tasks with speakers of different languages. So far, the effect was observed more in explicit tasks than implicit tasks and stronger in verbal than non-verbal tasks. Additionally, whereas inconsistent findings were reported with speakers of three-gender languages such as German, grammatical gender was reported to affect the conceptualization of speakers of two-gender languages including Spanish and French mostly. However, although the effect of grammatical gender was mostly observed in the settings in which linguistic encoding is available, the extent to which grammatical gender affects conceptualization has not been fully understood yet. Further, whether this effect is specific to native speakers of grammatical gender languages or learning a grammatical gender language as a foreign language can affect the object-related concepts of bilingual speakers remain as an open question.

3. LINGUISTIC RELATIVITY AND BILINGUALISM

After early studies showed that bilinguals do not categorize colors like monolinguals do (e.g., Ervin 1961; Caskey-Sirmons and Hickerson 1977), the relation between speaking more than one language and cognition was not studied for a long time (see Basetti and Cook 2011 for a review). In the 2000s, however, scholars turned back to the relationship between bilingualism and linguistic relativity and started to look for answers to questions such as how speaking languages with different grammatical properties predicts the conceptualization of bilinguals? Can learning a second language (L2) modify the existing concepts of individuals? Do bilinguals transfer the concepts from one language to the other? Does the language of the task affect how bilinguals conceptualize (Aveledo 2015; Athanasopoulos and Aveledo 2012)?

So far, the relationship between bilingualism and linguistic relativity has been studied in several domains including color (e.g., Jameson and Alvarado 2003; Athanasopoulos 2009), motion events (e.g., Daller, Treffers-Daller and Furman 2011; Hohenstein, Eisenberg and Naigles 2006), categorization (e.g., Ameel et al. 2005; Nicoladis and Gao 2022), time and space (e.g., Park and Zeigler 2014; Boroditsky 2001), as well as grammatical gender (e.g., Kurinski and Sera 2011; Kurinski, Jambor and Sera 2016; Lambelet 2016; see Chapter 3.1). In one of the earliest studies, Boroditsky (2001) examined whether time encoding patterns unique to L2 affect the way in which bilinguals conceptualize time. Whereas English speakers use only horizontal terms to talk about time (e.g., before, behind, forward), Mandarin speakers use both horizontal and vertical terms ("*shàng*" [up] and "*xià*" [down]). Mandarin-English bilinguals were asked to decide whether the statements about time (e.g., March comes earlier than April) are true or false. It was found that the younger a participant started to learn English, the less this person showed vertical bias. The author suggested that increased exposure to English leads Mandarin-English bilinguals to shift their concepts toward native English speakers. Also, the Korean-English bilinguals' conceptualizations of space were found to differ from both monolingual speak-

ers of Korean who categorize space based on fit properties (e.g., tight fit, loose fit) and English speakers who categorize spatial concepts in terms of containment (e.g., put in, put on; Park and Zeigler 2014). The researchers also found L2 proficiency and native language (L1) frequency of use as predictors of the shift toward the L2. Specifically, participants with higher English proficiency categorized objects more similar to English monolinguals. And the more a Korean-English bilingual used Korean in their everyday life, the less this person categorized objects similar to English speakers.

In the domain of bilingual color categorization, Jameson and Alvarado (2003) showed that Vietnamese-English bilinguals' color naming tendencies were affected by both their L1 and L2. English and Vietnamese differ in their categorization of orange, blue, and green. Unlike English, Vietnamese does not have two different categories for blue and green. Instead, "*xanh*" is used for referring to both. Also, whereas English has a distinct category for orange, Vietnamese does not have such a category. In Vietnamese, a name modified by yellow is used to refer to orange. Bilinguals were shown color chips and asked to name the colors in Vietnamese. The naming patterns of bilinguals did not completely match with either monolingual Vietnamese or English speakers. Whereas they named blue and green colors similar to monolingual Vietnamese, for naming orange, like the English speakers, they used the term "*cam*" which refers to the fruit (i.e., similar to orange) in Vietnamese but is not frequently used for referring to the color orange.

In a series of studies, similar findings were reported for the L2 English learners of native Greek (Athanasopoulos 2009) and Japanese (Athanasopoulos et al. 2011) speakers. Unlike English, in Greek, there are two category labels for blue: "*ble*" is for a darker shade and "*ghalazio*" is for a lighter shade of blue. Athanasopoulos (2009) presented Greek-English bilinguals with color chips and asked them to name the chips. Then, they were asked to indicate the best examples of *ble* and *ghalazio*. The researcher also asked a different group of Greek-Bilingual participants to judge the similarity and differences between the colors. Athanasopoulos (2009) found that bilinguals differ from the monolingual speakers of Greek and their color categories have started to shift in a direction similar to English. The study also showed a significant effect of length of stay. In other words, bilinguals who have lived more than 24 months have shifted their categories to the L2 direction more. In another study, Athanasopoulos and colleagues (2011) controlled for the English levels of participants and examined the other variables affecting bilingual conceptualization. Advanced Japanese-English bilinguals with varying lengths of stay in the UK participated in the study. Whereas half of the bilinguals were tested in their native language, Japanese, the other half were tested in English. Again, participants

were presented with colors and asked to decide how similar or different those colors are. Japanese-English bilinguals were found to distinguish color categories neither quite similar to Japanese monolingual nor English monolingual. The categorization patterns of bilinguals were somehow between the two monolingual groups. They also reported that the more a bilingual speaker uses English in their daily life, the less this person is affected by the color categories in Japanese. However, they did not find any significant effect of the length of stay in the UK or test language.

Furthermore, bilinguals were found to use labels to categorize objects or actions differently from the monolingual speakers of their L1 and L2. For example, English speakers tend to classify objects based on their shape whereas Japanese speakers based their classification on the material. In a study, Cook et al. (2006) found that Japanese-English bilinguals who stayed in an English-speaking country for 3 years or more made more shape-based classification. When they compared the results of long-stay bilinguals with monolingual speakers of English and Japanese, they found that bilinguals classify objects differently from the monolingual speakers of either language. The researchers suggested that learning a language with a different classification system restructured the concepts of bilinguals and as a result, they have a system combination of both languages. Later, Athanasopoulos (2007) examined variables affecting this category switch towards L2. Japanese-English speakers living in the UK were asked to decide the similarity of the objects that can be either labeled with a count or mass noun. Overall, the judgments of bilinguals were between the two monolingual groups. Japanese-English bilinguals who were tested in L2 significantly differed from monolingual Japanese speakers, whereas bilinguals who were tested in L1 did not differ from any group. Also, not the length of stay in the UK but proficiency level was found to affect their judgments significantly. The more proficient one in English, the more this person behaved similar to monolingual speakers of English. Additionally, French-Dutch simultaneous bilinguals were found to behave differently than monolinguals of Dutch and French in their object categorization. Yet, they agreed on their judgments in Dutch and French suggesting that they created new categories (Ameel et al. 2005).

Moreover, in a recent study, Nicoladis and Gao (2022) showed that bilinguals differ from monolingual speakers in their categorization of actions. Mandarin and English differ from one another in their verbs that refer to throwing action. Whereas, in Mandarin, throw verbs refer to differences in dimension such as force, in English, the verbs are closer to one another in their dimensions. Mandarin-English sequential bilinguals were presented with videos that depict Mandarin throwing actions. Participants first were asked to name the action and then, they took a forced-choice task in which they decided which verbs describe the action better in both Mandarin

and English at different times. Even though bilinguals named the actions similar to monolinguals, they tended to modify the verbs by adding words indicating the dimensions (e.g., throw down or throw hard). In the forced-choice task, bilinguals assumed that there was one English verb that corresponded to the Mandarin verbs. However, they chose different words. The results show that bilinguals do not rely on only one strategy but instead use different strategies to label and categorize the not easily translatable actions.

Conceptualization of motion events is another domain in which bilinguals were found to differ from monolinguals. Verb-framed languages like Spanish, Turkish, and Korean express the path in the main verb (e.g., enter, exit). English, on the other hand, is a satellite-framed language that expresses the manner in the main verb (e.g., run, walk). Hohenstein, Eisenberg and Naigles (2006) presented Spanish-English bilinguals with videos and asked them to describe what happened in each video. They were tested in Spanish and English at different times. Whereas they tended to use more manner verbs when they were tested in English, they were more likely to use path verbs when the test was in Spanish. When the researchers indirectly compared their findings with previous results of monolingual Spanish and English speakers (see, Naigles et al. 1998), bilinguals were found to express manner less compared to English monolinguals and path less compared to Spanish monolinguals. Also, overall, L1 of participants affected their verb choice in L2 more than vice versa and this effect was stronger for late bilinguals (i.e., the ones who learned English after the age of 12). Early bilinguals, on the other hand, are affected by L2 while expressing the videos in their L1. Similarly, Turkish-German bilinguals were found to conceptualize motion events somehow different from monolinguals of German and Turkish (Daller, Treffers-Daller and Furman 2011). Daller, Treffers-Daller and Furman (2011) also reported that whereas Turkish-German bilinguals living in Turkey showed a pattern similar to Turkish monolinguals, the bilinguals who live in Germany conceptualized the motion event closer to German monolinguals. In a more recent study, on the other hand, Park (2020) found that although in the verbal task, Korean-English bilinguals' description of motion events shift towards an English-like pattern, in the non-verbal task, their conceptualization pattern was more similar to the monolingual Korean speakers. Also, whereas L2 proficiency modulated their performance in the verbal task, length of stay in the L2 speaking country modulated the performance in the non-verbal task.

Thus, although the evidence is not so consistent, so far, the widely accepted view in the field is that learning a language that has different grammatical categories than one's native language causes a conceptual shift toward the second language. However, the factors affecting this shift have not been fully understood yet. Re-

searchers reported factors including the length of stay in the L2-speaking country (e.g., Athanasopoulos 2009; Cook et al. 2006; Daller, Treffers-Daller and Furman 2011), the age of acquisition (e.g., Boroditsky, 2001), frequency (e.g., Athanasopoulos et al. 2011, Park and Zeigler 2014), task type (e.g., Park 2020), proficiency (e.g., Athanasopoulos 2007; Park 2020; Park and Zeigler 2014). But none of these factors was consistently found as moderating this shift. More studies are needed to understand the mechanisms behind the conceptualization of bilingual speakers.

3.1 Effects of Learning a Grammatical Gender Language as L2

Although plenty of studies examined the acquisition of grammatical gender as L2 and the sensitivity of L2 speakers to gender marking (e.g., Pérez-Pereira 1991, Dasse-Askildson 2008; Guillelmon and Grosjean 2001; Sabourin, Stowe, and De Haan 2006), not many studies examined whether learning a language with grammatical gender affects bilinguals object-related associations. To examine whether learning a new language system as grammatical gender affects cognition, Phillip and Boroditsky (2003) taught English speakers the *soupative* and *oosative* distinction in the fictional Gumuzi language. Participants were presented with a set of 20 pictures including people and inanimate pictures that are considered either soupative or oosative. The soupative/oosative distinction matched the biological gender of the people and the same biological genders were always in the same category. After participants had learned these distinctions, they rated the similarity between people and objects. Participants rated person-object pairs as more similar when the biological sex of the person matched with the gender of the object in the Gumuzi language. And this tendency was persistent even under verbal interference. These results indicated that learning a gender system later in life affects object conceptualization. Similar results were obtained by L2 learners of Spanish whose native languages do not have grammatical gender. Kurinski and Sera (2011), for example, examined how learning Spanish at a later age affects the conceptualization of English speakers. They tested the performance of native Spanish speakers, as well as beginning and advanced Spanish learners on a nonlinguistic voice attribution task with English instructions. Whereas native and advanced speakers of Spanish were tested only once, beginning Spanish speakers were tested four times during the semester. They found that judgments of beginning learners have changed with time and as they became more fluent in Spanish, their judgments were affected by Spanish grammatical gender more. Grammatical gender acquisition affected the judgments on artificial masculine items the most. When they compared the performance of

beginning learners with advanced bilinguals and Spanish native speakers, overall, the beginning and advanced learners did not significantly differ from each other but differed from native Spanish speakers. The native Spanish speakers assigned voices to the object more consistent with the grammatical gender of the words. Therefore, although the effect is not as strong as for the native speakers, learning a language with grammatical gender as a foreign language affected the gender assignments of native speakers of a language without grammatical gender. The authors suggested that perhaps the grammatical gender has a limited effect on object conceptualization of L2 learners because they already have certain concepts about nouns (e.g., cultural experience). In another study, Kurinski, Jambor and Sera (2016), following the same methods as Kurinski and Sera (2011), found that Hungarian-Spanish speakers' gender assignments were affected by Spanish grammatical gender. Compared to native English speakers, the effect emerged earlier and stronger for the speakers of Hungarian, a genderless language, which indicated that the native language affects the acquisition of grammatical gender. The author suggested that as Hungarian is less gendered than English, they may be more prone to the effects of Spanish grammatical gender. Also, with a sample consisting of English-Spanish bilinguals, Kaushanskaya and Smith (2016) examined whether learning a grammatical gender language affects bilinguals' lexical processing in their native language. Bilinguals were tested on an associative learning task in which they were asked to memorize object-name pairs that are matched or mismatched in their gender. Overall, they did not find any effect of grammatical gender. However, when they specifically examined the effect of L2 exposure, they found that bilinguals with high Spanish exposure remembered the pair better when the name of the gender and the grammatical gender of the object matched. These findings suggest that grammatical gender distinction in L2 can affect the processing in L1.

However, not all studies found a shift in the object-related concepts of bilinguals towards L2. For instance, Lambelet (2016) examined how learning a language with grammatical gender as a second language affects object conceptualization with participants consisting of L2 French speakers with varying first languages (i.e., languages with and without grammatical gender). Participants completed a linguistic voice attribution task in French. Contradictory to Kurinski and Sera (2016), and Kurinski, Jambor and Sera (2016), the researcher reported that participants whose native languages do not have any grammatical gender system assigned voices randomly, meaning that their conceptualization was not affected by French grammatical gender. Speakers of L1 with grammatical gender, on the other hand, were affected by the grammatical gender of the objects in their native language. However, the more proficient a participant in French, the less their voice attributions are affected

by grammatical gender in their native language. Lambelet (2016) suggested that the grammatical gender system of one's native language can enhance or restrict learning grammatical gender in the second language. Other studies with bilinguals whose both languages have a grammatical gender system also reported a reduced effect of L1 on object conceptualization. Child (Bassetti 2007) and adult (Basetti and Cook 2011) Italian-German bilinguals were found to conceptualize objects differently from monolingual Italian speakers when objects have different grammatical genders in Italian and German. Therefore, bilinguals whose L1 and L2 have grammatical gender systems conceptualize the objects differently from monolingual speakers of their L1 and L2. The reason for this reduced effect of L1 in bilingual speakers of grammatical gender languages is not clear yet. It is suggested that knowing more languages may lead bilinguals to realize that grammatical gender assignments are arbitrary (Basetti 2011) or the inconsistent gender assignments in different languages may weaken the habitual gender assignment in bilinguals (Basetti and Nicoladis 2016).

The effects of learning a language with a grammatical gender system have been studied for a while now, but the exact mechanisms behind this effect require further research (Basetti and Nicoladis 2016). So far, the effect is found to be different for bilinguals with native speakers of grammatical gender languages and with native speakers of languages without a grammatical gender system. However, research showed inconsistent findings on whether speakers of genderless languages can be affected by L2 grammatical gender. Also, the factors that have been reported as affecting the conceptual shifts of bilinguals such as the age of acquisition in other domains have not been studied in the domain of grammatical gender. Thus, more studies are needed to understand the factors that may play a role in how L2 grammatical gender affects the object conceptualization of bilingual speakers.

4. VERBAL INTERFERENCE

Verbal interference is one of the widely used methods to examine the effect of language on cognition. It is a dual-task methodology in which participants are asked to remember and/or repeat some words or numbers while they are performing a task that may or may not require the use of language (Nedergaard, Wallentin and Lupyan 2022). This methodology was the first used to study working memory and its components that deal with verbal material (Nedergaard, Wallentin and Lupyan 2022; see also Baddeley 1992). The main assumption is that since the verbal rehearsal system is used for the interference task, it cannot be used for verbally encoding the visual stimuli (Athanasopoulos and Casaponsa 2020). Hence, under verbal interference, if performance on the main task decreases compared to the non-verbal interference condition, it can mean that language is used to complete the main task (Nedergaard, Wallentin and Lupyan 2022).

In their recent review, Nedergaard, Wallentin and Lupyan (2022) grouped the verbal interference tasks into four main categories: *syllable/word repetition*, *verbal memory*, *verbal shadowing*, and *judgment tasks*. The *syllable/word repetition* (also known as articulatory suppression) tasks were reported as the most widely used verbal interference task. Participants are asked to repeat nonsense syllabus or some words while they are completing the main task. In the other type of verbal interference, *verbal memory tasks*, participants are required to covertly rehearse the verbal or non-verbal material during the main task with a subsequent memory test. The issue that the authors raised about these kinds of tasks is that it is hard to understand at what stage of memory (i.e., encoding, maintenance, or retrieval stages) the effect of verbal interference occurs. In *verbal shadowing*, on the other hand, participants are asked to quickly repeat the verbal material they were given during the main task. The main difference between verbal shadowing and syllable/word repetition tasks is that the former requires perceiving and then producing the outcome simultaneously. The last category, *judgment tasks*, requires participants to make judgments about the presented stimulus (e.g., word/nonword judgment and rhyme judgment) while

they complete the main task.

Verbal interference methodology has been used to examine the effect of language on domains including memory, reasoning, categorization, and visuospatial cognition (Nedergaard, Wallentin and Lupyan). Verbal interference tasks, also, have been used in linguistic relativity studies to investigate whether differences in the nonlinguistic tasks among speakers of different languages are due to language affecting nonlinguistic representations or participants covertly verbalizing the stimuli. As mentioned in Chapter 1.2, some studies reported that under verbal interference, differences between speakers of different languages disappeared and concluded that people use language as a cognitive tool (e.g., Gennari et al. 2002; Gilbert et al. 2006, 2008; Winewar et al. 2007). For example, in one study, Frank et al. (2012) asked English speakers to complete number matching tasks under verbal shadowing and indirectly compared their performance with the performance of Pirahã speakers that was reported by Frank and colleagues (2008). They found that when verbal encoding of numbers is prevented, English speakers relied on similar estimation strategies as Pirahã speakers who do not have a number system for larger numbers. These findings suggest that lexical representation of numbers does not alter nonlinguistic number representation but rather when English speakers have access to them, they rely on numbers to solve the task. Also, in a study that examined similarity judgments of English and Italian speakers on motion events, Cardini (2010) found that in the verbal task, English and Italian speakers differed in their response with English speakers indicating the manner of the motion more. However, this difference diminished when they completed a nonlinguistic similarity judgment task under verbal shadowing (also see Gennari et al. 2002; Gilbert et al. 2006; Athanasopoulos and Bylund 2012; Athanasopoulos and Albright 2016; Trueswell and Papafragou 2010). As the effect of language was found to diminish when its online use is blocked, such findings suggest that language does not shape nonlinguistic cognition.

Additionally, in a study with German-English bilinguals, Athanasopoulos and his colleagues (2015) reported that, when access to one language was disrupted, the concepts of bilinguals switched toward the other language. In the non-verbal interference condition, monolingual speakers of German selected motion-completion alternates more than English monolinguals. Later, German-English bilinguals were asked to complete a similar matching task while repeating the three two-digit number strings, as in the aforementioned study by Athanasopoulos and Bylund (2013). Whereas bilinguals who took the verbal interference task in English selected motion-completion alternates more, bilinguals under German verbal interference selected motion-completion alternates less. These findings suggest that verbal interference does not block access to the general language ability. Rather, it blocks only the

specific language the verbal interference is given.

Findings that were obtained using the verbal interference methodology were considered as fitting well with the *label-feedback theory* that was proposed by Lupyan (2012; Athanasopoulos and Casaponsa 2020; Nedergaard, Wallentin and Lupyan 2022). The label-feedback theory suggests that the effect of language is diminished when language use is blocked because the effect of language on cognition is online. The effect of language is observed even in the nonlinguistic tasks that do not require explicit use of language because when a non-verbal stimulus is presented, the verbal representation of it is automatically activated and modulates cognition. As verbal interference prevents verbalization, it disrupts the online feedback between stimuli and rapid linguistic representations (Athanasopoulos and Casaponsa, 2020).

However, some researchers have reported that even under verbal interference, the difference between the speakers of languages with different structures did not disappear and interpreted their findings as language shapes nonlinguistic cognition. In a study, for example, Dolscheid and colleagues (2013) compared mental representations of the musical pitch of Dutch- and Farsi-speaking adults on a nonlinguistic task. Although both Dutch and Farsi use spatial metaphors for describing pitch, in Dutch, the pitches are described as high ("*hoog*") or low ("*lag*"), and in Farsi, on the other hand, thin ("*nāzok*") is used for high and thick ("*koloft*") is used for low pitches. Participants listened to different tones of pitches in the presence of lines that varied in height or thickness. Then, they were asked to sing the tones they heard. They found that whereas Dutch speakers' pitch estimates were affected by the height of the lines, Farsi speakers' pitch estimates were affected by the thickness of the lines. In order to eliminate the possibility that although the task was nonlinguistic, participants covertly used language, in the second study, they asked Dutch participants to take the same height-interference task under verbal interference. They reported that the performance of participants under verbal interference did not differ from the first study and interpreted their results as language affecting nonlinguistic cognition. Also, in another study, Phillips and Boroditsky (2003) asked Spanish and German speakers to rate the similarities of object-person pairs and to repeat randomly generated English letters. They found that even under verbal shadowing, grammatical gender affected the similarity judgments and Spanish and German speakers rate pairs with matching grammatical and biological gender as more similar.

Thus, in order to understand whether the effect of language due to the online use of the language in the task or because language affects nonlinguistic representations better, more studies with verbal interference methodology are needed.

5. CURRENT STUDY

5.1 Summary of the Literature Review and the Current Study

Although grammatical gender is one of the most studied domains in the scope of linguistic relativity, there are a lot of conflicting findings and unanswered questions such as the degree to which grammatical gender affects cognition. As previously mentioned, the effect of grammatical gender was examined by using explicit and implicit tasks. Although tasks such as the similarity judgment task were frequently used to reduce the explicit reference to grammatical gender, they still require participants to make an explicit decision. Implicit measures that do not require participants to make an explicit decision about the objects such as IAT and EAST are not common in the field. To my knowledge, these tasks were used only with linguistic stimuli to examine the object conceptualization of Polish (Maciuszek, Polak and Świątkowska 2019) and German (e.g., Bender, Beller and Klauer 2016a) speakers. The question of whether grammatical gender affects nonlinguistic implicit associations remains unanswered.

Only a small number of studies tested the influence of grammatical gender in the presence of another cue such as conceptual gender, and these studies reported conflicting findings. Whereas some studies found a significant effect of grammatical gender on conceptualization independent of the conceptual genders of the objects (e.g., Sato and Athanasopoulos 2018; Sato, Casaponsa and Athanasopoulos 2020), others found the effect of grammatical gender only when it is congruent with the conceptual gender and argued that it is the conceptual, not the grammatical gender that affects the object conceptualization (e.g., Bender, Beller and Klauer 2016a, 2018). Further, in a more recent study, by using objects that have matched or mismatched grammatical and conceptual gender, Casado, Palma and Paolieri (2021) examined the grammatical and conceptual gender interaction with two tasks that varied in grammatical gender saliency: *lexical decision task* and *gender decision task*. In the

lexical decision task, participants listened to the stimuli that were spoken either by a woman or man, and they were asked to decide whether each stimulus was a word or a pseudo-word. Only grammatical gender, not its interaction with conceptual gender, was found to significantly affect participants' response patterns. In the gender decision task, again, they listened to the stimuli but this time, they were asked to indicate the grammatical gender of each word. The authors reported the significant effect of grammatical gender along with significant grammatical gender and conceptual gender interaction. Specifically, Spanish speakers were faster to react when the grammatical and conceptual genders of the objects matched. The authors argued the activation of the grammatical gender in the task activated conceptual stereotypes related to the object. And they interpreted these findings as a transfer from grammatical gender to conceptual gender. Thus far, the question of whether the effect of grammatical gender is related to the conceptual gender of objects needs further research.

Additionally, although grammatical gender is considered an arbitrary system, the distinction is mainly based on gender. Studies found that bilinguals are more sexist when they are tested in their grammatical gender language (Wasserman and Weseley 2009) and individuals with higher sexist attitudes have more negative attitudes toward gender-neutral language (e.g., Sarrasin, Gabriel and Gygax 2012). However, to my knowledge, no study examined whether the individual differences in gender role attitudes affect the degree to which grammatical gender affects object conceptualization. Previous studies have shown that individuals' attitudes toward sexism affect how individuals conceptualize stereotypically feminine and masculine objects (e.g., Meagher 2017). Participants with more sexist attitudes were found to rate stereotypically feminine objects (e.g., beauty products) as more feminine and stereotypically masculine objects (e.g., hardware tools) as more masculine. Along with the task-dependent factors, further studies are needed to understand whether the relationship between grammatical gender and object conceptualization is affected by individual factors.

Whether learning a language with grammatical gender as a foreign language can affect the object conceptualization of bilingual speakers is another domain that has not been fully understood yet. Although researchers have not reached a consensus about the factors affecting it, most studies in different domains including motion events and color categorization have shown that the categorization of bilingual speakers shifts towards their L2. Nonetheless, not many studies examined this effect in the domain of grammatical gender, and the studies reported conflicting findings. Using a voice attribution task, some studies found that learning a grammatical gender L2 (e.g., Spanish) affects the object categorization of English (Kurinski and Sera

2011) and Hungarian speakers (Kurinski et al. 2016). With a sample consisting of L2 French speakers who have a variety of L1, on the other hand, Lambelet (2016) found that French grammatical gender did not affect the gender assignment patterns of L2 French speakers with a native language that does not have grammatical gender in the voice attribution task. In addition, although studies on the other domains examined the factors affecting the cognitive shift such as length of living in the L2-speaking country (e.g., Athanasopoulos 2009; Cook et al. 2006; Daller, Treffers-Daller and Furman 2011), the age of acquisition (e.g., Boroditsky 2001), and task type (e.g., Park 2020), only the effects of proficiency (Kurinski and Sera 2011) and L2 exposure (Kaushanskaya and Smith 2016) were examined in the scope of grammatical gender. Therefore, whether the grammatical gender of L2 affects the object conceptualization of L2 learners of a grammatical gender language and the factors that modulate these effects remain an open question.

Lastly, verbal interference is a widely used methodology in linguistic relativity research. However, there are not many studies that used this dual-task methodology to study the effect of grammatical gender on nonlinguistic cognition. To my knowledge, there are only two studies that used verbal interference and their findings are conflicting. In one study, Cubelli et al. (2011) found that under articulatory suppression, the effect of grammatical gender disappeared and concluded that grammatical gender affects only linguistic cognition. On the contrary, Phillips and Boroditsky (2003) reported that grammatical gender affected similarity rankings of participants, even under verbal interference thus grammatical gender affects nonlinguistic representations. However, one drawback of Phillips and Boroditsky's (2003) study is that the participants in this study were Spanish-English and German-English bilinguals, and the verbal interference task was in English. As previously mentioned, Athanasopoulos and his colleagues (2015) reported that verbal interference disturbs only the language in which verbal interference is given. Since Phillips and Boroditsky (2003) made verbal interference in English, perhaps they prevented access to only English, a language without grammatical gender, and their native languages, Spanish and German, were still accessible. Therefore, the effect they reported might not be interpreted as grammatical gender affecting nonlinguistic cognitive processes. To examine whether grammatical gender influences nonlinguistic object conceptualization, the number of studies that use verbal interference methodology should increase.

Considering these gaps in the literature, the current study aims to test a sample consisting of Turkish native speakers, French native speakers, and Turkish-French bilinguals to answer the following research questions:

1. Does conceptual gender affect how Turkish and French speakers conceptualize objects?

2. Does grammatical gender play a role in implicit and/or explicit gender conceptualization of native French speakers?

3. Does learning a grammatical gender language (French) as L2 affect object-related concepts of bilingual speakers?

4. Does the effect of grammatical gender emerge due to the online use of language, even when labeling is task-irrelevant?

5. Do individual differences in gender role attitudes modulate the way grammatical and conceptual gender affect object conceptualization?

To provide answers to these research questions, 4 different studies were conducted in the scope of this thesis.

5.1.1 Study I – Native Turkish Speakers

Study I examined how grammatical and conceptual gender affect the implicit and explicit object conceptualization of Turkish speakers, a genderless language. The hypothesis of Study I is as follows:

H.1.1. Grammatical gender would not affect the object conceptualization of Turkish speakers in neither implicit nor explicit tasks.

H.1.2. Conceptual gender of objects would affect the response patterns of Turkish speakers in both implicit and explicit measures.

H.1.2.1. In the Implicit Association Test, Turkish speakers would be slower and less accurate when the conceptual gender of the object is not congruent with the gender of the face (e.g., categorizing a skirt together with a male face) than when they are congruent (e.g., categorizing a skirt together with a female face).

H.1.2.2. In the Explicit Gender Attribution Task, Turkish speakers would assign genders to the objects consistent with their conceptual gender (e.g., they would assign the female gender to the skirt).

H.1.3. Individual differences in the attitudes towards gender roles would affect the relationship between conceptual gender and object conceptualization in both implicit and explicit tasks. Specifically, participants who are high in sexist attitudes would be affected by conceptual gender in both tasks more.

5.1.2 Study II – Native French Speakers

Study II examined the effect of grammatical and conceptual gender on the implicit and explicit object conceptualization of French speakers, a grammatical gender language. The hypothesis of Study II is as follows:

H.1.1. Grammatical gender would affect the response patterns of French speakers in both implicit and explicit tasks.

H.1.1. In the Implicit Association Test, they would be slower and less accurate when the grammatical gender of the object is not congruent with the gender of the face (e.g., tie [*cravate*] with a male face) than they are congruent (e.g., tie [*cravate*] with a female face).

H.1.1.3. In the Explicit Gender Attribution Task, they would attribute genders to objects consistent with their grammatical gender (e.g., they would assign the female gender to the tie).

H.1.2. The conceptual gender of the objects would affect the response patterns of French speakers in both implicit and explicit measures.

H.1.2.1. In the Implicit Association Test, they would be slower and less accurate when the conceptual gender of the object is not congruent with the gender of the face than they are congruent.

H.1.2.2. In the Explicit Gender Attribution Task, they would assign genders to objects consistent with their conceptual gender.

H.1.3. Grammatical and conceptual gender would affect object conceptualization independently.

H.1.4. Gender role attitudes participants have would play a role in the degree to which they are affected by grammatical and conceptual gender in both implicit and explicit tasks. Specifically, I expected participants with more sexist attitudes to be affected by conceptual gender more and participants with more egalitarian gender role attitudes to be affected by grammatical gender more in both tasks.

5.1.3 Study III – Turkish-French bilinguals

This study examined whether learning a grammatical gender language (i.e., French) can affect object-related concepts Turkish-French bilinguals have. Additionally, this study tested the factors, including the age of acquisition, years of speaking, L2

frequency, and L2 proficiency, that may affect the cognitive shift towards L2. The hypothesis of Study III is as follows:

H.1. Grammatical gender would affect the response patterns of Turkish-French bilinguals in both implicit and explicit tasks.

H.1.2. In the Implicit Association Test, they would be slower and less accurate when the grammatical gender of the object is not congruent with the gender of the face than they are congruent.

H.1.3. In the Explicit Gender Attribution Task, they would attribute genders to objects consistent with their grammatical gender.

H.1.4. I expected the effect of grammatical gender to be modulated with factors such as the age of acquisition, years of speaking, L2 frequency, and L2 proficiency. Specifically, I expected that participants who learned French at a younger age, speak it for a longer time and more frequently, with a higher French proficiency would be affected by grammatical gender more.

H.1.5. Conceptual gender of the objects would affect the response patterns of Turkish-French bilinguals in both implicit and explicit measures.

H.1.5.1. In the Implicit Association Test, they would be slower and less accurate when the conceptual gender of the object is not congruent with the gender of the face than they are congruent.

H.1.5.2. In the Explicit Gender Attribution Task, they would assign genders to objects consistent with their conceptual gender.

H.1.6. Grammatical and conceptual gender would affect object conceptualization independently.

H.1.7. Gender roles attitudes participants have would play a role in the degree to which they are affected by grammatical and conceptual gender in both implicit and explicit tasks. Specifically, I expected participants with more sexist attitudes to be affected by conceptual gender more and participants with more egalitarian gender role attitudes to be affected by grammatical gender more in both tasks.

5.1.4 Study IV – Verbal Interference

Study IV was conducted with another group of native French speakers to examine whether the influence of grammatical gender in the IAT was due to language affecting

nonlinguistic object conceptualization or the effect emerged because grammatical gender was activated during the task, even if the task itself does not require the strategic use of language. The hypothesis of Study IV is as follows:

H.1.1. As the participants take the verbal interference only in the Implicit Association Test, the effect of grammatical gender would diminish in the Implicit Association Test, but it would still affect the explicit gender assignment patterns in the Explicit Gender Attribution Task.

H.1.1.2. In the Explicit Gender Attribution Task, they would attribute genders to objects consistent with their grammatical gender.

H.1.2. Verbal interference would not affect the associations related to conceptual gender hence conceptual gender of the objects would affect the response patterns of French speakers in both implicit and explicit measures.

H.1.2.1. In the Implicit Association Task, they would be slower and less accurate when the conceptual gender of the object is not congruent with the gender of the face than they are congruent.

H.1.2.2. In the Explicit Gender Attribution Task, they would assign genders to objects consistent with their conceptual gender.

H.1.3. Grammatical and conceptual gender would affect object conceptualization independently in the explicit task.

H.1.4. Gender role attitudes participants have would play a role in the degree to which they are affected by conceptual gender in the implicit task and by both grammatical and conceptual gender in the explicit task. Specifically, I expected participants with more sexist attitudes to be affected by conceptual gender more and participants with more egalitarian gender role attitudes to be affected by grammatical gender more.

5.2 Study Materials

5.2.1 Stimuli Selection

The main stimuli used in the Implicit Association Test (IAT) and Explicit Gender Attribution Task (EGAT) were the pictures of clothing items and tools. The clothing category included clothes and accessories a person can put on (e.g., skirt, tie), and

the tool category included utensils and machines used for purposes such as repairing, cooking, and personal care (e.g., drill, tweezers; Table 5.1). These objects differed in terms of their conceptual gender (i.e., stereotypical gender associations; feminine, masculine, and gender-neutral) and grammatical gender in French (feminine and masculine). For the objects that were conceptually feminine or masculine, the conceptual and grammatical genders were congruent for half of the objects (e.g., skirt [*jupe*] is conceptually female and grammatically feminine), and incongruent for the other half (e.g., tie [*cravate*] was conceptually male but grammatically feminine). And whereas half of the conceptually gender-neutral objects were grammatically feminine (e.g., sock [*chaussette*]), the other half was grammatically masculine (e.g., gloves [*gants*]).

Table 5.1 Stimuli Set Used in the IAT and EGAT

English	French	Turkish	Grammatical gender	Conceptual gender
Clothing Items				
Ring	Bague	Yüzük	Feminine	Female
Skirt	Jupe	Etek	Feminine	Female
Shirt	Chemise	Gömlek	Feminine	Male
Tie	Cravate	Kravat	Feminine	Male
Watch	Montre	Saat	Feminine	Neutral
Sock	Chaussette	Çorap	Feminine	Neutral
Bag	Sac	Çanta	Masculine	Female
Swimsuit	Maillot	Mayo	Masculine	Female
Hat	Chapeau	Şapka	Masculine	Male
Suit	Costume	Takım elbise	Masculine	Male
Gloves	Gant	Eldiven	Masculine	Neutral
Winterhat	Bonnet	Bere	Masculine	Neutral
Tools				
Tweezers	Pince à épiler	Cımbız	Feminine	Female
Pan	Poêle	Tava	Feminine	Female
Axe	Hache	Balta	Feminine	Male
Drill	Perceuse	Matkap	Feminine	Male
Fork	Fourchette	Çatal	Feminine	Neutral
Spoon	Cuillère	Kaşık	Feminine	Neutral
Blender	Mixeur	Blender	Masculine	Female
Mixer	Batteur	Çırpıcı	Masculine	Female
Hammer	Marteau	Çekiç	Masculine	Male
Tape measure	Mètre à ruban	Metre	Masculine	Male
Scissors	Ciseaux	Makas	Masculine	Neutral
Nail clipper	Coupe-ongles	Tırnak makası	Masculine	Neutral

To select the stimuli, pictures of fifty objects (collected from *Bank of Standardized Stimuli* [BOSS; Brodeur et al., 2010] and the internet) were presented to Turkish and French native speakers and they were asked to assign a gender to these objects and name them. The objects that French speakers proposed words with opposite grammatical genders were excluded. Also, objects that most participants assigned a gender different from their stereotypical gender associations were excluded from

the stimuli list. For deciding the final stimuli list, a separate group of fifteen native French (11 males, 4 females; $M_{age} = 26.29$) and fifteen native Turkish speakers (9 males, 6 females; $M_{age} = 24.50$) were recruited. These participants were presented with forty pictures of objects, and they were asked to indicate which gender each of the objects reminded them of. The EGAT was a forced-choice task with female and male as the only options. This forced-choice task was chosen to reduce the possibility that participants' response patterns were affected by self-presentation artifacts. Participants were given three seconds to make their choice. In addition, French-speaking participants were asked to name the objects to be sure of the grammatical gender of the objects. For the final stimuli set, the objects with one predominant conceptual gender according to both language groups were kept. The objects with mixed responses from both groups were also kept as conceptually gender-neutral objects. Objects that were assigned female gender by twenty or more participants (out of thirty) were categorized as conceptually feminine objects. Objects that were assigned male gender by more than twenty-seven out of thirty participants were categorized as conceptually masculine objects. And objects that were assigned either a female or male gender by around nine to nineteen participants were categorized as conceptually gender-neutral objects. In the end, the final stimuli set consisted of twenty-four objects, equally distributed into six conditions.

A separate set of Generalized Linear Mixed Models (GLMMs) with Grammatical Gender (GG; feminine vs. masculine) and Conceptual Gender (CG; female vs. male) as fixed effects and Participant and Item as random intercepts were constructed for both Turkish and French participants to examine whether their response patterns were affected by conceptual and grammatical gender. Neither conceptual ($B =$ 21.16, $SE = 418.05$, $Z = 0.51$, $p = 0.96$) nor grammatical ($B =$ -1.86, $SE = 3.77$, $Z = 0.49$, $p = 0.62$) gender affected gender assignments of Turkish speakers for the conceptually gendered objects. Similarly, gender assignments of French speakers were not affected by either conceptual ($B = 1.40$, $SE = 3.12$, $Z = 0.45$, $p = 0.65$) or grammatical ($B = 1.16$, $SE = 1.87$, $Z = 0.62$, $p = 0.54$) gender. For conceptually gender-neutral objects, separate GLMMs with GG (feminine vs. masculine) as a fixed effect and Participant and Item as random intercepts were constructed for both Turkish and French participants. Again, Turkish participants' gender assignments were not affected by grammatical gender ($B = 0.56$, $SE = 0.44$, $Z = 1.28$, $p = 0.20$). However, although it was not significant, grammatical gender of the objects affected gender assignments patterns for conceptually gender-neutral items ($B = 1.20$, $SE =$ 0.63, $Z = 1.92$, $p = 0.054$).

The images of twenty-four Caucasian faces (12 female, 12 male) were taken from the Chicago Face Database (Ma et al., 2015) for using in the IAT. Female faces were

chosen based on their femininity ratings ($M = 5.53$, $SD = 0.14$), and male faces were chosen based on their masculinity ratings ($M = 5.11$, $SD = 0.16$) that were reported by the authors.

5.2.2 Implicit Association Test (IAT)

First developed by Greenwald et al. (1998), the Implicit Association Test (IAT) measures the strengths of automatic associations made by respondents (Greenwald et al., 2003). IAT aims to assess implicit attitudes of respondents without directly asking them and this prevents self-presentation artifacts (e.g., Greenwald et al., 2003). In a typical IAT, participants sort out a series of items into two groups. For example, to assess people's implicit associations towards genders and careers, in the first two parts, respondents classify stimuli into two categories (e.g., female vs. male; career vs. family). In the 3rd and 4th parts, respondents are asked to classify particular concepts together by using the same keys (e.g., Key E for female and career and Key I for male and family). The 5th part is the reverse of the 1st part, and the 6th and 7th parts are the reverse of the 3rd and 4th parts (e.g., Key E for female and family and Key I for male and career). The implicit associations are computed from the response speed and errors respondents make while classifying categories together (i.e., the difference between the critical blocks: Part 3 and 4 vs. Part 6 and 7). The core assumption is that respondents will be faster and more accurate when the sorting rules are consistent with their automatic associations or stereotypes. For example, if a participant associates the concept "family" with the female gender, this participant would be faster and more accurate in the trials which ask them to use the same key for family and female.

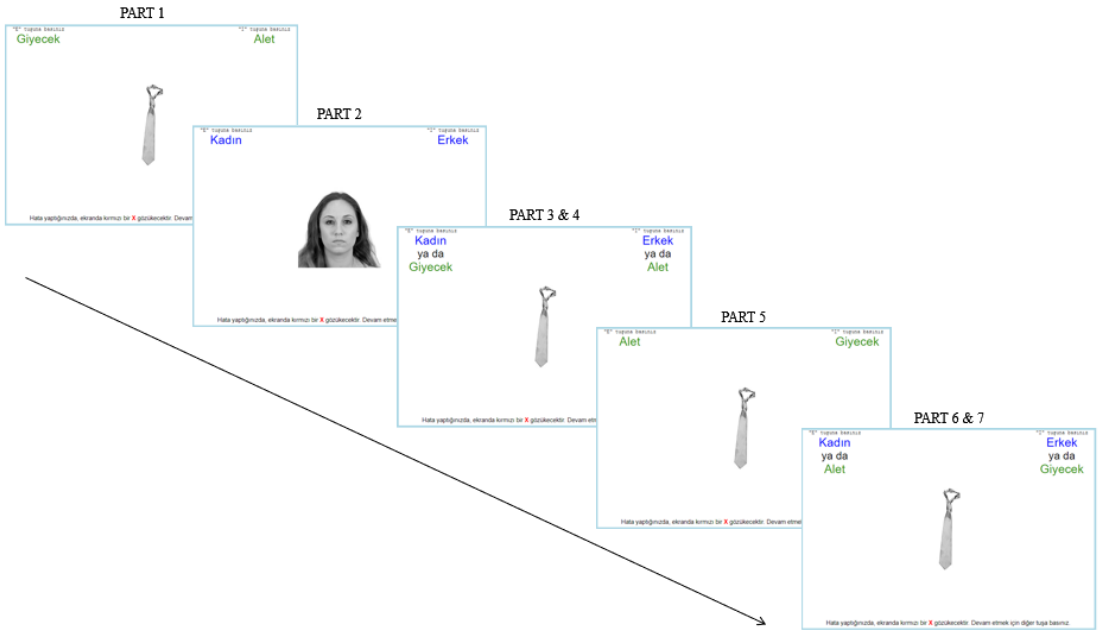
To my knowledge, the only research that assessed the effect of grammatical gender on object conceptualization using the IAT was conducted by Maciuszek, Polak and Świątkowska (2019; but see also Bender, Beller and Klauer 2016a for another study that used an implicit task). Although the study demonstrated that grammatical gender affects implicit conceptualization even when the information is irrelevant to the task, it should be noted, however, that Maciuszek, Polak and Świątkowska (2019) presented words instead of images. Thus, these words might have activated grammatical gender. Therefore, it is still unclear whether grammatical gender affects nonlinguistic implicit cognition even when participants are not prompted to think of genders or specific words. For this reason, in this study, a nonlinguistic version of the IAT was used.

The IAT for this study was created using Minno.js (Zlotnick et al., 2015) by using

the script available in the *Project Implicit* (Maimon, 2020) and was implemented on *Qualtrics*. As mentioned above, this modified IAT utilized pictures of objects and human faces (Figure 5.1). The faces were classified based on their gender (female and male faces) and objects were classified based on their category (tool or clothing items) which is unrelated to both their conceptual and grammatical gender. The IAT consisted of seven parts. The first part consisted of twenty-four trials, and it was a practice block with clothing items and tools: participants were asked to press "E" if the object is a clothing item ("*Giyecek*" in Turkish and "*Habillement*" in French) and "I" if the object is a tool item ("*Alet*" in Turkish and "*Outlis*" in French). The 2nd part, too, consisted of twenty-four trials and it was another practice part with faces: participants were asked to press "E" if it is a female face ("*Kadın*" in Turkish and "*Femme*" in French) and "I" if it is a male face ("*Erkek*" in Turkish and "*Homme*" in French). In the 3rd and 4th parts, participants were instructed to press "E" if they saw a clothing item or a female face, and "I" if they saw a tool or a male face. The 3rd and 4th parts are the critical blocks that included forty-eight trials each (i.e., 24 objects, 24 faces) and ninety-six trials total. The 5th part was the reverse version of the 1st part. The 6th and 7th parts were the reverse versions of the 3rd and 4th parts, where participants pressed "E" if they saw a tool or a female face, and "I" if they saw a clothing item or a male face. The order of classified concepts was randomized among participants so half of the participants categorized clothes with female faces and tools with male faces in the 3rd and 4th parts and tools with female faces and clothes with male faces in the 6th and 7th parts and it was the opposite for the other half. Although there was no time restriction, participants were instructed to answer as quickly and accurately as much as possible. The IAT took about four minutes to complete.

Different from the original IAT analysis, this study analyzed the difference between the object categories in terms of gender congruency (i.e., whether grammatical gender or conceptual gender are congruent or incongruent with the gender of the face). This kind of analysis method was chosen because the conceptual and grammatical gender of the objects in each category (i.e., tools and clothing items) were manipulated. And the aim was to examine how the conceptual and/or grammatical gender affects object conceptualization. If participants are affected by conceptual gender, they are expected to be faster and more accurate in the conceptual gender congruent trials (e.g., skirt + female face) than in the incongruent trials (e.g., skirt + male face). Similarly, if grammatical gender affects their responses, they would be faster and more accurate when the grammatical gender of the object matched the gender of the face (e.g., skirt [*jupe*] + female face) than when it is mismatched (e.g., skirt [*jupe*] + male face).

Figure 5.1 Design of the IAT used in Study I



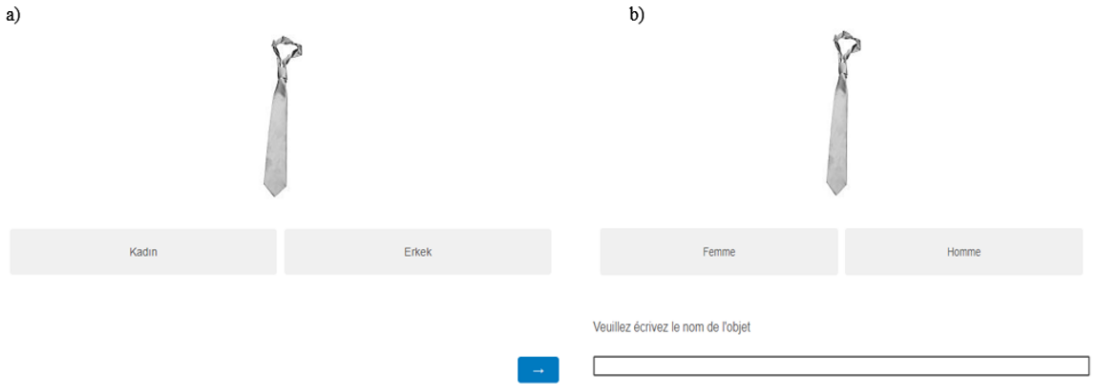
The same design was translated into French and used in Study II, III, and IV. The IAT consisted of seven parts and between the parts, participants read the instructions for the following part.

5.2.3 Explicit Gender Attribution Task (EGAT)

The Explicit Gender Attribution Task (EGAT) is an adaptation of the gender attribution tasks that was developed for this thesis. In this task, participants were presented with the same set of object pictures as appeared in the IAT, one by one in random order. They were asked to decide whether each object reminded them of a woman or a man. The EGAT was a forced-response task, so participants needed to attribute either of the genders to the objects. There were no time restrictions, and participants completed the task at their own pace.

The order of the IAT and EGAT was not randomized because the main purpose of the IAT was to assess the effect of grammatical and conceptual gender when they were not salient to participants. Completing the EGAT before the IAT may activate object-related associations (both conceptual and linguistic) and affect the performance in the IAT because, in the EGAT, participants were required to make an explicit decision about the gender of the objects and name the objects (only in Study II and III, see Figure 5.2).

Figure 5.2 Design of the EGAT



a) EGAT that was used in Study I and IV. Participants only were asked to indicate whether the object they see reminds them of a female ("*Kadın*" in Turkish and "*Femme*" in French, or a male "*Erkek*" in Turkish and "*Homme*" in French. b) The EGAT that was used in Study II and III. Along with assigning a gender to objects, participants were instructed to write the name of the object.

5.2.4 Gender Role Attitude Scale (GRAS)

The GRAS was originally developed by García-Cueto and colleagues (2015) to assess attitudes towards gender roles of both females and males in young Spanish adults. The scale consists of twenty items (e.g., Boys have the same obligations to help with household chores as girls) that are rated on a Likert scale of 1-5 (Totally agree, Totally disagree). The items are divided into two categories: transcendent attitudes vs. sexist attitudes and these categories are divided into three subareas: family, social interrelations, and employment. In the original study, the alpha value of the scale was found .99. Scores between 1-2.99 are thought to be sexist gender role attitudes, and scores between 3-5 indicate egalitarian gender role attitudes (Cakiroglu and Harmanci Seren 2022).

In Study I, Turkish participants completed the Turkish version of the GRAS (Gender Roles Attitudes Scale - Turkish Version GRAS-TR; Cakiroglu and Harmanci Seren 2022). The Cronbach alpha coefficient of the Turkish version of the scale is .87 (Cakiroglu and Harmanci Seren 2022). There was no French adaptation of GRAS, and thus the scale was translated into French for this study by a native French speaker (see Appendix A for the French version and Appendix B for the English version). Higher scores on the scale mean higher egalitarian gender role attitudes.

6. STUDY I - NATIVE TURKISH SPEAKERS

The aim of Study I is to confirm that conceptual gender (CG), but not the grammatical gender (GG) of French, affects the implicit and explicit object conceptualization in native Turkish speakers. As Turkish lacks grammatical gender, I hypothesized that only conceptual gender (i.e., gender stereotypes) would affect the way Turkish speakers conceptualize objects. I expected Turkish speakers to be *less accurate* and *slower* in the CG incongruent trials than in the CG congruent trials in the IAT. In other words, Turkish speakers would struggle more when sorting conceptually feminine objects (e.g., skirt) with male faces and conceptually masculine objects (e.g., tie) with female faces (i.e., CG incongruent trials), than when sorting feminine objects with female faces and masculine objects with male faces (i.e., CG congruent trials). The study also examined whether individual differences in gender role attitudes play a role in how CG influences Turkish speakers. I hypothesized that individual differences in gender role attitudes would modulate the degree to which CG affects object conceptualization. I expected participants who were high in sexist gender role attitudes to be affected by the CG of the object more.

6.1 Participants

The data were collected from fifty-four native Turkish speakers living in Turkey. Three participants who reported knowing French were excluded from the data. Following the recommendation of Greenwald and colleagues (2003), I also removed one participant who responded faster than 300 ms to more than 10 percent of the trials. The final dataset consisted of fifty native Turkish speakers (*age range*: 18-31 years; $M_{age} = 24.17$; $SD_{age} = 3.40$; 25 females, 25 males). Although twenty-seven of these participants reported being fluent at least in English, six of them reported some knowledge of another language with grammatical gender (German, Russian, Bulgarian, Italian). Nevertheless, none of them were fluent in this grammatical gender

language. Participants were recruited through advertisements on social media as well as word of mouth and received a gift card for their participation.

6.2 Materials and Procedure

Participants completed the study online by using their own computers. After reading the consent form (see Appendix H for the Turkish and Appendix J for the English translation.), and giving their consent to participate in the study, they first completed the *Implicit Association Test (IAT)*. Then, they filled out a demographic form that included questions such as their age, gender, and native language (see Appendix C for the Turkish version and Appendix E for the English translation). Their gender role attitudes were assessed by the *Gender Role Attitudes Scale - Turkish Version (GRAS-TR*; see Appendix B for the English version of the scale). Lastly, they took the *Explicit Gender Attribution Task (EGAT)*. Finally, participants were given the Debriefing Form (see Appendix M for the Turkish version and Appendix O for the English translation) that explained the true purpose of the project. All the materials were given in Turkish, and the entire procedure lasted around fifteen minutes.

6.3 Results

In both the IAT and EGAT, trials with conceptually gendered objects and trials with conceptually gender-neutral objects were analyzed separately. In the following sections, the results of GRAS-TR are first presented. Then, the results of IAT and EGAT with conceptually gendered objects and then with conceptually gender-neutral objects are reported. The data were analyzed using *R* (http://www.R-project.org/) and *RStudio* (http://www.rstudio.com/).

6.3.1 Gender Role Attitudes Scale - Turkish Version (GRAS-TR)

The GRAS-TR was found to be reliable ($\alpha = 0.88$). The participants obtained a high score (*score range* = 2.55 – 4.9; $M = 4.04$; $SD = 0.64$) which indicates that overall, they have egalitarian gender role attitudes.

6.3.2 Conceptually Gendered Objects

6.3.2.1 Implicit Association Test (IAT)

As recommended by Greenwald et al. (2003), ten responses with latencies longer than 10,000 ms were excluded from the data as outliers (one data point from ten different participants). Table 6.1 summarizes the error rates and reaction times (RTs) in the IAT for conceptually gendered objects. The greater numbers indicate more errors and a slower response rate.

Table 6.1 Descriptive Statistics of Performance in the IAT for Conceptually Gendered Objects

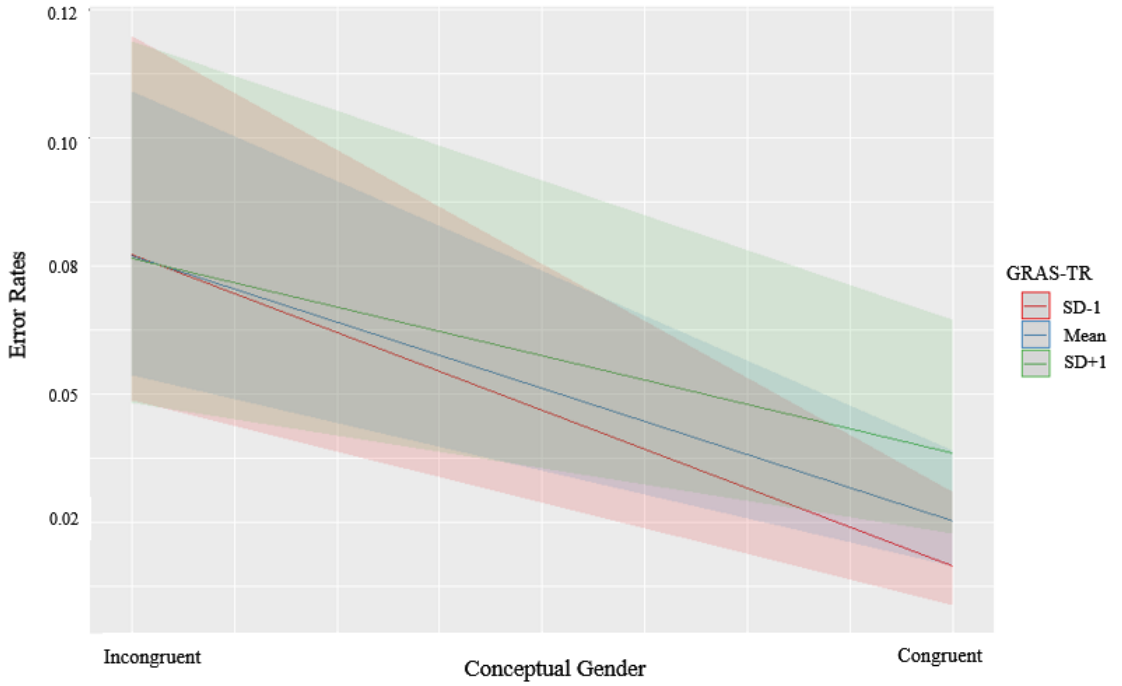
	GG Congruent		GG Incongruent		CG Congruent		CG Incongruent	
	mean	*SD*	*mean*	*SD*	*mean*	*SD*	*mean*	*SD*
Error	0.07	0.26	0.07	0.26	0.04	0.20	0.11	0.31
RT	1019.28	749.95	1015.16	757.42	955.61	624.27	1080.06	859.77
$N = 50$								

Error Rates Table 6.2 summarizes all the GLMMs that were constructed to predict error rates. First, a GLMM was constructed with GG Congruency (Congruent vs. Incongruent) and CG Congruency (Congruent vs. Incongruent) as fixed effects, and Participant and Item as random intercepts (Model 1a). CG Congruency but not GG Congruency affected the error rates. Specifically, native Turkish speakers made more mistakes when they faced an CG incongruent trial - pairing female faces and conceptually masculine objects (e.g., tie) into one category, and male faces and feminine objects (e.g., skirt) into the other category. Then, the GG Congruency*CG Congruency interaction was added to the model (Model 1b). The main effect of CG Congruency remained significant. However, neither the main effect of GG Congruency nor the GG Congruency*CG Congruency interaction was found significant. To examine whether the gender role attitudes of participants modulate how they are affected by GG Congruency or CG Congruency, GRAS-TR and its interactions with GG Congruency and CG Congruency were included in the model (Model 1c). Again, CG Congruency remained significant with participants making more mistakes when the conceptual gender of the object and the gender of the face were incongruent. No significant effect of GG Congruency, GRAS-TR, or the GG Congruency*GRAS-TR interaction was found. On the other hand, the CG Congruency*GRAS-TR interaction was significant. The CG Congruency affected the error rates most when participants had relatively high sexist attitudes, and these participants were more accurate than participants with lower sexist attitudes when sorting the object into a CG congruent category (Figure 6.1).

Table 6.2 GLMMs for Predicting Error Rates in the IAT for Conceptually Gendered Objects

	B	*SE*	*Z*	*p*	*IAC*	*BIC*
Model 1a					1528.26	1558.60
GG Congruency	0.02	0.15	0.12	0.906		
CG Congruency	-1.10	0.15	-7.26	<0.001		
Model 1b					1530.25	1566.66
GG Congruency	0.02	0.15	0.10	0.918		
CG Congruency	-1.10	0.15	-7.26	<0.001		
GG Congruency*CG Congruency	-0.03	0.56	-0.06	0.954		
Model 1c					1526.79	1575.33
GG Congruency	0.00	0.15	-0.02	0.982		
CG Congruency	-1.17	0.16	-7.36	<0.001		
GRAS-TR	0.22	0.16	1.39	0.165		
GG Congruency*GRAS-TR	0.16	0.15	1.03	0.302		
CG Congruency*GRAS-TR	0.44	0.18	2.46	0.014		
$N = 50$						

Figure 6.1 The effect of interaction between GRAS-TR and CG congruency on the error rates in the IAT for conceptually gendered objects



The lines indicate the error rates of participants who were low (SD+1), medium (Mean), or high (SD-1) in confirming sexist attitudes based on the GRAS-TR. The ribbons represent the standard errors. The higher numbers on the Y-axis indicate more mistakes. $N = 50$.

Reaction Times (RTs) Table 6.3 summarizes all the LMMs that were constructed to predict the reaction times. To predict the RTs of native Turkish speakers, a LMM using the same set of fixed and random effects was conducted (Model 2a). GG Congruency did not affect RTs; however, CG Congruency significantly affected RTs. Thus, participants were slower in the CG incongruent trials. Then, the GG Congruency*CG Congruency interaction was added to the model (Model 2b). Whereas the main effect of GG Congruency and the GG Congruency*CG Congruency interaction were not found significant, the main effect of CG Congruency remained significant. When GRAS-TR and its interactions with CG Congruency and GG Congruency were again included in the model (Model 2c), only the main effect of CG Congruency was significant.

Table 6.3 LMMs for Predicting RTs for Conceptually Gendered object

	B	***SE***	***t***	***p***	***IAC***	***BIC***
Model 2a					50957.43	50993.84
GG Congruency	5.51	24.62	0.22	0.823		
CG Congruency	-127.47	24.62	-5.18	<0.001		
Model 2b					50948.96	50991.44
GG Congruency	5.51	24.62	0.22	0.823		
CG Congruency	-127.47	24.62	-5.18	<0.001		
GG Congruency*CG Congruency	-10.33	75.42	-0.14	0.893		
Model 2c					50934.8	50989.42
GG Congruency	5.50	24.63	0.22	0.823		
CG Congruency	-127.44	24.63	-5.17	<0.001		
GRAS-TR	-58.67	41.39	-1.42	0.163		
GG Congruency*GRAS-TR	-17.39	24.63	-0.71	0.480		
CG Congruency*GRAS-TR	14.72	24.63	0.60	0.550		
$N = 50$						

6.3.2.2 Explicit Gender Attribution Task (EGAT)

Table 6.4 summarizes the gender assignment patterns of participants in the EGAT for conceptually gendered objects. The greater numbers indicate that they assigned the female gender to objects more and the lower numbers indicate they assigned the male gender to objects more.

Table 6.5 summarizes all the GLMMs that were constructed to predict the gender assignment patterns of participants. A GLMM predicting explicit gender attribution was constructed with GG (Feminine vs. Masculine) and CG (Female vs. Male) as fixed effects and Item as random intercept (Model 3a). For a better model fit, Participant was not included as a random intercept. The way participants assigned

genders to objects was significantly affected by the CG meaning that they assigned female to objects with feminine conceptual gender, and male to conceptually masculine objects. GG of the object did not significantly affect gender assignment. When GG*CG interaction was included in the model (Model 3b) the main effect of CG remained significant. However, neither GG nor the GG*CG interaction was significant. For assessing how gender role attitudes affected explicit gender attributions, GRAS-TR and its interactions with GG and CG were included in the model (Model 3c). Again, only the main effect of CG was significant with the female gender being attributed to conceptually female objects and the male gender being attributed to conceptually male objects.

Table 6.4 Descriptive Statistics for Gender Assignment Patterns in the EGAT for Conceptually Gendered Objects

Grammatically feminine		Grammatically masculine		Conceptually feminine		Conceptually masculine	
mean	*SD*	*mean*	*SD*	*mean*	*SD*	*mean*	*SD*
0.47	0.50	0.51	0.50	0.92	0.27	0.06	0.24
$N = 50$							

Table 6.5 GLMMs for Predicting Gender Assignments in EGAT for Conceptually Gendered Objects

	B	***SE***	***Z***	***p***	***IAC***	***BIC***
Model 3a					393.55	412.29
GG	-0.75	0.53	-1.43	0.153		
CG	5.85	0.56	10.40	<0.001		
Model 3b					395.52	418.94
GG	-0.76	0.52	-1.44	0.149		
CG	5.85	0.56	10.45	<0.001		
GG*CG	0.19	1.05	0.18	0.856		
Model 3c					394.49	427.28
GG	-0.77	0.53	-1.45	0.146		
CG	5.94	0.57	10.44	<0.001		
GRAS-TR	0.21	0.15	1.46	0.145		
GG*GRAS-TR	-0.48	0.29	-1.67	0.096		
CG*GRAS-TR	0.05	0.30	0.17	0.863		
$N = 50$						

6.3.3 Conceptually Gender-Neutral Objects

6.3.3.1 Implicit Association Test

Table 6.6 summarizes the error rates and reaction times of participants in the IAT for conceptually gender-neutral objects. The greater numbers indicate more errors and a slower response rate.

Table 6.6 Descriptive Statistics for Performance in the IAT for Conceptually Gender-Neutral Objects

	GG Congruent		GG Incongruent	
	mean	*SD*	*mean*	*SD*
Error	0.08	0.27	0.08	0.28
RT	1031.84	749.76	1021.93	711.08
$N = 50$				

Error rates Table 6.7 summarizes all the GLMMs that were constructed to predict the error rates. To predict the error rates for conceptually gender-neutral objects, a GLMM with GG Congruency (Congruent vs. Incongruent) as a fixed effect, and Participant and Item as random intercepts was constructed (Model 4a). No significant effect of GG Congruency on error rates was found. When GRAS-TR and its interaction with GG Congruency were included in the model (Model 4b) again, no effect was significant. Therefore, the error rates of participants for conceptually gender-neutral objects were not affected by any variables.

Table 6.7 GLMMs for Predicting Error Rates in the IAT for Conceptually Gender-Neutral Objects

	B	***SE***	***Z***	***p***	***IAC***	***BIC***
Model 4a					855.48	876.99
GG Congruency	-0.11	0.18	-0.57	0.568		
Model 4b					858.21	890.47
GG Congruency	-0.10	0.19	-0.56	0.578		
GRAS-TR	-0.19	0.17	-1.10	0.271		
GG Congruency*GRAS-TR	0.01	0.18	0.05	0.958		
$N = 50$						

Reaction Times Table 6.8 summarizes all the LMMs that were constructed to predict the RTs. To predict the RTs of participants, a LMM using the same set of fixed and random effects as Model 4a was constructed (Model 5a). GG Congruency did not affect the RTs of participants. Also, when GRAS-TR and its interaction

with GG Congruency were included in the model (model 5b) no significant main effects of GG Congruency and GRAS and the interaction between them were found.

Table 6.8 LMMs for Predicting RTs in the IAT for Conceptually Gender-Neutral Objects

	B	***SE***	***t***	***p***	***IAC***	***BIC***
Model 5a					25352.78	25379.67
GG Congruency	9.98	32.63	0.31	0.760		
Model 5b					25320.44	25358.07
GG Congruency	10.45	32.66	0.32	0.749		
GRAS-TR	-81.48	48.19	-1.69	0.097		
GG Congruency*GRAS-TR	-3.63	32.67	-0.11	0.912		
$N = 50$						

6.3.3.2 Explicit Gender Attribution Task

Table 6.9 summarizes the gender assignment patterns of participants in the EGAT for conceptually gender-neutral objects. The higher numbers indicate that they assigned female gender to more objects and the lower numbers indicate they assigned male gender to more objects.

Table 6.9 Descriptive Statistics for Gender Assignment Patterns in the EGAT for Conceptually Gender-Neutral Objects

Grammatically feminine		Grammatically masculine	
mean	*SD*	*mean*	*SD*
0.58	0.49	0.39	0.49
$N = 50$			

Table 6.10 summarizes all the GLMMs that were constructed to predict the gender assignment patterns of participants in the EGAT. A GLMM predicting explicit gender attribution was constructed using the same set of fixed and random effects (Model 6a). GG was found to significantly affect participants' gender assignment. Participants assigned genders to objects consistent with their grammatical gender in French. After GRAS-TR and GG*GRAS-TR interaction were added (Model 6b), the main effect of GG remained significant. However, no significant effects of GRAS-TR and GG*GRAS-TR interaction were found.

Table 6.10 GLMMs for Predicting Gender Assignment Patterns in the EGAT for Conceptually Gender-Neutral Objects

	B	***SE***	***Z***	***p***	***IAC***	***BIC***
Model 6a					542.67	558.63
GG	0.83	0.32	2.59	0.010		
Model 6b					545.67	569.62
GG	0.83	0.32	2.59	0.010		
GRAS-TR	-0.08	0.12	-0.63	0.528		
GG*GRAS-TR	-0.16	0.21	-0.76	0.445		
$N = 50$						

6.4 Discussion

Study I examined the factors affecting how native speakers of Turkish conceptualize objects. As expected, for the conceptually gendered objects, both in the implicit and explicit measures, only conceptual gender affected the response patterns of participants. In the IAT, participants were less accurate and slower in the conceptual gender incongruent trials. Also, in the EGAT, they assigned gender to the objects in a way that was consistent with the conceptual genders of the objects. Participants' gender role attitudes affected how CG congruency influenced their response patterns in the IAT but not in the EGAT. In particular, participants with relatively high sexist attitudes found CG congruent trials easier to pair together. As the only gender distinctions familiar to Turkish speakers should be associations based on gender stereotypes, not grammatical gender but conceptual gender intervened with their performance.

However, unlike what was expected, individual differences in gender role attitudes did not affect how they assigned gender in the EGAT. One reason why gender role attitudes influenced the degree to which they were affected by CG in the IAT but not in the EGAT can be the difference in the nature of the tasks. The IAT assessed the implicit associations by comparing how easily they pair concepts together. Thus, in the IAT, participants were not asked to make any explicit decision about the gender of the objects. Therefore, for people with higher sexist role attitudes, the gender distinction may be more salient, and they may be more prone to the effect of conceptual gender because their readily presumed gender associations made it easier to sort conceptual gender congruent trials (Bem, 1981; 1993). And as the stereotypical gender associations are less salient for people with more egalitarian gender role attitudes, the conceptual gender congruency affected their response patterns less. In

the EGAT, on the other hand, participants were required to make an object classification based on gender. Therefore, the concept of gender was more salient, and this may have primed the stereotypical gender associations of participants, independent of their gender attitudes. As the only available cue for Turkish participants to base their decisions on was the conceptual gender, they assigned genders to objects consistent with their conceptual gender.

For conceptually gender-neutral objects, whereas, in the IAT, GG or gender role attitudes did not have any significant effect on the response patterns, Turkish speakers assigned genders to objects consistent with their GG in French in the EGAT. Although this finding seems odd, it indeed is consistent with previous studies reporting that English speakers attributed gender to inanimate objects in line with Spanish grammatical gender (e.g., Sera, Berge and del Castillo Pintado 1994; Sera et al. 2002). Sera and colleagues (1994; 2002) suggested that these response patterns of English speakers indicate that Spanish grammatical gender is not fully arbitrary but rather, has some semantic basis that happen to be shared by speakers of other languages. The current study provides additional evidence for this suggestion.

In sum, as expected, both in the IAT and EGAT, only the CG affected how native Turkish speakers conceptualize conceptually gendered objects. Also, whereas individual differences in the gender role attitudes modulated the degree to which participants were implicitly influenced by CG, gender role attitudes did not have any effect on the explicit gender assignment of participants. Lastly, neither GG nor gender role attitudes affected the response patterns of participants in the gender-neutral condition in the IAT. However, in the EGAT, participants assigned genders to objects in line with the French grammatical gender, although they were not familiar with French grammatical gender. This result may indicate that another shared categorical property of objects (e.g., round-angular, light-heavy; Sera et al. 2002), which was not controlled in the study caused this effect.

7. STUDY II - NATIVE FRENCH SPEAKERS

As previously mentioned, the effect of grammatical gender on object conceptualization has been widely studied in the scope of the language-thought interaction. So far, most studies found that speaking a grammatical gender language causes native speakers of that language to conceptualize the objects in line with the grammatical gender (e.g., Sera, Berge and del Castillo Pintado 1994; Sera et al. 2002; Ramos and Roberson 2011; Cubelli et al. 2011). However, the degree to which grammatical gender affects cognition has not been fully understood yet. The current study aimed to examine the effect of grammatical gender on implicit and explicit object conceptualization in the presence of another cue, conceptual gender. Additionally, whether individual differences in the gender role attitudes have any impact on how grammatical or conceptual gender affects object conceptualization was examined. I expected grammatical gender and conceptual gender to affect the object conceptualization of French speakers both in the IAT and the EGAT. In the IAT, French speakers would be slower and less accurate when either the grammatical or conceptual gender of the object is incongruent with the gender of the face. In the EGAT, they would assign genders to objects in line with grammatical or conceptual gender. Grammatical and conceptual gender would affect object conceptualization independent of each other. In other words, I expected participants to conceptualize grammatically feminine objects as more feminine regardless of the conceptual gender of the objects and vice versa. Lastly, I hypothesized that participants' gender role attitudes would affect how they are affected by grammatical and conceptual gender. In particular, participants who are high in the sexist gender role attitudes would be affected by conceptual gender more and participants with more egalitarian gender role attitudes would be affected by the grammatical gender of the objects more.

7.1 Participants

The data were collected from fifty-one native speakers of French living in France through the participant recruitment system *Prolific* (https://www.prolific.co). Following the same exclusion criteria as Study I, I excluded one participant who responded faster than 300 ms to more than 10 percent of the trials. The final dataset consisted of fifty native French speakers (*age range* = 18-30 years; $M_{age} = 23.54$; $SD_{age} = 3.26$; 25 female, 23 male; 2 participants chose the "*Je préfère ne pas répondre*" (I prefer not to indicate) option). All participants indicated French as their native language. None of them was a monolingual speaker of French, and they all spoke at least English as their foreign language. Although fifteen participants reported knowing additional languages (German, Spanish, Italian, Russian, Japanese, Korean, Hungarian, Catalan and Arabic), none of them reported being fluent in those languages. They were paid on Prolific for their participation.

7.2 Materials and Procedure

The procedure was largely the same as in Study I. All study materials used in Study I were translated into French by a native French speaker (see Appendices A, D, I and N for French versions and Appendices B, E, J and O for the English translation of forms). The only difference in the experimental procedure was that in the EGAT, in addition to gender assignments, they were asked to write the names of the objects. In other words, they wrote the French word corresponding to each object, just after assigning gender to that object. There was no French adaptation of GRAS, and thus the scale was also translated into French for this study by the same native French speaker. All the materials were given in French and the entire procedure lasted around fifteen minutes.

7.3 Results

In both the IAT and EGAT, trials with conceptually gendered objects and trials with conceptually gender-neutral objects were analyzed separately. In the following sections, first the results of GRAS are presented. Then, the results of IAT and EGAT with conceptually gendered objects and then with conceptually gender-neutral ob-

jects are reported. The data were analyzed using *R* (http://www.R-project.org/) and *RStudio* (http://www.rstudio.com/).

7.3.1 Gender Role Attitudes Scale (GRAS)

The GRAS was found to be a reliable scale for the French-speaking participants (α = 0.89). Participants, overall, had a high score (*score range* = 2.2 – 5; M = 4.47; SD = 0.64), which indicates that participants have egalitarian gender role attitudes.

7.3.2 Conceptually Gendered Objects

7.3.2.1 Implicit Association Test (IAT)

Following the exclusion criteria used in Study I, four responses with reaction time above 10,000 ms were removed as outliers (three data points from a participant and one data point from another participant). Table 7.1 summarizes the error rates and reaction times of participants in the IAT for conceptually gendered objects. The greater numbers indicate more error and a slower reaction time.

Table 7.1 Descriptive Statistics of Performance in the IAT for Conceptually Gendered Objects

	GG Congruent		GG Incongruent		CG Congruent		CG Incongruent	
	mean	*SD*	*mean*	*SD*	*mean*	*SD*	*mean*	*SD*
Error	0.08	0.26	0.10	0.30	0.04	0.20	0.13	0.34
RT	848.11	533.88	861.00	564.22	815.46	561.46	893.15	534.06
N = 50								

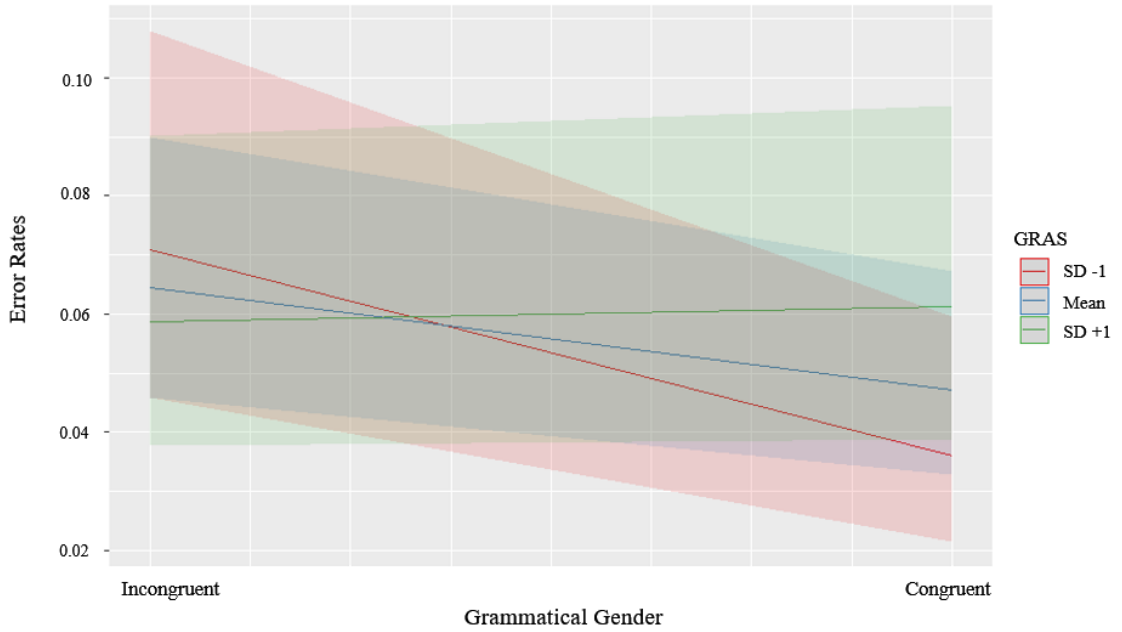
Error Rates Table 7.2 summarizes all the GLMMs for predicting error rates. As in the case of Study I, to predict the error rates, a GLMM was constructed with GG Congruency (Congruent vs. Incongruent), and CG Congruency (Congruent vs. Incongruent) as fixed effects, and Participant and Item as random intercepts (Model 1a). Both GG Congruency and CG Congruency affected the error rates. Specifically, French speakers made more mistakes when they faced incongruent trials - sorting female faces and grammatically/conceptually masculine objects into one category, and male faces and feminine objects into the other category. Then, the GG Congruency*CG Congruency interaction was added to the model (Model 1b). Whereas the GG Congruency*CG Congruency interaction was not significant, the main ef-

fects of GG Congruency and CG Congruency remained significant. To examine the influence of gender role attitudes on the degree to which participants are affected by GG and CG Congruency, GRAS and its interactions with GG Congruency and CG Congruency were included in the model (Model 1c).Gender role attitudes did not significantly affect participants response patterns. However, the main effects of GG Congruency and CG Congruency were significant. Participants made more mistakes both in the GG and CG incongruent trials. Additionally, the significant GG Congruency*GRAS and CG Congruency*GRAS interactions suggested that GG and CG Congruency affected participants with less egalitarian gender role attitudes more. In other words, participants with relatively high sexist attitudes made more mistakes when GG (Figure 7.1) or CG (Figure 7.2) was not congruent with the gender of the face, and they were more accurate when GG or CG was congruent with the gender of the face.

Table 7.2 GLMMs for Predicting Error Rates in the IAT for Conceptually Gendered Objects

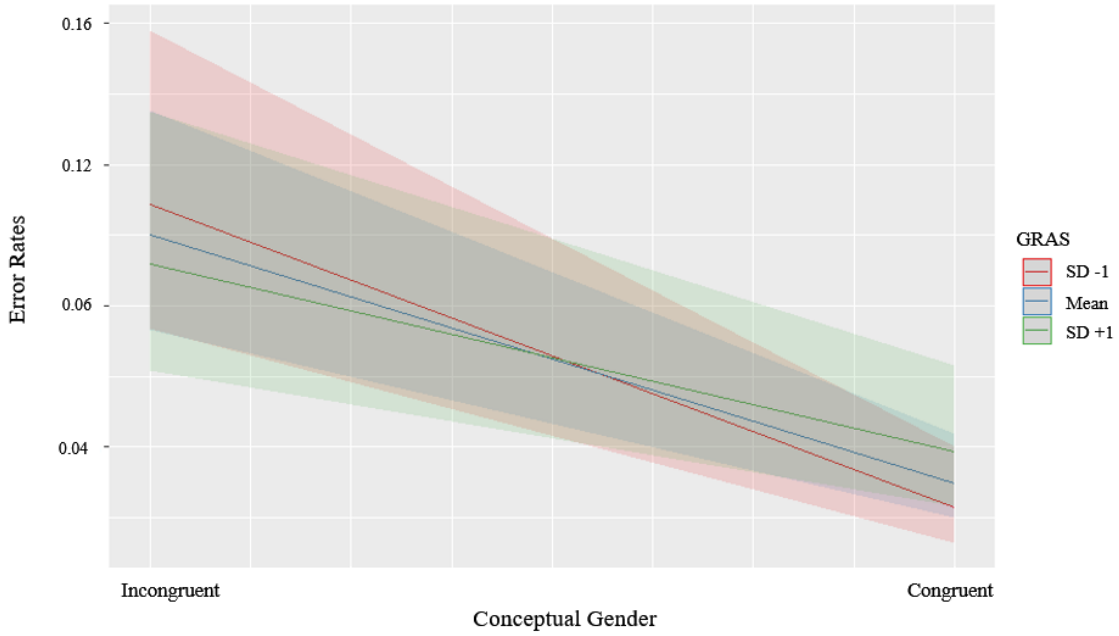
	B	***SE***	***Z***	***p***	***IAC***	***BIC***
Model 1a					1712.02	1742.37
GG Congruency	-0.32	0.14	-2.26	0.024		
CG Congruency	-1.27	0.15	-8.69	<0.001		
Model 1b					1713.98	1750.40
GG Congruency	-0.33	0.15	-2.24	0.025		
CG Congruency	-1.27	0.15	-8.67	<0.001		
GG Congruency*CG Congruency	-0.11	0.50	-0.21	0.832		
Model 1c					1705.87	1754.43
GG Congruency	-0.33	0.14	-2.34	0.019		
CG Congruency	-1.29	0.15	-8.69	<0.001		
GRAS	0.09	0.14	0.63	0.531		
GG Congruency*GRAS	0.38	0.14	2.68	0.007		
CG Congruency*GRAS	0.37	0.17	2.15	0.032		
$N = 50$						

Figure 7.1 The effect of the interaction between GRAS and GG on the error rates in the IAT for conceptually gendered objects



The lines indicate the error rates of participants who were low (SD+1), medium (Mean), or high (SD-1) in confirming sexist attitudes based on the GRAS. The ribbons represent the standard errors. The higher numbers on the Y-axis indicate more mistakes. $N = 50$.

Figure 7.2 The effect of the interaction between GRAS and CG on the error rates in the IAT for conceptually gendered objects



The lines indicate the error rates of participants who were low (SD+1), medium (Mean), or high (SD-1) in confirming sexist attitudes based on the GRAS. The ribbons represent the standard errors. The higher numbers on the Y-axis indicate more mistakes. $N = 50$.

Reaction Times (RTs) Table 7.3 summarizes all the LMMs that were constructed to predict the reaction times. To predict the RTs, a LMM with the same set of fixed and random effects was constructed (Model 2a). GG Congruency did not affect the RTs. However, CG Congruency significantly predicted RTs. Participants were slower in the CG incongruent trials. Then, the GG Congruency*CG Congruency interaction was added to the model (Model 2b). The main effect of GG Congruency and GG Congruency*CG Congruency interaction were not found significant. However, the main effect of CG Congruency remained significant, meaning that participants were faster when the CG of the object and the gender of the face were congruent. When GRAS and its interactions with CG Congruency and GG Congruency were included in the model (Model 2c), only the main effect of CG Congruency was significant.

Table 7.3 LMMs for Predicting RTs in the IAT for Conceptually Gendered Object

	B	*SE*	*t*	*p*	*IAC*	*BIC*
Model 2a					48941.77	48978.20
GG Congruency	-14.13	17.65	-0.80	0.423		
CG Congruency	-77.23	17.65	-4.38	<0.001		
Model 2b					48933.88	48976.37
GG Congruency	-14.14	17.65	-0.80	0.423		
CG Congruency	-77.23	17.65	-4.38	<0.001		
GG Congruency*CG Congruency	-9.74	56.20	-0.17	0.865		
Model 2c					48921.09	48975.72
GG Congruency	-14.14	17.65	-0.80	0.423		
CG Congruency	-77.23	17.65	-4.38	<0.001		
GRAS	-4.85	33.56	-0.14	0.886		
GG Congruency*GRAS	25.58	17.65	1.45	0.147		
CG Congruency*GRAS	-13.10	17.65	-0.74	0.458		
$N = 50$						

7.3.2.2 Explicit Gender Attribution Task (EGAT)

Table 7.4 summarizes the gender assignment patterns of participants in the EGAT for conceptually gendered objects. The greater numbers indicate that they assigned the female gender to objects more and the lower numbers indicate they assigned the male gender to objects more.

Table 7.4 Descriptive Statistics for Gender Assignment Patterns in the EGAT for Conceptually Gendered Objects

Grammatically feminine		Grammatically masculine		Conceptually feminine		Conceptually masculine	
mean	*SD*	*mean*	*SD*	*mean*	*SD*	*mean*	*SD*
0.55	0.50	0.45	0.50	0.80	0.40	0.20	0.40
$N = 50$							

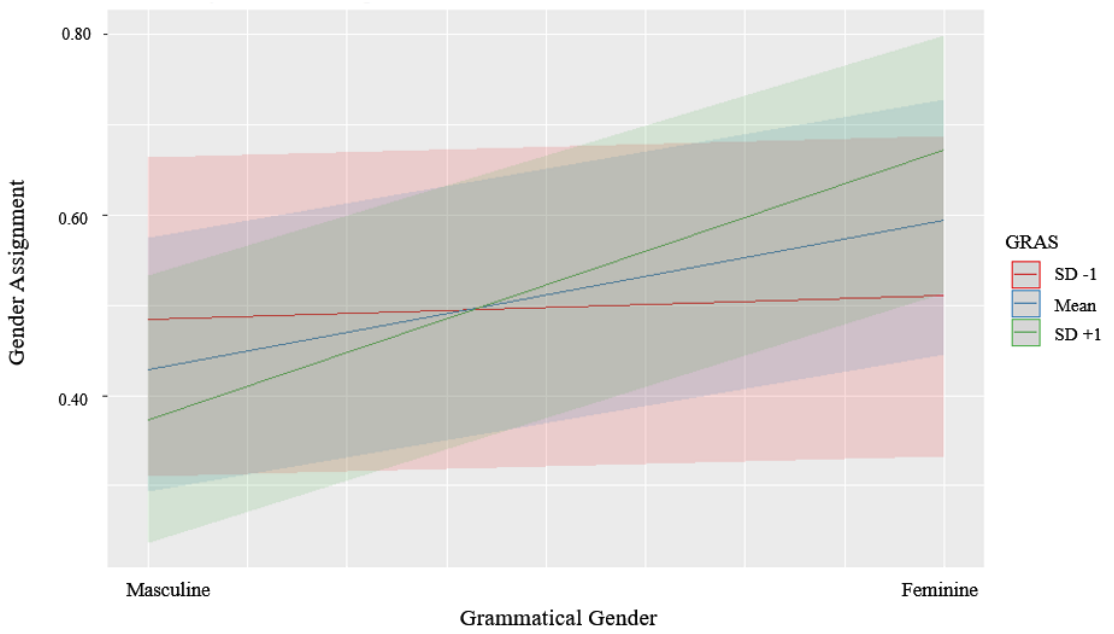
Table 7.5 summarizes all the GLMMs that were constructed to predict the gender assignment patterns of participants in the EGAT. A GLMM predicting explicit gender attribution was constructed with GG (Feminine vs. Masculine) and CG (Female vs. Male) as fixed effects and Participant and Item as random intercepts (Model 3a). The way participants assigned genders to objects was significantly affected by the CG, meaning that French speakers assigned the female gender to conceptually feminine objects (e.g., bag), and the male gender to conceptually masculine objects (e.g.,

necktie). Also, although the effect of GG on gender assignment was not significant, the trend was in line with the GG; they assigned female gender to grammatically feminine objects and male gender to grammatically masculine objects. When the GG*CG interaction was included in the model (Model 3b), only the main effect of CG was significant; neither the main effect of GG nor GG*CG interaction was significant. To assess how participants' gender role attitudes affected their explicit gender attributions, GRAS and its interactions with GG and CG were included in the model (Model 3c). Only the main effect of CG was significant, with the female gender being attributed to conceptually female objects and the male gender being attributed to conceptually male objects. The significant GG*GRAS interaction showed that participants with relatively more egalitarian gender role attitudes attributed genders to objects more consistent with grammatical gender than did participants with less egalitarian gender role attitudes (Figure 7.3). And the significant CG*GRAS interaction indicated that participants with greater sexist gender role attitudes were affected by the conceptual gender of the objects more than their peers with less sexist attitudes (Figure 7.4). In summary, whereas the gender assignments of participants with relatively high sexist tendencies were influenced by conceptual gender, it was the grammatical gender of the objects that affected how participants with more egalitarian gender role attitudes attributed genders to objects.

Table 7.5 GLMMs for Predicting Gender Assignment Patterns in the EGAT for Conceptually Gendered Objects

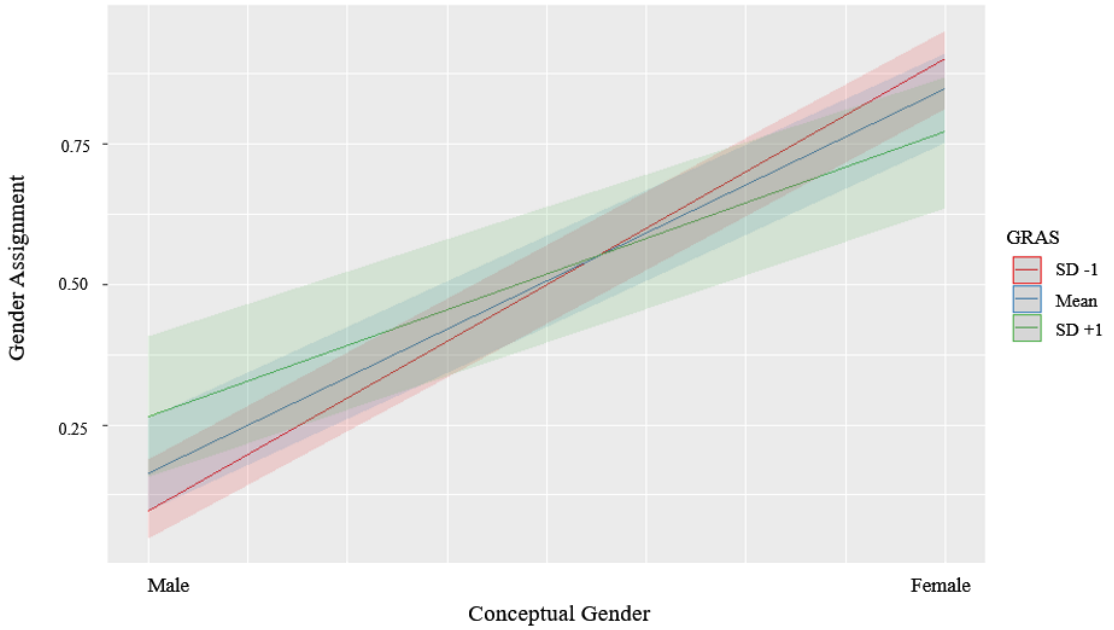
	B	***SE***	***Z***	***p***	***IAC***	***BIC***
Model 3a					770.71	794.13
GG Congruency	0.78	0.41	1.91	0.056		
CG Congruency	3.14	0.42	7.55	<0.001		
Model 3b					772.71	800.81
GG Congruency	0.78	0.41	1.91	0.056		
CG Congruency	3.14	0.42	7.55	<0.001		
GG Congruency*CG Congruency	0.03	0.82	0.03	0.975		
Model 3c					748.04	785.52
GG Congruency	0.67	0.43	1.57	0.116		
CG Congruency	3.34	0.43	7.68	<0.001		
GRAS	0.05	0.14	0.39	0.696		
GG Congruency*GRAS	0.56	0.26	2.20	0.028		
CG Congruency*GRAS	-1.09	0.26	-4.22	<0.001		
$N = 50$						

Figure 7.3 The effect of the interaction between GRAS and GG on the gender assignment in the EGAT for conceptually gendered objects



The lines indicate the gender assignment patterns of participants who were low (SD+1), medium (Mean), or high (SD-1) in confirming sexist attitudes based on the GRAS. The ribbons represent the standard errors. The greater numbers on the Y-axis indicate that participants assigned female gender to objects dominantly, and the lower values indicate that participants assigned male gender to objects dominantly. $N = 50$.

Figure 7.4 The effect of the interaction between GRAS and CG on the gender assignment in the EGAT for conceptually gendered objects



The lines indicate the gender assignment patterns of participants who were low (SD+1), medium (Mean), or high (SD-1) in confirming sexist attitudes based on the GRAS. The ribbons represent the standard errors. The greater numbers on the Y-axis indicate that participants assigned female gender to objects dominantly, and the lower values indicate that participants assigned male gender to objects dominantly. $N = 50$.

7.3.3 Conceptually Gender-Neutral Objects

7.3.3.1 Implicit Association Test

Table 7.6 summarizes the error rates and RTs of participants in the IAT for conceptually gender-neutral objects. The greater numbers indicate more errors and a slower response rate.

Error rates Table 7.7 summarizes all the GLMMs that were constructed to predict the error rates in the IAT for conceptually gender-neutral objects. To predict the error rates, a GLMM with GG Congruency (Congruent vs. Incongruent) as a fixed effect, and Participant and Item as random intercepts was constructed (Model 4a). No significant effect of GG Congruency was found. When GRAS and its interaction with GG Congruency was included in the model (Model 4b) again, no significant effect was found.

Table 7.6 Descriptive Statistics for Performance in the IAT for Conceptually Gender-Neutral Objects

	GG Congruent		GG Incongruent	
	mean	*SD*	*mean*	*SD*
Error	0.07	0.26	0.08	0.27
RT	877.7	617.08	889.55	561.98
$N = 50$				

Table 7.7 GLMMs for Predicting Error Rates in the IAT for Conceptually Gender-Neutral Objects

	B	***SE***	***Z***	***p***	***IAC***	***BIC***
Model 4a					823.74	845.25
GG Congruency	-0.15	0.19	-0.81	0.417		
Model 4b					824.41	856.66
GG Congruency	-0.11	0.20	-0.52	0.600		
GRAS	0.27	0.19	1.42	0.156		
GG Congruency*GRAS	-0.29	0.25	-1.14	0.253		
$N = 50$						

Reaction Times (RTs) Table 7.8 summarizes all the LMMs that were constructed to predict the RTs. To predict the RTs of French speakers, a LMM using the same set of fixed and random effects as Model 4a was conducted (Model 5a). GG Congruency did not affect the RTs of participants. Also, when GRAS and its interaction with GG Congruency were included in the model (model 5b), no significant main effects of GG Congruency and GRAS and the GG Congruency*GRAS interaction were found.

Table 7.8 LMMs for Predicting RTs in the IAT for Conceptually Gender-Neutral Objects

	B	***SE***	***t***	***p***	***IAC***	***BIC***
Model 5a					24712.58	24739.46
GG Congruency	-10.76	26.74	-0.40	0.688		
Model 5b					24699.08	24736.72
GG Congruency	-10.75	26.75	-0.40	0.688		
GRAS	0.08	37.57	0.00	0.998		
GG Congruency*GRAS	1.78	26.76	0.07	0.947		
$N = 50$						

7.3.3.2 Explicit Gender Attribution Task

Table 7.9 summarizes the gender assignment patterns of participants in the EGAT for conceptually gender-neutral objects. The greater numbers indicate that they assigned the female gender to objects more and the lower numbers indicate they assigned the male gender to objects more.

Table 7.9 Descriptive Statistics for Gender Assignment Patterns in the EGAT for Conceptually Gender-Neutral Object

Grammatically feminine		Grammatically masculine	
mean	*SD*	*mean*	*SD*
0.70	0.46	0.52	0.50
$N = 50$			

Table 7.10 summarizes all the GLMMs that were constructed to predict the gender assignment patterns of participants in the EGAT for conceptually gender-neutral objects. A GLMM predicting explicit gender attribution was constructed using the same set of fixed and random effects (Model 6a). Participants attributed gender to objects in line with GG. After GRAS and GG*GRAS interaction was added (Model 6b), the main effect of GG remained significant. However, no significant effects of GRAS and the GG*GRAS interaction were found.

Table 7.10 GLMMs for Predicting Gender Assignment Patterns in the EGAT for Conceptually Gender-Neutral Objects

	B	***SE***	***Z***	***p***	***IAC***	***BIC***
Model 6a					527.19	543.15
GG	0.79	0.29	2.74	0.006		
Model 6b					531.06	555.00
GG	0.79	0.29	2.74	0.006		
GRAS	0.02	0.12	0.12	0.904		
GG*GRAS	0.07	0.21	0.35	0.729		
$N = 50$						

7.4 Discussion

Study II examined the implicit and explicit effects of grammatical gender on the object conceptualization of native French speakers in the presence of conceptual

gender. The study also examined whether individual differences in the gender role attitudes modify the influence of GG and CG. In the IAT, both GG and CG of the objects were found to affect the accuracy of participants. In other words, native French speakers found it easier to pair objects with faces when either the GG or CG of the object was congruent with the gender of the face. Therefore, even in a task that does not require the strategic use of language, GG implicitly affected the object conceptualization. The results of Study II provide further evidence for the influence of grammatical gender on the object conceptualization even when it is task-unrelated (e.g., Cubelli et al. 2011; Maciuszek, Polak and Świątkowska 2019).

The nonsignificant GG and CG interaction found in Model 1b (see Table 7.2) indicates that participants did not conceptualize grammatically feminine objects as more feminine when the objects were also conceptually female, and the same was true for grammatically masculine objects that were conceptually male. The results of Study II suggest that GG and CG affect object conceptualization independently. As previously mentioned, using personified allegories with congruent or incongruent GG and CG (e.g., "*Frühling*" [spring] grammatically masculine but conceptually feminine), Bendler, Beller and Klauer (2016b) reported that German speakers were affected by GG only when GG and CG of the allegories were the same. As when the GG and CG of the allegories diverge the effect of gender congruency diminished, the authors argued that the effect was not driven by the GG but rather it is the conceptual associations related to allegories that affected the conceptualization. The findings of the present study differ from the results of Bendler, Beller and Klauer (2016b). Perhaps this discrepancy between the findings is due to participants and stimuli used in the two studies. Grammatical gender is known to have stronger effects on speakers of languages with the two-gender system such as French than speakers of languages with the three-gender system such as German (e.g., Sera et al. 2002; Vigliocco et al. 2005; Samuel, Cole and Eacott 2019), and thus different from German speakers, GG based associations may be stronger for French speakers. Further, a recent study showed that the effect of grammatical gender is stronger for concrete words compared to abstract words (Paolieri et al., 2019). However, more studies are needed to have a better understanding of the relationship between grammatical gender and conceptual gender.

Notably, Study II also found significant interactions between individual differences in the gender role attitudes and the GG and CG of the objects. In the IAT, participants with relatively high sexist attitudes were more accurate when the sorting rules for faces and objects were grammatically or conceptually congruent than they were not. Hence, as in Study I, the conceptual genders of objects may be especially salient for people with sexist gender role attitudes. Additionally, although grammatical gender

distinctions are an arbitrary grammatical system only needed when using language, the system affects individuals with relatively high sexist attitudes more presumably because the terms are based on biological sexes and the distinction itself is based on gender. In other words, gender role attitudes may lead people to be sensitive to both cultural and linguistic gender distinctions implicitly. The finding is difficult to interpret because, to my knowledge, no previous study directly examined the effect of gender role attitudes concerning the relationship between grammatical gender and object conceptualization. This relationship will be discussed in Chapter 10.5 in a more detailed way.

CG affected gender assignment patterns of French speakers in the EGAT. However, although they assigned genders to objects consistent with GG, the effect was not significant. This finding is somewhat at odds with previous findings reporting the significant effect of GG in the explicit tasks (e.g.,Sera, Berge and del Castillo Pintado 1994; Seera et al. 2002; see Samuel, Cole Eacott 2019 for a review). One important difference between the current study and the previous studies is that different than most of those studies, in the current explicit task, participants had the conceptual gender on which they can base their gender assignments. In that sense, the nonsignificant effect of GG in the EGAT is consistent with the findings of Sato, Casapanso and Athanasopoulos (2020). The study also used the stimuli differing in congruency of both GG and CG but found the effect of CG only in the explicit task. The current finding is in line with the argument that grammatical gender is rapidly activated, and when it is not active anymore, even the speakers of grammatical gender languages based their decision on the overt conceptual gender (Sato, Casapanso and Athanasopoulos 2020). In the explicit measure, different from the implicit measures, individual differences in the gender role attitudes affected the degree to which participants were influenced by GG and CG congruency differently. Whereas participants with more sexist attitudes tended to assign gender to objects in line with the CG, participants who were high in egalitarian gender role attitudes assigned gender to objects consistent with GG. These findings suggest when the task is prone to strategic use of available cues, individual differences in the gender role attitudes modulate which categorical distinction (i.e., grammatical or conceptual gender) is more salient to people. However, further studies are needed to understand how individual differences modulate the degree to which GG and CG affect conceptualization.

Also, for the conceptually neutral objects, even though GG Congruency did not have any effect on the response rates in the IAT, in the EGAT, participants assigned genders to objects consistent with GG. However, as Turkish speakers showed the same gender assignment pattern although they were not familiar with the French gram-

matical gender system, this finding can be attributed to another shared categorical property (round-angular, light-heavy; Sera et al., 2002) that was not controlled in the study.

To conclude, using a nonlinguistic IAT, this study showed that grammatical gender implicitly affects the object conceptualization of French speakers, even when the use of language is irrelevant to the task and even in the presence of another cue. Also, the effect of GG was found to be independent of the CG of the objects. However, although a nonlinguistic version of IAT was used and the task itself did not require the verbalization of the objects, the study design itself is not enough to make a judgment on the degree to which language affects cognition, as it did not eliminate the possibility that participant covertly repeated the object labels. Therefore, further studies are needed to understand the nonlinguistic effect of grammatical gender. To examine whether grammatical gender affects nonlinguistic object conceptualization, in Study IV (See Chapter 9), a different group of native French speakers will be asked to complete the same task under verbal interference. In addition, as in the EGAT, participants were asked to assign gender to objects and name them at the same time, the naming process may have made grammatical gender more salient. To reduce the salience of language in the EGAT, in Study IV, participants will not be asked to name the object.

8. STUDY III - TURKISH-FRENCH BILINGUALS

Most of the previous research that examined bilingualism in the scope of grammatical gender and linguistic relativity studied whether native speakers of grammatical gender languages who learn a natural gender or genderless language are affected by the grammatical gender system of their native language even when the task was given in the genderless language (e.g., Boroditsky and Schmidt 2000; Boroditsky Schmidt and Phillips 2003; Semenuks et al. 2017). Only a few studies examined whether learning a grammatical gender language as a second language can affect object-related concepts of native speakers of genderless or natural gender languages. Studies on the other domains such as color, and motion events showed that learning a language with a grammatical category that their native language does not have causes bilinguals' cognition to shift towards L2-like patterns (e.g., Athanasopoulos 2009; Cook et al. 2006; Daller, Treffers-Daller and Furman 2011; Boroditsky 2001). In the case of the effect of L2 grammatical gender on object conceptualization of bilinguals, previous studies reported conflicting results. Whereas some studies found that learning a grammatical gender language causes a cognitive shift towards the L2 (e.g., Kurinski, Jambor and Sera 2016), other studies reported that object conceptualization of native speakers of genderless languages is not affected by L2 grammatical gender (Lambelet 2016). The current study aimed to examine whether learning French (a grammatical gender language) can affect the implicit and explicit object conceptualization of native speakers of Turkish (a genderless language). This study, also, examined the factors that may affect the degree to which grammatical gender influences the object conceptualization of Turkish-French bilinguals. Considering the previous research on bilingual cognition and linguistic relativity, I expected Turkish-French bilinguals to be affected by French grammatical gender in the IAT and EGAT. I also expected them to be affected by the conceptual gender of the objects. I hypothesized bilingual speakers to be slower and less accurate in the trials in which either the GG or CG of the objects are not congruent with the gender of the face. Similarly, they would assign genders to objects consistent with both GG and CG of the objects. Additionally, I expected factors including gender role attitudes,

age of acquisition (AoA), years of speaking French, L2 Frequency, and L2 proficiency to affect how GG affects the object conceptualization of bilinguals. I specifically expected participants who are high in sexist gender role attitudes, learned French at a younger age, and speak French with a higher frequency and proficiency to be affected by GG more.

8.1 Participants

Fifty-five participants participated in Study III, and three participants who did not indicate Turkish as their native language, together with one participant who did not fit into the study's age criteria were excluded from the data. Also, I excluded one participant who responded faster than 300 ms to more than 10 percent of the trials. The final dataset consisted of fifty Turkish-French bilinguals (age range = 18 - 31 years; M_{age} = 24.64, SD_{age} = 2.98; 26 females, 23 males;1 person chose "*Belirtmek istemiyorum*" (I prefer not to indicate) option) living in France. Five participants were simultaneous Turkish-French bilinguals and the rest were sequential bilinguals who indicated Turkish as their native language (*age of French acquisition range* = 0 – 28; $M_{age\ of\ acquisition}$ = 9.86; $SD_{age\ of\ acquisition}$ = 7.86). The average years of speaking French was 13.5 years (*years of speaking range* = 1 - 30; $SD_{years\ of\ speaking}$ = 7.65). Whereas eleven participants spoke only Turkish and French, other participants reported some knowledge of other languages including Russian, German, Italian, Korean, Arabic, Azeri, and Spanish. However, they did not report advanced proficiency in these languages. All participants indicated to have at least a Low Intermediate (B1: I can make simple sentences and can understand the main points of a conversation but need much more vocabulary) or higher proficiency level in French and the average proficiency level of the participants is Advanced (C2: I speak and understand very well but sometimes have problems with unfamiliar situations and vocabulary). On a scale from 1 to 10, the average L2 Frequency of participants was 8.56 (*frequency range* = 5 - 10; $SD_{L2\ frequency}$ = 1.35). The participants were recruited through advertisements on social media as well as word of mouth and received a gift card for their participation.

8.2 Materials and Procedure

The procedure was largely the same as in Study I and II. Different from the previous studies, after the IAT, they completed the EGAT. French versions of the IAT and the EGAT were used in this study and similar to Study II, they were asked to write the names of the objects in the EGAT. However, before writing the name, they were also asked to indicate whether they know the French label of the object. Then, they completed GRAS-TR and Demographic Form in Turkish. In the bilingual version of the Demographic Form (see Appendix F for the Turkish version and Appendix G for the English translation) participants answered additional questions about their French knowledge including their age of acquisition, proficiency level, and L2 frequency. The entire procedure lasted around twenty minutes (see Appendix P for Turkish version of the Debriefing Form and Appendix Q for the English translation of the form).

8.3 Results

In both the IAT and EGAT, trials with objects that participants indicated as not knowing the French label were removed from the data. In total, 304 trials from twenty-one different participants were excluded. Similar to Study I and II, in both the IAT and EGAT, trials with conceptually gendered objects and trials with conceptually gender-neutral objects were analyzed separately. In the following sections, first, the results of GRAS-TR are presented. After, the correlation between independent variables that are analyzed as factors affecting the degree to which Turkish-French bilinguals are affected by French GG are given. Then, the results of IAT and EGAT with conceptually gendered objects and lastly with gender-neutral objects are reported. The data were analyzed using *R* (http://www.R-project.org/) and *RStudio* (http://www.rstudio.com/).

8.3.1 Gender Role Attitudes Scale - Turkish Version (GRAS-TR)

The GRAS-TR was found to be reliable ($\alpha = 0.92$). The participants obtained a high score (*score range* = 2.47 – 4.95; $M = 3.93$; $SD = 0.85$) which indicates that, overall, they have egalitarian gender role attitudes.

8.3.2 Correlations Between Independent Variables

Table 8.1 shows the correlation matrix between the independent variables. As seen in the table, independent variables that are analyzed as factors that may modulate how bilinguals are affected by GG are significantly correlated with each other.

Table 8.1 Correlation Matrix Between the Independent Variables

	Age of Acquisition	Years of Speaking	L2 Proficiency	L2 Frequency	GRAS-TR
Age of Acquisition	1.00				
Years of Speaking	-0.93***	1.00			
L2 Proficiency	-0.62***	0.66***	1.00		
L2 Frequency	-0.52***	0.55***	0.78***	1.00	
GRAS-TR	0.63***	-0.62***	-0.45***	-0.33***	1.00
$N = 50$					

Notes: *** p<0.001

8.3.3 Conceptually Gendered Objects

8.3.3.1 Implicit Association Test (IAT)

As recommended by Greenwald et al. (2003), six responses with latencies of more than 10.000 ms. were excluded from the data as outliers (one data point from six different participants). Table 8.2 summarizes the error rates and reaction times of participants in the IAT for gendered objects. The greater numbers indicate more errors and a slower response rate.

Table 8.2 Descriptive Statistics of Performance in the IAT for Conceptually Gendered Objects

	GG Congruent		GG Incongruent		CG Congruent		CG Incongruent	
	mean	*SD*	*mean*	*SD*	*mean*	*SD*	*mean*	*SD*
Error	0.06	0.24	0.05	0.22	0.03	0.17	0.10	0.29
RT	1117.12	858 .83	1105.53	834.29	1027.02	784.94	1172.34	897.86
$N = 50$								

Error rates Table 8.3 summarizes all the GLMMs that were constructed to predict the error rates. As in the case of previous studies, to predict the error rates, a GLMM was constructed with GG Congruency (Congruent vs. Incongruent), and CG Congruency (Congruent vs. Incongruent) as fixed effects, and Participant and Item as random intercepts. CG Congruency but not GG Congruency significantly affected the error rates. More specifically, participants made more mistakes in the

CG incongruent trials. Then, the GG Congruency*CG Congruency interaction was added to the model (Model 1b). The main effect of CG Congruency remained significant. However, neither the main effect of GG Congruency nor GG Congruency*CG Congruency interaction was found significant. To examine the effect of gender role attitudes on the degree to which participants are affected by GG Congruency and CG Congruency, GRAS-TR and its interactions with GG Congruency and CG Congruency were included in the model (Model 1c). Again, CG Congruency remained significant with participants making more mistakes when the CG of the object and the gender of the face did not match. Also, the significant main effect of GRAS-TR showed that participants with relatively higher sexist attitudes, overall, made more mistakes. No significant effect of GG Congruency, CG Congruency*GRAS-TR, or GG Congruency*GRAS-TR interaction was found.

Table 8.3 GLMMs for Predicting Error Rates in the IAT for Conceptually Gendered Objects

	B	***SE***	***Z***	***p***	***IAC***	***BIC***
Model 1a					1288.98	1318.91
GG Congruency	0.03	0.16	0.19	0.854		
CG Congruency	-1.27	0.18	-7.22	<0.001		
Model 1b					1290.95	1326.87
GG Congruency	0.02	0.17	0.11	0.911		
CG Congruency	-1.27	0.18	-7.22	<0.001		
GG Congruency*CG Congruency	-0.08	0.49	-0.17	0.863		
Model 1c					1287.15	1335.04
GG Congruency	-0.03	0.17	-0.15	0.880		
CG Congruency	-1.32	0.18	-7.16	<0.001		
GRAS-TR	-0.28	0.12	-2.29	0.022		
GG Congruency*GRAS-TR	-0.25	0.15	-1.65	0.099		
CG Congruency*GRAS-TR	-0.20	0.17	-1.18	0.239		
$N = 50$						

Table 8.4 summarizes all the GLMMs that were constructed for predicting error rates and identifying factors that may affect bilingual cognition. In order to examine the influence of AoA, AoA and its interactions with GG Congruency and CG Congruency were included in the model (Model 1d). Only the main effects of CG Congruency and AoA were significant. Participants made more mistakes in the CG incongruent trials. Moreover, participants who learned French at a younger age made more mistakes. Then, Years of Speaking, and its interactions with GG Congruency and CG Congruency were included in the model (Model 1e). Only CG Congruency was found to significantly affect the error rate. When L2 Frequency and GG Congruency*L2 Frequency and CG Congruency*L2 Frequency interactions were included (Model 1f), no effect was found significant. When L2 Proficiency

and its interactions with GG Congruency and CG Congruency were included in the model (Model 1g), the only significant effect was the CG Congruency.

Table 8.4 GLMMs for Predicting Error Rates and Identifying Factors in the IAT for Conceptually Gendered Objects

	B	***SE***	***Z***	***p***	***IAC***	***BIC***
Model 1d					1289.27	1337.17
GG Congruency	0.05	0.17	0.28	0.781		
CG Congruency	-1.33	0.19	-7.10	<0.001		
AoA	-0.32	0.13	-2.37	0.018		
GG Congruency*AoA	0.07	0.16	0.43	0.668		
CG Congruency*AoA	-0.23	0.20	-1.14	0.253		
Model 1e					1293.48	1341.38
GG Congruency	0.02	0.17	0.13	0.896		
CG Congruency	-1.27	0.18	-7.17	<0.001		
Years of Speaking	0.14	0.13	1.08	0.280		
GG Congruency*Years of Speaking	0.08	0.16	0.48	0.630		
CG Congruency*Years of Speaking	0.00	0.19	0.02	0.980		
Model 1f					1292.83	1340.72
GG Congruency	-0.46	1.46	-0.31	0.755		
CG Congruency	-0.40	1.61	-0.25	0.803		
L2 Frequency	0.13	0.12	1.08	0.280		
GG Congruency*L2 Frequency	0.05	0.15	0.34	0.737		
CG Congruency*L2 Frequency	-0.09	0.17	-0.54	0.591		
Model 1g					1289.83	1337.73
GG Congruency	0.00	0.17	-0.01	0.994		
CG Congruency	-1.25	0.18	-7.04	<0.001		
L2 Proficiency	0.18	0.13	1.38	0.167		
GG Congruency*L2 Proficiency	0.22	0.18	1.28	0.202		
CG Congruency*L2 Proficiency	-0.16	0.19	-0.87	0.382		
$N = 50$						

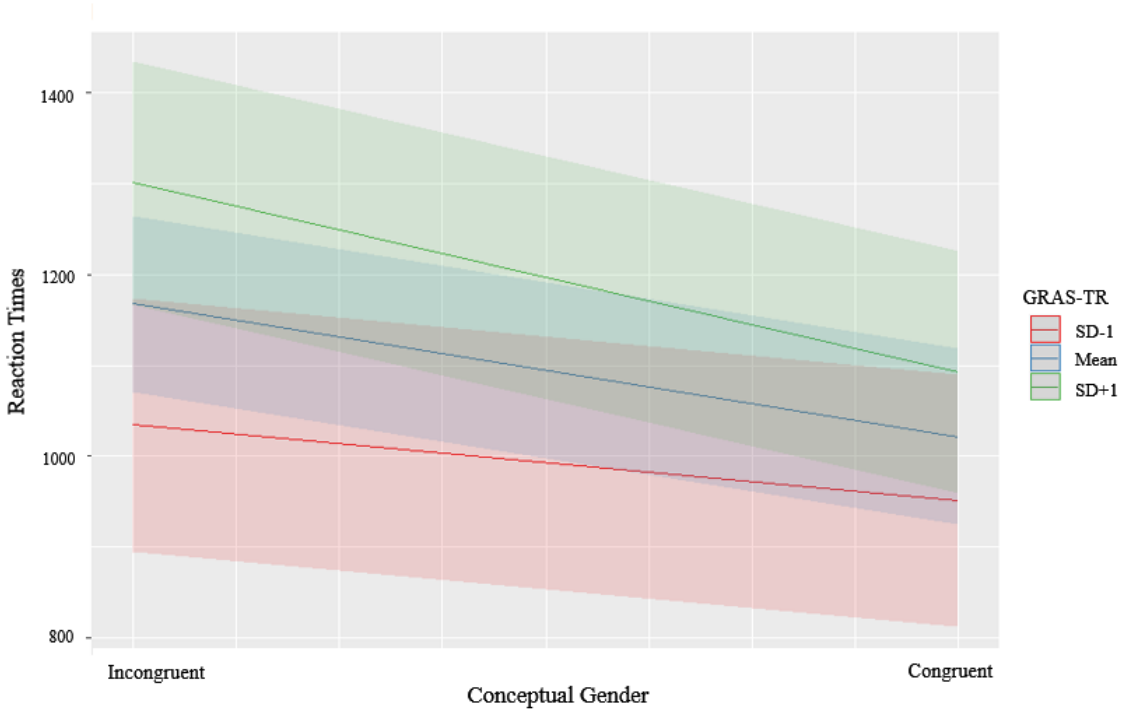
Reaction Times (RTs) Table 8.5 summarizes all the LMMs that were constructed to predict the reaction times. To predict the RTs, an LMM using the same set of fixed and random effects was conducted (Model 2a). Whereas GG Congruency did not have a significant effect, CG Congruency significantly affected the RTs. Participants were slower when the gender of the face was not congruent with the CG of the object. Then, the GG Congruency*CG Congruency interaction was added to the model (Model 2b). The main effect of GG Congruency and GG Congruency*CG Congruency interaction were not significant. However, the main effect of CG Congruency remained significant. When GRAS-TR and its interactions with CG Congruency and GG Congruency were included in the model (Model 2c), only the main effect of GRAS-TR was significant. Participants with more egalitarian gender role attitudes were slower in general. The significant CG Congruency*GRAS-TR indicated that more egalitarian participants were slower in the CG incongruent trials

than in congruent trials (Figure 8.1).

Table 8.5 LMMs for Predicting RTs in the IAT for Conceptually Gendered Object

	B	*SE*	*t*	*p*	*IAC*	*BIC*
Model 2a					47637.37	47673.3
GG Congruency	35.98	28.75	1.25	0.211		
CG Congruency	-145.65	28.75	-5.07	<0.001		
Model 2b					47628.5	47670.41
GG Congruency	36.00	28.75	1.25	0.211		
CG Congruency	-145.65	28.75	-5.07	<0.001		
GG Congruency*CG Congruency	-51.41	70.39	-0.73	0.477		
Model 2c					47604.71	47658.6
GG Congruency	-135.27	134.11	-1.01	0.313		
CG Congruency	141.05	134.11	1.05	0.293		
GRAS-TR	120.18	55.17	2.18	0.034		
GG Congruency*GRAS-TR	44.18	33.69	1.31	0.190		
CG Congruency*GRAS-TR	-73.81	33.69	-2.19	0.029		
$N = 50$						

Figure 8.1 The effect of the interaction between GRAS-TR and CG on the RTs in the IAT for conceptually gendered objects



The lines indicate the RTs of participants who were low (SD+1), medium (Mean), or high (SD-1) in confirming sexist attitudes based on the GRAS-TR. The ribbons represent the standard errors. The higher numbers on the Y-axis indicate slower RTs. $N = 50$.

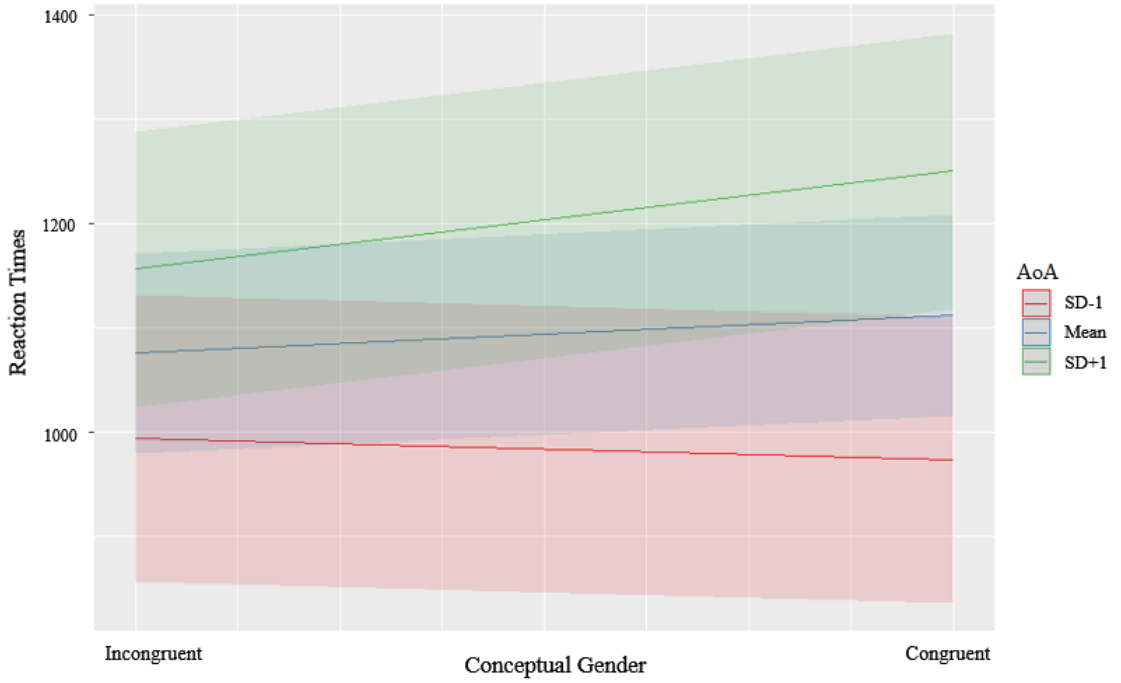
Table 8.6 summarizes all the LMMs that were constructed to predict the RTs and

identify factors that may affect bilingual cognition. When the AoA and its interactions with GG Congruency and CG Congruency were included in the model (Model 2d), the main effects of CG Congruency and AoA and GG Congruency*AoA interaction were significant. Participants were slower in the CG incongruent trial and participants who learned French at an older age were slower in general. Also, participants who learned French at an older age were slower when GG was congruent with the gender of the face (Figure 8.2). When Years of Speaking and its interactions with GG Congruency and CG Congruency were included in the model (Model 2e), only the main effects of CG Congruency and Year of Speaking were significant. Participants were slower when CG was incongruent with the gender of the face. Also, participants who spoke French for a shorter time were slower in general. However, no significant interaction effect was found. When L2 Frequency and its interactions with GG Congruency and CG Congruency were included (Model 2f), no significant effect was found. When L2 Proficiency and GG Congruency*L2 Proficiency, and CG Congruency*L2 Proficiency interactions were included (Model 2g), only the main effect of CG Congruency significantly affected the response pattern of participants.

Table 8.6 LMMs for Predicting RTs and Identifying Factors in the IAT for Conceptually Gendered Objects

	B	***SE***	***t***	***p***	***IAC***	***BIC***
Model 2d					47604.03	47657.91
GG Congruency	36.31	28.72	1.26	0.206		
CG Congruency	-145.96	28.72	-5.08	<0.001		
AoA	109.83	45.79	2.40	0.020		
GG Congruency*AoA	57.35	28.73	2.00	0.046		
CG Congruency*AoA	-52.29	28.73	-1.82	0.069		
Model 2e					47606.77	47660.65
GG Congruency	36.22	28.73	1.26	0.208		
CG Congruency	-145.88	28.73	-5.08	<0.001		
Years of Speaking	-107.05	46.16	-2.32	0.025		
GG Congruency*Years of Speaking	-48.50	28.74	-1.69	0.092	.	
CG Congruency*Years of Speaking	41.07	28.74	1.43	0.153		
Model 2f					47614.59	47668.48
GG Congruency	410.79	242.19	1.70	0.090	.	
CG Congruency	-242.22	242.19	-1.00	0.317		
L2 Frequency	18.92	41.48	0.46	0.650		
GG Congruency*L2 Frequency	-39.90	25.59	-1.56	0.119		
CG Congruency*L2 Frequency	10.34	25.59	0.40	0.686		
Model 2g					47614.3	47668.18
GG Congruency	36.00	28.75	1.25	0.211		
CG Congruency	-145.59	28.75	-5.06	<0.001		
L2 Proficiency	-37.48	47.11	-0.80	0.430		
GG Congruency*L2 Proficiency	-38.38	28.75	-1.34	0.182		
CG Congruency*L2 Proficiency	-3.27	28.75	-0.11	0.909		
$N = 50$						

Figure 8.2 The effect of the interaction between AoA and CG on the RTs in the IAT for conceptually gendered objects



The lines indicate the RTs of participants who learn French at an older (SD+1), average (Mean), or younger (SD-1) age. The ribbons represent the standard errors. The higher numbers on the Y-axis indicate slower RTs. $N = 50$.

8.3.3.2 Explicit Gender Attribution Task (EGAT)

Table 8.7 summarizes the gender assignment patterns of participants in the EGAT for conceptually gendered objects. The greater numbers indicate that they assigned the female gender to objects more and the lower numbers indicate they assigned the male gender to objects more.

Table 8.7 Descriptive Statistics for Gender Assignment Patterns in the EGAT for Conceptually Gendered Objects

Grammatically feminine		Grammatically masculine		Conceptually feminine		Conceptually masculine	
mean	*SD*	*mean*	*SD*	*mean*	*SD*	*mean*	*SD*
0.55	0.50	0.41	0.50	0.79	0.40	0.16	0.38
$N = 50$							

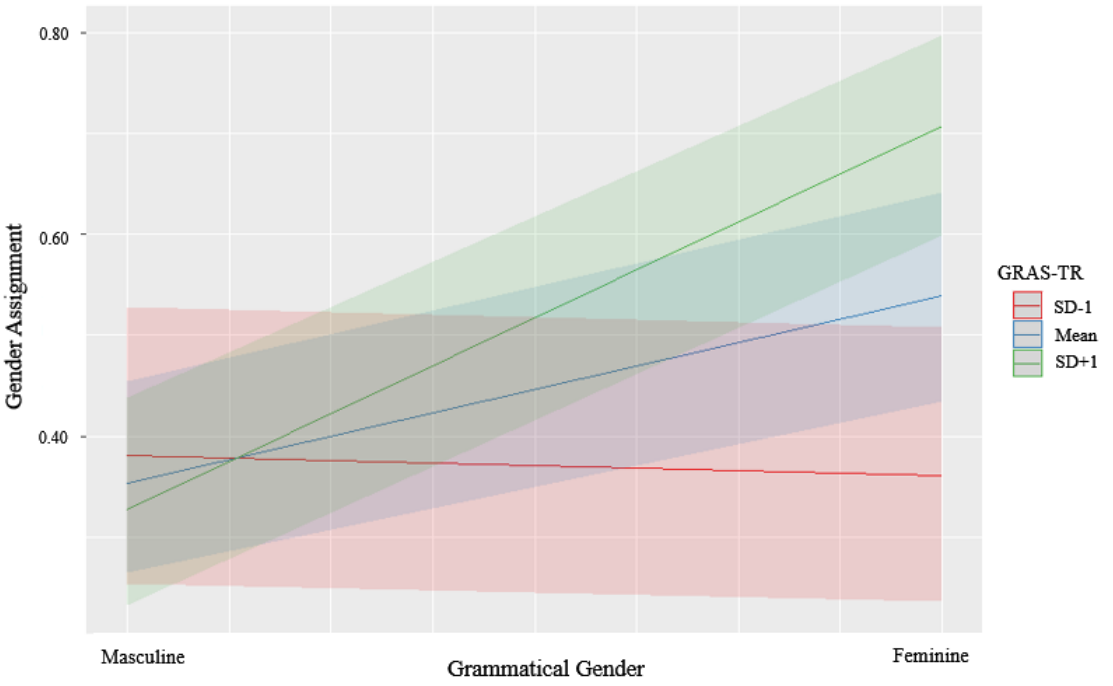
Table 8.8 summarizes all the GLMMs that were constructed to predict the gender assignment patterns of participants in the EGAT. A GLMM predicting explicit gender attribution was constructed with GG (Feminine vs. Masculine) and CG (Female

vs. Male) as fixed effects and Participant and Item as random intercepts (Model 3a). The way participants assigned genders to objects was significantly affected by both GG and the CG of the objects. They assigned female gender to objects that were conceptually or grammatically feminine, and male gender to conceptually or grammatically masculine objects. When GG*CG interaction was included in the model (Model 3b), although GG*CG interaction did not affect the response patterns of participants, the main effects of GG and CG remained significant. After GRAS-TR and its interactions with GG and CG were included in the model (Model 3c), the main effects of GG and CG remained significant. Also, the significant main effect of GRAS-TR suggested that participants with relatively higher egalitarian gender role attitudes assigned female gender to more objects. Additionally, GG*GRAS-TR and CG*GRAS-TR interactions were found significant. Whereas participants with relatively less sexist attitudes assigned genders to the objects consistent with the GG (Figure 8.3), relatively more sexist participants based their gender assignments on CG (Figure 8.4).

Table 8.8 GLMMs for Predicting Gender Assignment Patterns in the EGAT for Conceptually Gendered Objects

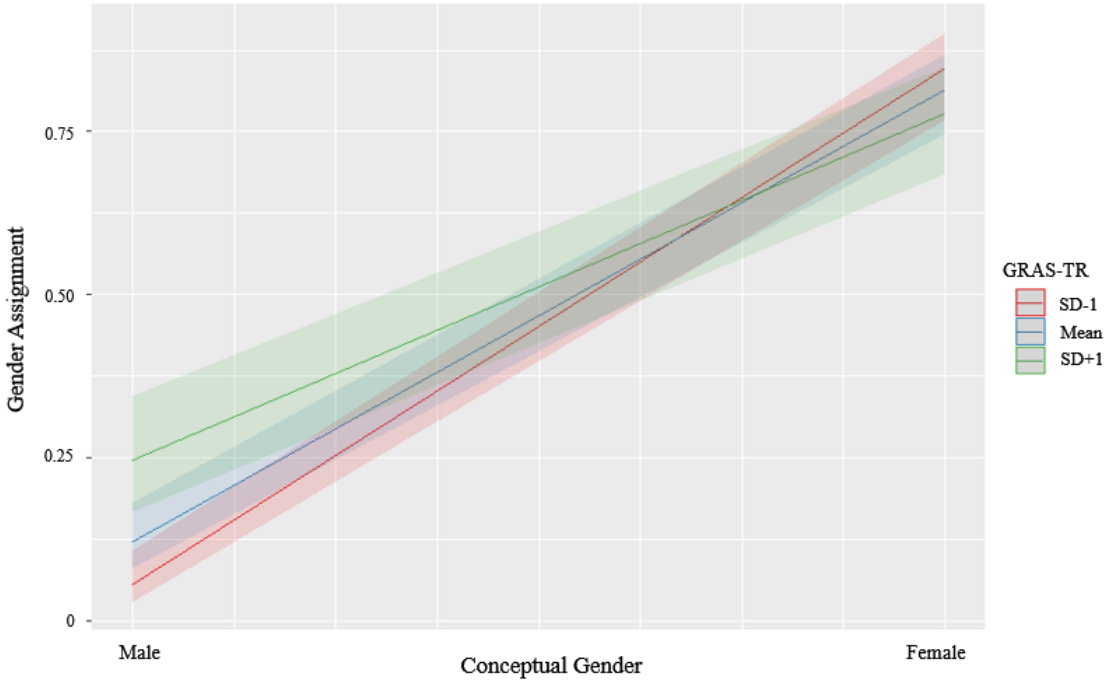
	B	***SE***	***Z***	***p***	***IAC***	***BIC***
Model 3a					622.96	641.00
GG	0.93	0.27	3.52	<0.001		
CG	3.17	0.27	11.83	<0.001		
Model 3b					624.75	647.29
GG	0.93	0.27	3.49	<0.001		
CG	3.17	0.27	11.87	<0.001		
GG*CG	0.24	0.53	0.46	0.644		
Model 3c					586.01	617.58
GG	0.76	0.30	2.52	0.012		
CG	3.46	0.31	11.05	<0.001		
GRAS-TR	0.31	0.13	2.48	0.013		
GG*GRAS-TR	0.85	0.24	3.52	<0.001		
CG*GRAS-TR	-1.08	0.26	-4.25	<0.001		
$N = 50$						

Figure 8.3 The effect of the interaction between GRAS-TR and GG on the gender assignment in the EGAT for conceptually gendered objects



The lines indicate the gender assignment patterns of participants who were low (SD+1), medium (Mean), or high (SD-1) in confirming sexist attitudes based on the GRAS-TR. The ribbons represent the standard errors. The greater numbers on the Y-axis indicate that participants assigned female gender to objects dominantly, and the lower values indicate that participants assigned male gender to objects dominantly. $N = 50$.

Figure 8.4 The effect of the interaction between GRAS-TR and CG on the gender assignment in the EGAT for conceptually gendered objects



The lines indicate the gender assignment patterns of participants who were low (SD+1), medium (Mean), or high (SD-1) in confirming sexist attitudes based on the GRAS-TR. The ribbons represent the standard errors. The greater numbers on the Y-axis indicate that participants assigned female gender to objects dominantly, and the lower values indicate that participants assigned male gender to objects dominantly. $N = 50$.

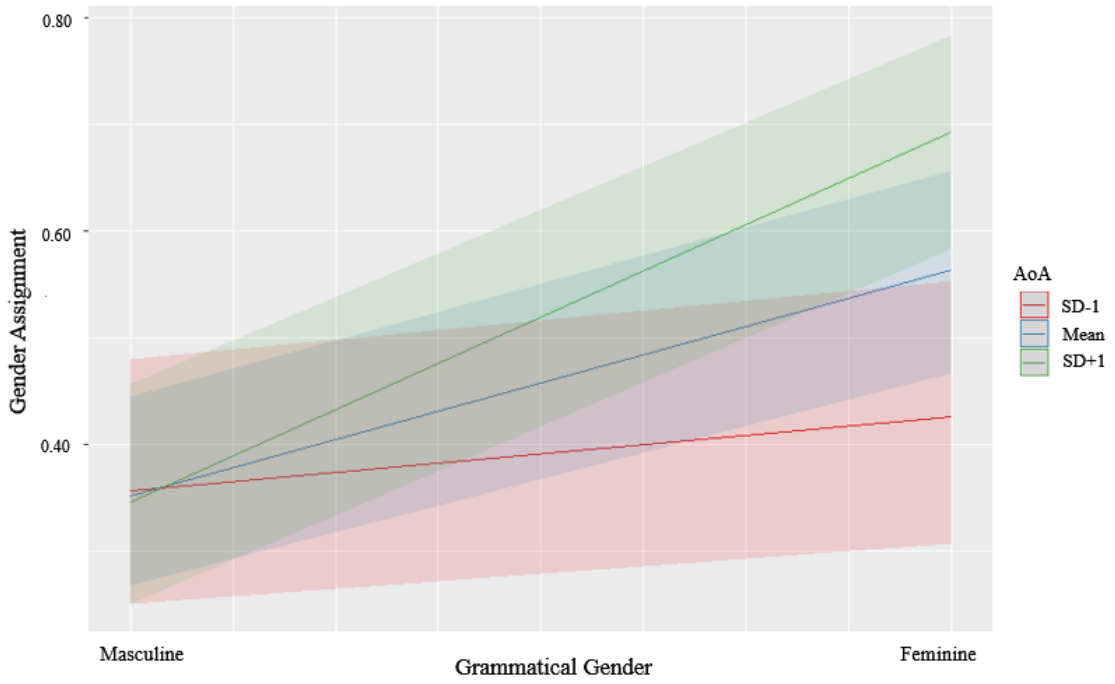
Table 8.9 summarizes all the GLMMs that were constructed to predict the gender assignment patterns of participants in the EGAT and identify the factors that may affect bilingual cognition. When AoA and GG*AoA and CG*AoA interactions were included (Model 3d), the main effects of GG, CG, and AoA were significant. Participants assigned genders to objects consistent with GG and CG. Also, participants who learned French at an older age assigned female gender to more objects. The significant GG*AoA and CG*AoA interactions indicated that whereas participants who learned French at an older age were affected by GG (Figure 8.5), the early learners of French were affected by CG (Figure 8.6) more. When Years of Speaking and its interactions with GG and CG were included (Model 3e), the main effects of GG, CG, and Years of Speaking were significant. Participants assigned genders to objects consistent with GG and CG of the objects. Also, participants who speak French for a shorter time were assigned female gender to more objects. Additionally, the significant GG*Years of Speaking and CG*Years of Speaking showed that

whereas participants who speak French for a shorter time were affected by GG (Figure 8.7), the ones who speak it for a longer time were affected by CG (Figure 8.8) more. When L2 Frequency and its interactions with GG and CG were included in (Model 3f), only the main effects of GG and CG were found significant. When L2 Proficiency and its interactions with GG and CG were included in the model (Model 3g), whereas no interaction effect was significant, the main effects of GG, CG, and L2 Proficiency were found significant. Participants with lower French proficiency assigned female to objects more.

Table 8.9 GLMMs for Predicting Gender Assignment Patterns and Identifying Factors for Conceptually Gendered Objects

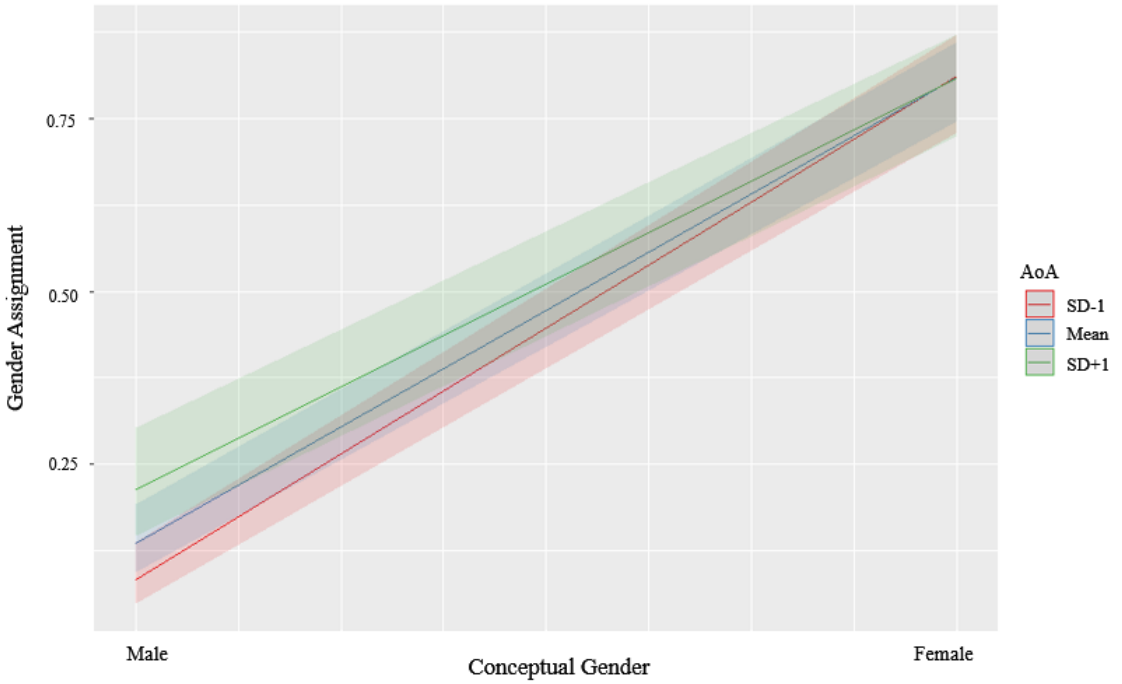
	B	***SE***	***Z***	***p***	***IAC***	***BIC***
Model 3d					604.92	636.48
GG Congruency	0.87	0.28	3.09	0.002		
CG Congruency	3.30	0.29	11.49	<0.001		
AoA	0.27	0.11	2.55	0.011		
GG Congruency*AoA	0.58	0.22	2.67	0.008		
CG Congruency*AoA	-0.56	0.22	-2.56	0.011		
Model 3e					603.02	634.59
GG Congruency	0.87	0.28	3.10	0.002		
CG Congruency	3.34	0.29	11.48	<0.001		
Years of Speaking	-0.34	0.11	-3.06	0.002		
GG Congruency*Years of Speaking	-0.46	0.22	-2.10	0.036		
CG Congruency*Years of Speaking	0.70	0.23	3.12	0.002		
Model 3f					624.77	656.34
GG Congruency	0.93	0.27	3.50	<0.001		
CG Congruency	3.19	0.27	11.82	<0.001		
L2 Frequency	-0.17	0.10	-1.72	0.086		
GG Congruency*L2 Frequency	-0.13	0.21	-0.62	0.534		
CG Congruency*L2 Frequency	0.16	0.21	0.76	0.449		
Model 3g					621.08	652.64
GG Congruency	0.93	0.27	3.47	0.001		
CG Congruency	3.20	0.27	11.80	<0.001		
L2 Proficiency	-0.21	0.10	-2.16	0.031		
GG Congruency*L2 Proficiency	-0.21	0.21	-1.01	0.311		
CG Congruency*L2 Proficiency	0.25	0.21	1.21	0.228		
$N = 50$						

Figure 8.5 The effect of the interaction between AoA and GG on the gender assignment in the EGAT for conceptually gendered objects



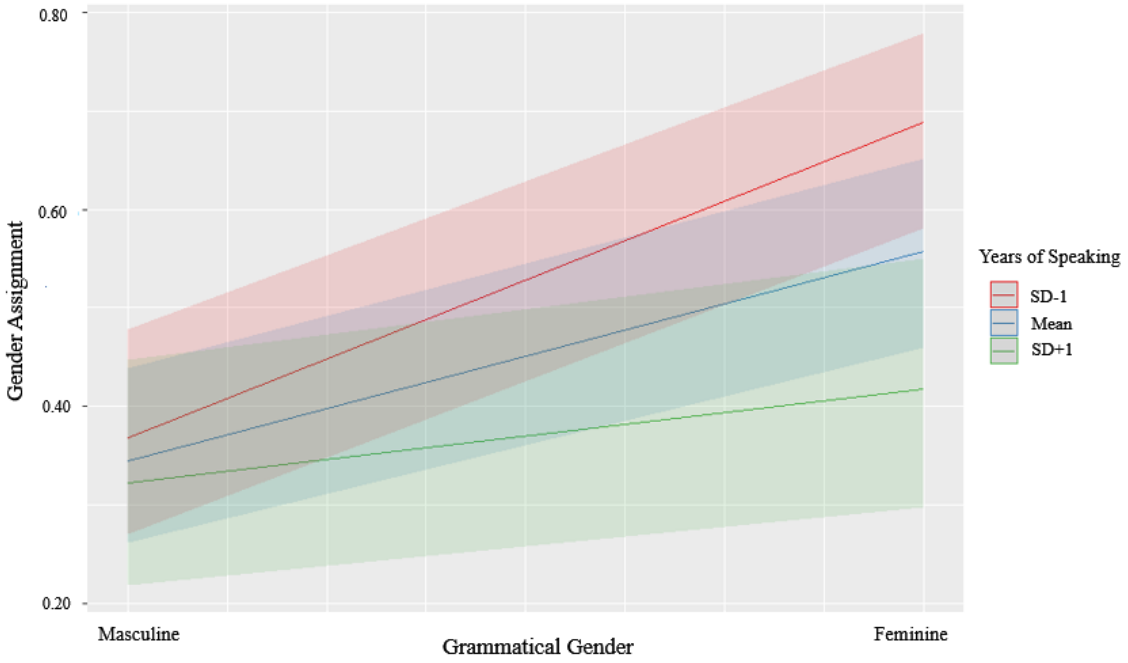
The lines indicate the gender assignment patterns of participants who learned French at an older (SD+1), average (Mean), or younger (SD-1) age. The ribbons represent the standard errors. The greater numbers on the Y-axis indicate that participants assigned female gender to objects dominantly, and the lower values indicate that participants assigned male gender to objects dominantly. $N = 50$.

Figure 8.6 The effect of the interaction between AoA and CG on the gender assignment in the EGAT for conceptually gendered objects



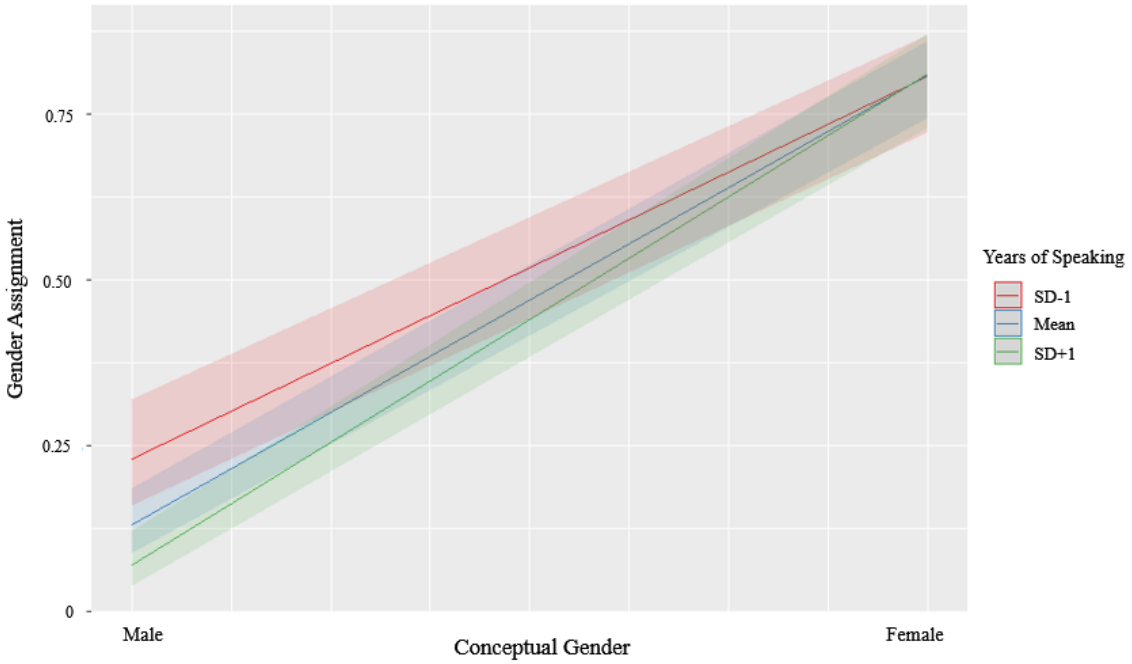
The lines indicate the gender assignment patterns of participants who learned French at an older (SD+1), average (Mean), or younger (SD-1) age. The ribbons represent the standard errors. The greater numbers on the Y-axis indicate that participants assigned female gender to objects dominantly, and the lower values indicate that participants assigned male gender to objects dominantly. $N = 50$.

Figure 8.7 The effect of the interaction between Years of Speaking and GG on the gender assignment in the EGAT for conceptually gendered objects



The lines indicate the gender assignment patterns of participants who speak French for a longer (SD+1), average (Mean), or shorter (SD-1) time.The ribbons represent the standard error. The greater numbers on the Y-axis indicate that participants assigned female gender to objects dominantly, and the lower values indicate that participants assigned male gender to objects dominantly. $N = 50$.

Figure 8.8 The effect of the interaction between Years of Speaking and CG on the gender assignment in the EGAT for conceptually gendered objects



The lines indicate the gender assignment patterns of participants who speak French for a longer (SD+1), average (Mean), or shorter (SD-1) time.The ribbons represent the standard error. The greater numbers on the Y-axis indicate that participants assigned female gender to objects dominantly, and the lower values indicate that participants assigned male gender to objects dominantly. $N = 50$.

8.3.4 Conceptually Gender-Neutral Objects

8.3.4.1 Implicit Association Test

Table 8.10 summarizes the error rates and RTs of participants in the IAT for conceptually gender-neutral objects. The greater numbers indicate more errors and a slower response rate.

Error rates Table 8.11 summarizes all the GLMMs that were constructed to predict the error rates. To predict the error rates for conceptually gender-neutral objects, a GLMM with GG Congruency (Congruent vs. Incongruent), as a fixed effect, and Participant and Item as random intercepts was constructed (Model 4a). No significant effect of GG Congruency on error rates was found. When GRAS-TR and its interaction with GG Congruency were included in the model (Model 4b), only the main effect of GRAS-TR was significant. Participants with relatively higher

sexist attitudes made more mistakes. Neither the main effects of GG Congruency nor the GG Congruency*GRAS-TR interaction significantly affected the error rates of participants.

Table 8.10 Descriptive Statistics for Performance in the IAT for Conceptually Gender-Neutral Objects

	GG Congruent		GG Incongruent	
	mean	*SD*	*mean*	*SD*
Error	0.04	0.20	0.03	0.18
RT	1153.36	1140.47	1153.33	961.46
$N = 50$				

Table 8.11 GLMMs for Predicting Error Rates in the IAT for Conceptually Gender-Neutral Objects

	B	***SE***	***Z***	***p***	***IAC***	***BIC***
Model 4a					427.11	448.08
GG Congruency	0.21	0.29	0.72	0.470		
Model 4b					424.50	455.95
GG Congruency	0.10	0.29	0.34	0.736		
GRAS-TR	-0.37	0.17	-2.18	0.030		
GG Congruency*GRAS-TR	-0.37	0.26	-1.42	0.155		
$N = 50$						

Table 8.12 summarizes all the GLMMs that were constructed to predict the error rates and identify factors that may affect bilingual cognition for conceptually gender-neutral objects. When Years of Speaking and its interaction with GG were included (Model 4d), only the main effect of Year of Speaking significantly affected response patterns of participants with participants who speak French for a longer time making more mistakes. Because of the better model fit, in the following models, only Item was included as a random intercept. To predict the effect of AoA and its interaction with GG Congruency included in the model (Model 4c), neither the main effect of GG Congruency nor its interaction with AoA significantly affected the error rates. However, the significant main effect of AoA indicated that participants who learned French at a younger age made more mistakes. When L2 Frequency and GG Congruency*L2 Frequency interaction was included (Model 4e), no main or interaction effect was found significant. When L2 Proficiency and its interaction with GG Congruency were included in the model (Model 4f), the only significant effect was the main effect of L2 Proficiency with participants with higher proficiency in French making more mistakes.

Table 8.12 GLMMs for Predicting Error Rates and Identifying Factors in the IAT for Conceptually Gender-Neutral Objects

	B	***SE***	***Z***	***p***	***IAC***	***BIC***
Model 4c					425.38	451.59
GG Congruency	0.22	0.31	0.73	0.468		
AoA	-0.49	0.16	-3.06	0.002		
GG Congruency*AoA	0.05	0.32	0.14	0.886		
Model 4d					423.40	454.84
GG Congruency	0.12	0.30	0.40	0.690		
Years of Speaking	0.48	0.18	2.73	0.006		
GG Congruency*Years of Speaking	0.25	0.30	0.83	0.408		
Model 4e					432.58	458.79
GG Congruency	3.95	2.95	1.34	0.180		
L2 Frequency	0.20	0.15	1.29	0.196		
GG Congruency*L2 Frequency	-0.39	0.31	-1.29	0.199		
Model 4f					430.16	456.36
GG Congruency	0.22	0.30	0.73	0.465		
L2 Proficiency	0.39	0.18	2.16	0.030		
GG Congruency*L2 Proficiency	-0.05	0.36	-0.13	0.895		
$N = 50$						

Reaction Times Table 8.13 summarizes all the LMMs that were constructed to predict the reaction times. To predict the RTs of participants, an LMM using the same set of fixed and random effects as Model 4a was conducted (Model 5a). GG Congruency did not affect the RTs of participants. When the main effects of GRAS-TR and GG Congruency*GRAS-TR interaction were included (Model 5b), no significant effect was found.

Table 8.13 LMMs for Predicting RTs in the IAT for Conceptually Gender-Neutral Objects

	B	***SE***	***t***	***p***	***IAC***	***BIC***
Model 5a					23314.59	23340.79
GG Congruency	0.00	0.00	0.00	0.999		
Model 5b					23295.87	23332.56
GG Congruency	0.04	53.77	0.00	0.999		
GRAS-TR	85.31	54.40	1.57	0.124		
GG Congruency*GRAS-TR	-43.20	53.79	-0.80	0.422		
$N = 50$						

Table 8.14 summarizes all the LMMs that were constructed to predict the reaction times and identify factors that may affect bilingual cognition. When AoA (Model 5c), Years of Speaking (Model 5d), L2 Frequency (Model 5e), L2 Proficiency (Model

5f), and the interaction of each of them with GG's were included in the different models, no main or interaction effect was found significant.

Table 8.14 LMMs for Predicting RTs and Identifying Factors in the IAT for Conceptually Gender-Neutral Objects

	B	***SE***	***t***	***p***	***IAC***	***BIC***
Model 5c					23296.73	23333.42
GG Congruency	0.00	0.00	0.00	0.999		
AoA	0.00	0.00	1.35	0.183		
GG Congruency*AoA	0.00	0.00	0.63	0.530		
Model 5d					23297.4	23334.09
GG Congruency	0.04	53.78	0.00	0.999		
Years of Speaking	-67.04	54.59	-1.23	0.226		
GG Congruency*Years of Speaking	-10.69	53.80	-0.20	0.842		
Model 5e					23294.89	23331.58
GG Congruency	445.49	340.51	1.31	0.191		
L2 Frequency	7.51	40.66	0.19	0.854		
GG Congruency*L2 Frequency	-52.30	39.48	-1.33	0.185		
Model 5f					23298.9	23335.59
GG Congruency	0.04	53.78	0.00	0.999		
L2 Proficiency	7.49	55.33	0.14	0.893		
GG Congruency*L2 Proficiency	-4.14	53.80	-0.08	0.939		
$N = 50$						

8.3.4.2 Explicit Gender Attribution Task

Table 8.15 summarizes the error rates and reaction times of participants in the EGAT for conceptually gender-neutral objects. The greater numbers indicate more errors and a slower response rate.

Table 8.15 Descriptive Statistics for Gender Assignment Patterns in the EGAT for Conceptually Gender-Neutral Object

Grammatically feminine		Grammatically masculine	
mean	*SD*	*mean*	*SD*
0.69	0.46	0.29	0.46
$N = 50$			

Table 8.16 summarizes all the GLMMs that were constructed to predict the gender assignment patterns of the participants in the EGAT for conceptually gender-neutral objects. A GLMM predicting explicit gender attribution was constructed with GG (Feminine vs. Masculine) as fixed effect and Participant and Item as random intercepts (Model 6a). GG was found to significantly affect participants' gender

assignment. They assigned genders to objects in line with the GG of the objects. When the GRAS-TR and its interaction with GG were included in the model (Model 6b), the effect of GG remained significant. Additionally, the significant main effect of GRAS-TR indicated that participants with relatively higher egalitarian gender role attitudes assigned the female gender to objects more. However, no significant GG*GRAS-TR interaction was found.

Table 8.16 GLMMs for Predicting Gender Assignment Patterns in the EGAT for Conceptually Gender-Neutral Objects

	B	***SE***	***Z***	***p***	***IAC***	***BIC***
Model 6a					431.52	446.95
GG Congruency	1.84	0.30	6.16	<0.001		
Model 6b					425.06	448.21
GG Congruency	1.83	0.30	6.13	<0.001		
GRAS-TR	0.42	0.14	2.94	0.003		
GG Congruency*GRAS-TR	0.34	0.25	1.36	0.173		
$N = 50$						

Table 8.17 summarizes all the GLMMs that were constructed to predict gender assignment patterns of participants and identify factors that may affect bilingual cognition for conceptually gender-neutral objects. After AoA and GG*AoA interaction was added (Model 6c), the main effects of GG, and AoA were found significant. More specifically, Turkish-French bilinguals assigned genders to objects consistent with the GG. Also, the ones who learned French at a later age assigned the female gender to more objects. When Years of Speaking and GG*Years of Speaking interaction were added to the model (Model 6d), the main effects of GG remained significant. In addition, the significant main effect of Years of Speaking indicated that participants who speak French for a shorter time assigned the female gender to more objects. When the main effect of L2 Frequency and GG*L2 Frequency interaction were included in the model (Model 6e), only the main effect of GG was significant. Similarly, after the main effects of L2 Proficiency and GG*L2 Proficiency interaction were included in the model (Model 6f), only GG affected gender assignment significantly with participants assigning female to grammatically feminine objects and male to grammatically masculine objects more.

Table 8.17 GLMMs for Predicting Gender Assignment Patterns and Identifying Factors in the EGAT for Conceptually Gender-Neutral Objects

	B	***SE***	***Z***	***p***	***IAC***	***BIC***
Model 6c					420.39	443.54
GG Congruency	1.83	0.30	6.04	<0.001		
AoA	0.55	0.14	4.00	<0.001		
GG Congruency*AoA	0.02	0.25	0.07	0.945		
Model 6d					418.85	442.00
GG Congruency	1.84	0.31	5.97	<0.001		
Years of Speaking	-0.57	0.14	-4.14	<0.001		
GG Congruency*Years of Speaking	0.22	0.26	0.86	0.392		
Model 6e					432.31	455.46
GG Congruency	1.84	0.30	6.06	<0.001		
L2 Frequency	-0.25	0.15	-1.63	0.102		
GG Congruency*L2 Frequency	0.18	0.24	0.75	0.454		
Model 6f					430.86	454.01
GG Congruency	1.87	0.31	6.04	<0.001		
L2 Proficiency	-0.20	0.15	-1.29	0.197		
GG Congruency*L2 Proficiency	0.42	0.24	1.77	0.077		
$N = 50$						

8.4 Discussion

Study III was conducted to examine whether learning a language with grammatical gender can affect the object-related concepts that native speakers of a genderless language have. This study, also, examined the factors that may affect the degree to which bilinguals are affected by GG. For conceptually gendered objects, in the IAT, not GG but CG of the objects affected the response rates of bilingual speakers. Therefore, in the implicit measure, their response rates were more similar to Turkish speakers. When whether any factor may affect the degree to which participants are implicitly influenced by GG and CG was examined, the only significant interactions were CG*GRAS and GG*AoA. Unexpectedly, Turkish-French speakers with more egalitarian gender role attitudes were slower in the CG incongruent trials. Perhaps this unexpected pattern occurred because more egalitarian participants were more conscious of stereotypical gender associations, and they were trying to be more careful about not making mistakes in the incongruent trials. As a result, they reacted slower in those trials. Further, participants who learned French at a later age were slower in the GG congruent trials. This pattern is, too, unexpected, as previous studies in the other domains found that the earlier the second language is learned, the more it affects the conceptualization of bilingual speakers (e.g., Boroditsky 2001). Additionally, the factors that some of the previous studies reported as

affecting a cognitive shift towards the second language such as L2 proficiency level (e.g., Athanasopoulos 2007; Park 2020; Park and Zeigler 2014), and frequency (e.g., Athanasopoulos et al. 2011; Park and Zeigler 2014) were not found significant in the IAT.

In the explicit measure, both CG and GG of the objects affected the gender assignment patterns of bilinguals. In particular, they assigned genders to objects in line with either CG or GG. Thus, different from the implicit measure, in a task that requires participants to make a gender-based decision, French grammatical gender affected the gender assignment of Turkish-French bilinguals. Interestingly, whereas the significant effect of GG did not emerge for native speakers of French, it significantly affected the response patterns of bilinguals. Perhaps one reason for the stronger effect of GG on gender assignment patterns of the bilinguals is that labeling the objects is a more effortful process even for advanced bilinguals (e.g., Grüter, Lew-Williams and Fernald 2012) and it may have increased the salience of GG for them.

The nonsignificant GG*CG interaction indicated the effect of GG emerged independent of the CG. Moreover, similar to native French speakers, individual differences in the gender role attitudes affected the degree to which bilinguals were influenced by GG and CG. Again, participants with relatively more sexist attitudes assigned genders to objects in line with the CG, and participants who were higher in egalitarian gender role attitudes assigned genders to objects consistent with the GG of the objects in French. Thus, the findings of this study provide further evidence for the modulator effect of individual differences in the gender role attitudes to the degree to which participants are affected by GG and CG.

In the explicit measure, too, when the factors affecting the influence of GG and CG were assessed, unexpected patterns emerged. Whereas participants who learned French at an older age, and speak French for a shorter time were affected by GG more, bilinguals who learned French at a younger age, and speak French for a longer period were affected by CG more. As mentioned above, these results are at odds with the previous findings. These unexpected patterns may be due to a confounding variable that is in relation to participants' backgrounds in French and the salience of gender-related concepts for them. As previously mentioned, all of the independent variables are correlated with each other. The correlations between factors show that participants who learned French at an earlier age are the ones who speak French for a longer time. Also, in general, these people were relatively higher in sexist gender role attitudes compared to participants who learned French at an older age and hence speak it for a shorter time. Thus, the unexpected effects of factors related to

participants' language backgrounds may be modulated by the gender role attitudes they have. To have a better understanding of the factors modulating learning a grammatical gender language that affects the object conceptualization of bilinguals, further studies that control for individual differences in the gender role attitudes are needed.

For the conceptually gender-neutral objects, no effect of GG or its interactions with any variable was found in the IAT. Like Study I, and II, in the EGAT, GG affected the gender attribution patterns of participants. In other words, bilingual speakers assigned genders to objects consistent with GG. However, as previously mentioned, these findings can be attributed to another shared categorical property.

To sum up, the current study shows that whereas in the IAT, the performance of Turkish-French bilinguals was similar to native Turkish speakers, in the EAGT, similar to native French speakers, bilinguals' gender assignment patterns were affected by GG. These results of the present study expand the recent findings of Park (2020) suggesting that the nature of the task affects the performance of bilinguals. In other words, whereas in the verbal and explicit tasks bilinguals show an L2-like pattern, in the non-verbal and implicit tasks, they show an L1-like pattern. As the effect of GG emerged only in the explicit measures, the findings of the current study provide evidence for learning a GG language affects the object-related concepts of bilinguals, but this effect is limited.

9. STUDY IV - VERBAL INTERFERENCE

In Study II, native French speakers were found to be affected by grammatical gender in the nonlinguistic IAT even though the task did not prime the object labels or require the use of language. However, some scholars suggested that nonlinguistic tasks alone are not sufficient to argue that language affects nonlinguistic cognition, as participants can covertly use language to complete the task (e.g., Gleitman and Papafragou 2005, 2012). Label-feedback hypothesis (Lupyan 2012) suggests that even being exposed to nonlinguistic stimuli automatically activated labels and this online use of language affects perception. Consistent with this view, previous neuroimaging studies found an automatic and unconscious activation of grammatical gender even when the use of language was task-unrelated (Boutonnet, Athanasopoulos and Thierry 2012). Accordingly, Study II does not speak for the degree to which grammatical gender affects object conceptualization as the study procedure did not eliminate the online use of language. Using a dual-task methodology (i.e., verbal interference), Study IV prevents participants from subvocally verbalizing objects and examines whether grammatical gender affects nonlinguistic object conceptualization even when covert labeling is not possible. As mentioned earlier, in the verbal interference methodology, participants are asked to repeat some words or numbers while performing the main task. The assumption is that, since the verbal rehearsal system is preoccupied with the concurrent interference task, it cannot be used for verbally encoding the visual stimuli (Athanasopoulos and Casaponsa 2020). A number of studies reported that under verbal interference, some of the differences between speakers of different languages disappear and suggested that people use language as a cognitive tool to complete tasks (e.g., Gennari et al. 2002; Frank et al. 2008; Athanasopoulos and Albright 2016). On the contrary, other studies showed that the difference between the speakers of different languages persists even when the task is completed under verbal interference and argued that language affects nonlinguistic cognition (e.g., Dolscheid et al. 2013; Phillips and Boroditsky 2003).

Although verbal interference is a widely used methodology for studying the nonlin-

guistic influence of language on cognition, so far, to my knowledge, only two studies used verbal interference to examine the influence of grammatical gender on the nonlinguistic object conceptualization. In one study, for preventing lexical processing, Cubelli et al. (2011) asked participants to complete an articulatory suppression task in which they repeated nonsense syllables (blah blah blah), while they were performing a categorization task. They found that under articulatory suppression, the effect of grammatical gender disappeared and the authors suggested that the effect of grammatical gender is at the lexical level. On the contrary, Phillips and Boroditsky (2003) asked participants to rate similarities of objects under verbal interference and they reported that even under verbal interference the similarity judgments of participants were affected by grammatical gender. The authors suggested that the grammatical gender affects nonlinguistic representations. However, the participants in that study were Spanish-English and German-English bilinguals and the verbal interference task was in English. If, as Athanasopoulos and his colleagues (2015) reported, verbal interference disturbs only the language in which verbal interference is given, then, since Phillips and Boroditsky (2003) only prevented access to English, a language without grammatical gender, and participants' native languages, Spanish and German, were still accessible, the effect they reported might not be interpreted as grammatical gender affects nonlinguistic cognitive processes. Thus, further studies are needed to understand whether grammatical gender still affects cognition even when online access to language is prevented.

Also, in the EGAT, even though grammatical gender did not significantly affect the gender assignment patterns of native speakers of French, its interaction with gender role attitudes showed that participants with relatively higher egalitarian gender role attitudes assigned genders to objects consistent with the grammatical gender. Nevertheless, as mentioned before, in the EGAT, participants were simultaneously asked to assign gender and indicate the name of the object. The labeling process may have activated grammatical gender. By removing the labeling part, this study aims to assess the explicit object conceptualization of French speakers when the language salience of the task is low.

If the significant effect in the IAT emerged due to grammatical gender being automatically activated once participants saw the object pictures, I expected the effect of grammatical gender to diminish, under the verbal interference. Also, I expected verbal interference to disrupt only the effect of grammatical gender. Hence, as in Study I, II, and III, conceptual gender would affect the performance in the IAT. Specifically, under verbal interference, too, French speakers would be more accurate and faster in the conceptual gender congruent trials. Additionally, although the labels would be less salient, I expected both grammatical gender and conceptual

gender to affect the gender assignment patterns of French speakers in the EGAT. Lastly, I expected that gender role attitudes participants have would affect the degree to which they are affected by conceptual gender in the implicit task and by both grammatical and conceptual gender in the explicit task. Specifically, I expected participants with more sexist attitudes to be affected by conceptual gender more both in the IAT and EGAT, and participants with more egalitarian attitudes to be affected by grammatical gender more in the EGAT.

9.1 Participants

The data were collected from sixty-one native speakers of French through the participant recruitment system *Prolific* (https://www.prolific.co). Eleven participants were excluded from the data (eleven participants did not send the requested audio recording, and one participant could not record the whole procedure due to technical difficulty). The final dataset consisted of fifty native French speakers living in France (*age range* = 19-35 years; $M_{age} = 25.12$; $SD_{age} = 4.23$; 25 females, 24 males, 1 demiboy). Whereas four participants were monolingual speakers of French, the rest of the participants spoke at least English as a second language. Although some of them reported some knowledge of other languages (Italian, Spanish, German, Comorian, Malagasy, Japanese, and Russian), none of the participants reported speaking a grammatical gender language at the advanced level. Similar to Study II, they were paid on Prolific for their participation.

9.2 Materials and Procedure

The procedure was largely the same as in Study II. Different from Study II, participants performed verbal interference while they were completing the IAT. The verbal interference task consisted of 7 two-syllable French verbs ("*Partir*" [to leave], "*Aller*" [to go], "*Chercher*" [to look for], "*Venir*" [to come], "*Mener*" [to lead], "*Sortir*" [to go out], "*Offrir*" [to offer]) that do not describe any action related to study stimuli. The reason why verbs instead of numbers or nouns were chosen is that in French, all nouns including numbers are assigned to a gender. On the other hand, the verbs themselves do not have grammatical gender. Hence repeating the verbs during the task is not expected to prime either grammatical or conceptual gender. During the IAT, at the beginning of each part, participants were given a new word

and instructed to overtly repeat it until the end of that part. Those words were randomly assigned to each part. Participants were instructed to record their voices during the entire IAT procedure while they were performing the verbal interference and send the recording to the researcher once the experiment is done. After the IAT, they answered the Demographic Form and French version of GRAS. And lastly, they completed the EGAT. Unlike Study II, in the current study, participants were not asked to indicate the labels of the objects. Thus, like in the case of Study I, they were only presented with the object pictures one by one and asked to indicate the gender each object reminds them of. The materials were given in French (see Appendices A, D, K and R for the French versions and B, E, L and S) and the entire procedure lasted around twenty minutes.

9.3 Results

In both the IAT and EGAT, trials with conceptually gendered objects and trials with conceptually gender-neutral objects were analyzed separately. In the following sections, the results of GRAS are first presented. Then, the results of the IAT and EGAT with conceptually gendered objects and then with gender-neutral objects are reported.

9.3.1 Gender Role Attitudes Scale (GRAS)

The GRAS was found to be a reliable scale for the French-speaking participants (α = 0.91). Participants, overall, had a high score (*score range* = 2.6 – 5; $M = 4.52$; $SD = 0.54$), which indicates that participants have egalitarian gender role attitudes.

9.3.2 Conceptually Gendered Objects

9.3.2.1 Implicit Association Test (IAT)

There were no responses with reaction times above 10,000 ms thus, no trials were excluded. Table 9.1 summarizes the error rates and reaction times of participants in the IAT, for conceptually gendered objects. The greater numbers indicate more error and a slower reaction time.

Table 9.1 Descriptive Statistics of Performance in the IAT for Conceptually Gendered Objects

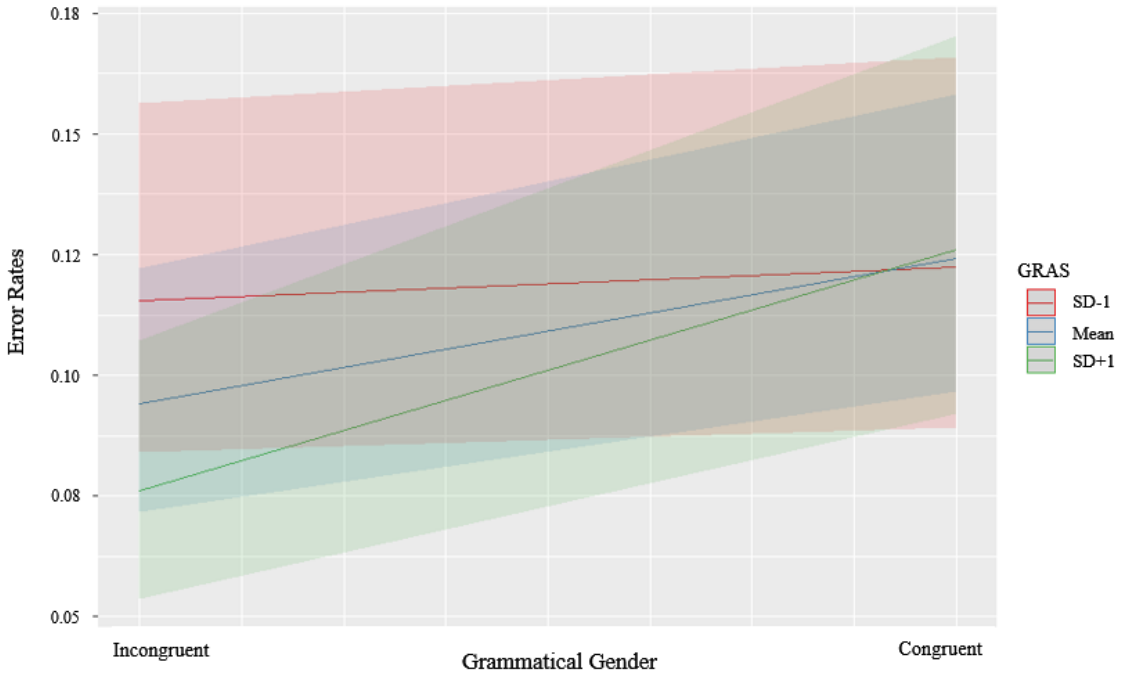
	GG Congruent		GG Incongruent		CG Congruent		CG Incongruent	
	mean	*SD*	*mean*	*SD*	*mean*	*SD*	*mean*	*SD*
Error	0.15	0.36	0.12	0.33	0.08	0.28	0.19	0.39
RT	899.23	567.24	872.61	498.74	843.67	536.36	928.15	528.80
$N = 50$								

Error Rates Table 9.2 summarizes all the GLMMs for predicting error rates. To predict the error rates, a GLMM was constructed with GG Congruency (Congruent vs. Incongruent), and CG Congruency (Congruent vs. Incongruent) as fixed effects, and Participant and Item as random intercepts (Model 1a). Both GG Congruency and CG Congruency affected the error rates. Participants were more accurate in the CG congruent trials. However, unexpectedly, participants made more mistakes in the GG congruent trials. Then, the GG Congruency*CG Congruency interaction was added to the model (Model 1b). Whereas the main effects of GG Congruency and CG Congruency remained significant, the GG Congruency*CG Congruency interaction was not significant. To examine the influence of gender role attitudes on the degree to which participants are affected by GG and CG Congruency, GRAS and its interactions with GG Congruency and CG Congruency were included in the model (Model 1c). The main effects of GG Congruency, CG Congruency, and GG Congruency*GRAS interaction were significant. The significant GG Congruency*GRAS interaction indicated that participants with relatively higher egalitarian gender role attitudes were more accurate in the GG incongruent trials (Figure 9.1). No significant effects of GRAS and its interaction with CG Congruency were found.

Table 9.2 GLMMs for Predicting Error Rates in the IAT for Conceptually Gendered Objects

	B	*SE*	*Z*	*p*	*IAC*	*BIC*
Model 1a					2379.67	2410.03
GG Congruency	0.29	0.11	2.63	0.008		
CG Congruency	-0.98	0.11	-8.60	<0.001		
Model 1b					2381.33	2417.75
GG Congruency	0.31	0.11	2.70	0.007		
CG Congruency	-0.98	0.11	-8.61	<0.001		
GG Congruency*CG Congruency	0.26	0.43	0.60	0.551		
Model 1c					2379.43	2427.99
GG Congruency	0.31	0.11	2.77	0.006		
CG Congruency	-0.98	0.11	-8.61	<0.001		
GRAS	-0.11	0.10	-1.12	0.264		
GG Congruency*GRAS	0.25	0.11	2.29	0.022		
CG Congruency*GRAS	-0.03	0.11	-0.30	0.763		
$N = 50$						

Figure 9.1 The effect of the interaction between GRAS and GG on the error rates in the IAT for conceptually gendered objects



The lines indicate the error rates of participants who were low (SD+1), medium (Mean), or high (SD-1) in confirming sexist attitudes based on the GRAS. The ribbons represent the standard errors. The higher numbers on the Y-axis indicate more mistakes. $N = 50$.

Reaction Times (RTs) Table 9.3 summarizes all the LMMs that were constructed to predict the reaction times in the IAT for conceptually gendered objects. To predict the RTs, a LMM with GG Congruency (Congruent vs. Incongruent), and CG Congruency (Congruent vs. Incongruent) as fixed effects, and Participant and Item as random intercepts was constructed (Model 2a). Whereas GG Congruency was not found to significantly affect the RTs, CG Congruency significantly affected the RTs. Participants were slower when the CG of the object was incongruent with the gender of the face. Then, the GG Congruency*CG Congruency interaction was added to the model (Model 2b). The main effect of GG Congruency and GG Congruency*CG Congruency interaction did not significant affect the response rates of participants. However, the main effect of CG Congruency remained significant indicating that participants were faster when the CG of the object and the gender of the face were congruent. When GRAS and its interactions with CG Congruency and GG Congruency were included in the model (Model 2c), again the main effect of CG congruency was found significant.

Table 9.3 LMMs for Predicting RTs in the IAT for Conceptually Gendered Object

	B	***SE***	***t***	***p***	***IAC***	***BIC***
Model 2a					49002.74	49039.16
GG Congruency	26.28	17.84	1.47	0.141		
CG Congruency	-84.12	17.84	-4.72	<0.001		
Model 2b					48994.36	49036.86
GG Congruency	26.28	17.84	1.47	0.141		
CG Congruency	-84.12	17.84	-4.72	<0.001		
GG Congruency*CG Congruency	26.13	67.09	0.39	0.703		
Model 2c					48979.63	49034.26
GG Congruency	26.28	17.83	1.47	0.141		
CG Congruency	-84.12	17.83	-4.72	<0.001		
GRAS	28.56	24.76	1.15	0.254		
GG Congruency*GRAS	16.26	17.84	0.91	0.362		
CG Congruency*GRAS	-33.34	17.84	-1.87	0.062		.
$N = 50$						

9.3.2.2 Explicit Gender Attribution Task (EGAT)

Table 9.4 summarizes the gender assignment patterns of participants in the EGAT for conceptually gendered objects. The greater numbers indicate that they assigned the female gender to objects more and the lower numbers indicate they assigned the

male gender to objects more.

Table 9.4 Descriptive Statistics for Gender Assignment Patterns in the EGAT for Conceptually Gendered Objects

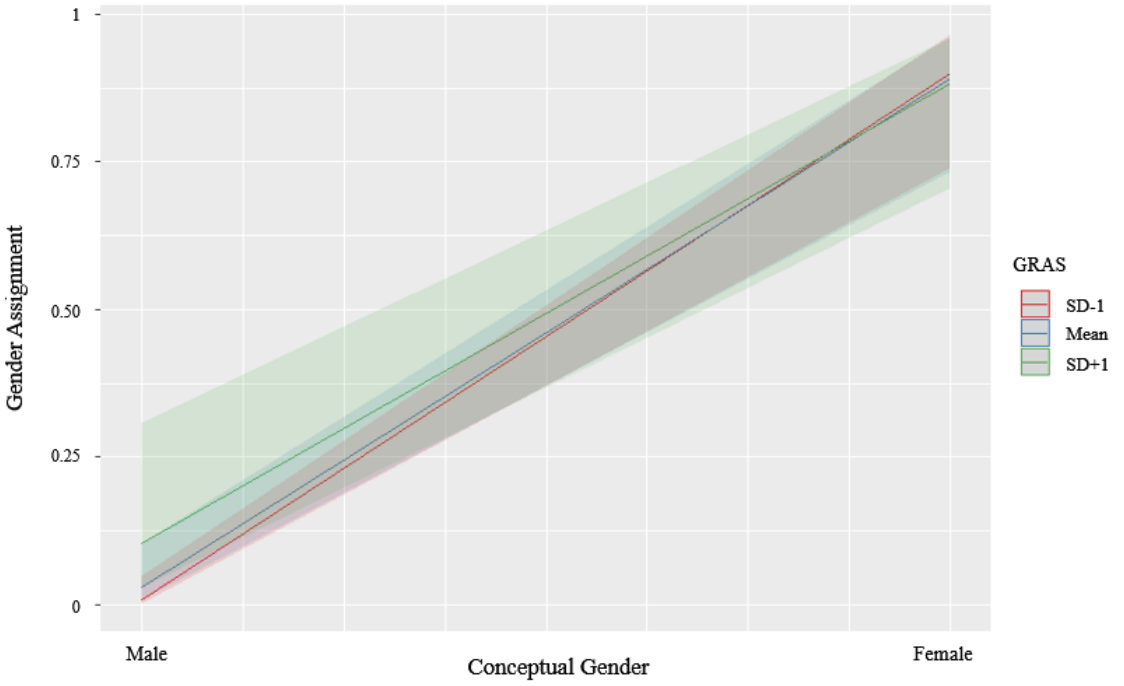
Grammatically feminine		Grammatically masculine		Conceptually feminine		Conceptually masculine	
mean	*SD*	*mean*	*SD*	*mean*	*SD*	*mean*	*SD*
0.47	0.50	0.47	0.50	0.78	0.42	0.07	0.26
$N = 50$							

Table 9.5 summarizes all the GLMMs that were constructed to predict the gender assignment patterns of participants in the EGAT. A GLMM predicting explicit gender attribution was constructed with GG (Feminine vs. Masculine) and CG (Female vs. Male) as fixed effects and Participant and Item as random intercepts (Model 3a). The way participants assigned genders to objects was significantly affected by the CG of the objects, indicating that French speakers assigned the female gender to conceptually feminine objects, and the male gender to conceptually masculine objects. GG was not found to significantly affect gender assignment patterns. When the GG*CG interaction was included in the model (Model 3b), the main effect of CG remained significant; neither the main effect of GG nor GG*CG interaction was significant. To assess how participants' gender role attitudes affected their explicit gender attributions, GRAS and its interactions with GG and CG were included in the model (Model 3c). The main effects of CG and GRAS were found significant. The female gender was attributed to conceptually female objects and the male gender was attributed to conceptually male objects more. Additionally, participants with relatively more egalitarian gender role attitudes tended to assign the female gender to more objects. The significant CG*GRAS interaction indicated that participants with greater sexist attitudes were affected by the conceptual gender of the objects more than their peers with less sexist attitudes (Figure 9.2).

Table 9.5 GLMMs for Predicting Gender Assignment Patterns in the EGAT for Conceptually Gendered Objects

	B	*SE*	*Z*	*p*	*IAC*	*BIC*
Model 3a					512.16	535.58
GG	-0.48	0.82	-0.59	0.557		
CG	5.22	0.84	6.19	<0.001		
Model 3b					513.54	541.65
GG	-0.39	0.81	-0.49	0.626		
CG	5.20	0.83	6.28	<0.001		
GG*CG	-1.30	1.62	-0.80	0.422		
Model 3c					505.70	543.17
GG	-0.46	0.82	-0.56	0.578		
CG	5.61	0.88	6.40	<0.001		
GRAS	0.63	0.27	2.34	0.020		
GG*GRAS	-0.05	0.28	-0.20	0.845		
CG*GRAS	-1.43	0.49	-2.89	0.004		
$N = 50$						

Figure 9.2 The effect of the interaction between GRAS and CG on the gender assignment in the EGAT for conceptually gendered objects



The lines indicate the gender assignment patterns of participants who were low (SD+1), medium (Mean), or high (SD-1) in confirming sexist attitudes based on the GRAS. The ribbons represent the standard errors. The greater numbers on the Y-axis indicate that participants assigned female gender to objects dominantly. $N = 50$.

9.3.3 Conceptually Gender-Neutral Objects

9.3.3.1 Implicit Association Test

Table 9.6 summarizes the error rates and reaction times of participants in the IAT for conceptually gender-neutral objects. The greater numbers indicate more errors and a slower response rate.

Table 9.6 Descriptive Statistics for Performance in the IAT for Conceptually Gender-Neutral Objects

	GG Congruent		GG Incongruent	
	mean	*SD*	*mean*	*SD*
Error	0.11	0.31	0.13	0.34
RT	902.63	546.38	912.33	592.59
$N = 50$				

Error rates Table 9.7 summarizes all the GLMMs that were constructed to predict the error rates. To predict the error rates for conceptually gender-neutral objects, a GLMM with GG Congruency (Congruent vs. Incongruent), as a fixed effect, and Participant and Item as random intercepts was constructed (Model 4a). No significant effect of GG Congruency on error rates was found. When GRAS and its interaction with GG Congruency was included in the model (Model 4b) again, neither the main effects of GG Congruency and GRAS nor their interaction significantly affected the error rates.

Table 9.7 GLMMs for Predicting Error Rates in the IAT for Conceptually Gender-Neutral Objects

	B	***SE***	***Z***	***p***	***IAC***	***BIC***
Model 4a					1129.89	1151.39
GG Congruency	-0.24	0.16	-1.55	0.122		
Model 4b					1132.11	1164.37
GG Congruency	-0.26	0.16	-1.62	0.106		
GRAS	-0.15	0.13	-1.14	0.253		
GG Congruency*GRAS	-0.12	0.16	-0.78	0.437		
$N = 50$						

Reaction Times (RTs) Table 9.8 summarizes all the LMMs that were constructed to predict the reaction times. To predict the RTs of French speakers, a LMM using the same set of fixed and random effects as Model 4a was conducted (Model 5a). GG Congruency did not affect the RTs of participants. Also, when GRAS and its

interaction with GG Congruency were included in the model (model 5b), no significant main effects of GG Congruency and GRAS and the GG Congruency*GRAS interaction were found.

Table 9.8 LMMs for Predicting RTs in the IAT for Conceptually Gender-Neutral Objects

	B	***SE***	***t***	***p***	***IAC***	***BIC***
Model 5a					24714.61	24741.5
GG Congruency	-9.96	26.82	1541.01	0.710		
Model 5b					24699.45	24737.09
GG Congruency	-9.96	26.82	1540.01	0.710		
GRAS	33.08	28.84	47.98	0.257		
GG Congruency*GRAS	-25.06	26.83	1539.99	0.35		

$N = 50$

9.3.3.2 Explicit Gender Attribution Task

Table 9.9 summarizes the gender assignment patterns of participants in the EGAT for conceptually gender-neutral objects. The greater numbers indicate more errors and a slower response rate.

Table 9.9 Descriptive Statistics for Gender Assignment Patterns in the EGAT for Conceptually Gender-Neutral Objects

Grammatically feminine		Grammatically masculine	
mean	*SD*	*mean*	*SD*
0.62	0.49	0.44	0.50

$N = 50$

Table 9.10 summarizes all the GLMMs that were constructed to predict the gender assignment patterns of participants in the EGAT. GLMM predicting explicit gender attribution was constructed using the same set of fixed and random effects (Model 6a). Although the effect of GG on gender assignment is not significant, the trend suggests that participants assigned female gender to grammatically feminine objects and male gender to masculine objects. After GRAS and GG*GRAS interaction were added (Model 6b), no significant effects of GG, GRAS, or GG*GRAS interaction were found.

Table 9.10 GLMMs for Predicting Gender Assignment Patterns in the EGAT for Conceptually Gender-Neutral Objects

	B	***SE***	***Z***	***p***	***IAC***	***BIC***
Model 6a					536.95	552.92
GG	0.77	0.43	1.81	0.071		
Model 6b					538.25	562.20
GG	0.77	0.43	1.81	0.070		
GRAS	0.17	0.11	1.57	0.117		
GG*GRAS	0.10	0.21	0.49	0.627		
$N = 50$						

9.4 Discussion

Study IV was conducted to examine whether the effect of grammatical gender found in the IAT with native French speakers (Study II) was driven by linguistic labels automatically activated during the task, as suggested by Lupyan (2012) and several others (e.g., Gleitman and Papafragou 2005, 2012). Using the verbal interference methodology, Study IV tested whether the effect of grammatical gender persists even when the online processing of language is disrupted. I hypothesized that if the effect emerged because of the online use of language, the influence of grammatical gender on object conceptualization would diminish under verbal interference.

In the IAT, the effect of conceptual gender remained significant indicating that verbal interference does not disrupt nonlinguistic cognitive processing (see also Feinmann 2020). The effect of grammatical gender, on the other hand, was reversed under verbal interference. More specifically, when the online use of language was not disrupted in Study II, French speakers were more accurate in the GG congruent trials. In Study IV, however, French speakers made more mistakes in the GG congruent trials than in the GG incongruent trials under verbal interference. Additionally, unlike Study II, not only gender role attitudes modulate the effect of conceptual gender, but also participants with more egalitarian gender role attitudes were more accurate in the GG incongruent trials than congruent trials. Thus, the way the effect of grammatical gender was modulated by gender role attitudes was affected under verbal interference. This disrupted effect of grammatical gender under verbal interference suggested that although the use of language was not relevant to the task, grammatical gender automatically activated in Study II and the effect emerged due to the online use of language. Thus, Study IV provides further evidence for the suggestion that language is automatically activated even in nonlinguistic tasks in

which the use of language is not required (Lupyan 2012).

The current study does not replicate the finding by Phillips and Boroditsky (2003) in which the effect of grammatical gender remained even under verbal interference. On the other hand, this study largely aligns with the findings of Cubelli et al. (2011) in which the effect of grammatical gender diminished under verbal interference. One reason why Phillips and Boroditsky (2003) reported the undisturbed effect of grammatical gender even under verbal interference may be the task language. As mentioned before, Phillips and Boroditsky (2003) examined the effect of grammatical gender with a sample consisting of German-English and Spanish-English bilinguals and both the main task and verbal interference were in English. Athanasopoulos and colleagues (2015) reported that verbal interference does not disrupt the general language faculty but rather, reduces the access to the language the task was given. Hence, it might be the case that the verbal interference task in the study of Phillips and Boroditsky (2003) only prevented access to English, and German and Spanish remained undisturbed. Thus, participants could still access the grammatical gender language to complete the task. However, this speculation requires further examination.

In linguistic relativity research using verbal interference, the main assumptions are that 1) if the significant effect of a specific language diminishes under verbal interference, the effect of language is at the linguistic level, and 2) if under verbal interference individuals perform the same as the no verbal interference condition this supports the argument that language affects nonlinguistic cognition (e.g., Nedergaard, Wallentin and Lupyan 2022). Thus, the reverse effect found in the current study was unexpected. Notably, Gilbert and colleagues also reported a reverse effect in the verbal interference condition of their studies on color (Gilbert et al. 2006) and category (Gilbert et al. 2008) discrimination. These studies reported that visual stimuli presented in the right visual field (RVF; see Chapter 1.2.1 for a detailed description of the study) – thus were processed in the language-dominant left hemisphere – were perceived categorically in accordance with the labeling patterns in participants' native language. In the no verbal interference and nonverbal interference conditions, participants were faster in the between-category distinction (e.g., a cat among dogs) than in within-category distinction (e.g., a cat among other cats), when the target was in the RVF. In the verbal interference condition, although the authors expected this category advantage to be attenuated, participants' performances were enhanced in a reverse way. In particular, they were faster in the between-category distinction, when the target was in the LVF (Gilbert et al. 2006, 2008), and they were faster in the within-category distinction when the target was in the RVF (Gilbert et al. 2006). The reverse effect was interpreted as verbal interference eliminating the effect

of language (Gilbert et al. 2006, 2008, see also Lupyan et al. 2019; Nedergaard, Wallentin and Lupyan 2022). In the same vein, the reverse effect of grammatical gender in the present study can be interpreted as the eliminated effect of language under verbal interference, and it can suggest that the significant effect that was observed in Study II was due to the automatic activation of labels in the task.

One possible reason for the reverse effect may be the cognitive switch toward undisturbed language suggested by Athanasopoulos and colleagues (2015). In other words, when the French verbal interference task reduced access to the French grammatical system, the gender system of other language that participants are familiar with became activated and affected their response pattern. As previously mentioned, no participants in the current study reported being fluent in or frequently using a grammatical gender language; however, eighteen participants reported that they speak at least one grammatical gender language other than French including Italian (four participants), German (three participants), and Spanish (eleven participants). Thus, when participants' access to French was reduced with verbal interference, the grammatical gender systems of these languages might have become activated and affected participants' response rate. As Spanish was the most common language among them, it can be speculated that the grammatical gender system in Spanish got activated for those participants, and perhaps the reverse effect was due to some objects having different grammatical genders in Spanish and French (e.g., ring is grammatically feminine in French [*bague*] but masculine in Spanish [*anillo*]). In order to rule out this possibility, these eleven Spanish-speaking participants were excluded, and to predict the error rates, a GLMM was constructed with GG Congruency (Congruent vs. Incongruent), and CG Congruency (Congruent vs. Incongruent) as fixed effects, and Participant and Item as random intercepts. However, similar response patterns as previous findings were reported. Again, participants were more accurate in the CG Congruent trials ($p < 0.001$) and made more mistakes in the GG congruent trials ($p = 0.011$). When the GG Congruency*CG Congruency interaction was added to the model, although the interaction between GG Congruency and CG Congruency was not significant, the main effects of CG Congruency ($p < 0.001$) and GG Congruency ($p = 0.010$) remained significant. To examine the effect of gender role attitudes on the degree to which participants are affected by GG and CG Congruency, GRAS and its interactions with GG Congruency and CG Congruency were included in the model. Again, participants were more accurate in the CG congruent trials ($p < 0.001$), and GG incongruent trials ($p = 0.007$). Also, participants with more egalitarian gender role attitudes were more accurate in the GG incongruent trials ($p = 0.050$). Thus, even when the participants with some knowledge of Spanish were excluded from the data, the significant pat-

terns remained the same. Therefore, I argue that it is unlikely that the reverse effect was due to the grammatical gender system in another language. Further studies are needed to understand the mechanism underlying the reverse effect.

In the EGAT, only the conceptual gender and its interaction with gender role attitudes affected the gender assignment patterns. Similar to Study II, French speakers assigned genders to objects consistent with the conceptual gender, and the gender assignment patterns of participants with relatively higher sexist role attitudes were affected by conceptual gender more compared to less sexist participants. The effect of conceptual gender remained the same even when the labels were less salient in the task thus, the change in the salience of language in the task did not affect its influence. However, after the salience of language in the task was reduced by removing the object labeling part, the effect of grammatical gender on object conceptualization diminished. In other words, when verbalization was not required, both the gender assignment pattern consistent with the grammatical gender of the objects and the stronger effect of grammatical gender on the participants with more egalitarian gender role attitudes that were reported in Study II diminished. Taken together, these results suggest that grammatical gender affected responses in the EGAT in Study II because the task primed the object labels and increased the salience of grammatical gender. Therefore, when the object labels are not primed, in the presence of conceptual gender, the automatic activation of grammatical gender is not strong enough to affect the explicit object conceptualization of French speakers.

Lastly, for the conceptually gender-neutral objects, GG congruency did not significantly affect either the implicit or explicit object conceptualization, although the gender assignment patterns in the EGAT were in line with the grammatical gender of the objects. As this gender assignment pattern was not found significant for the conceptually gendered objects but for gender-neutral objects, together with the significant grammatical gender effect on the gender assignments of Turkish-speaking participants for gender-neutral objects in Study I, this finding provides further evidence for the prediction that the effect is due to another shared categorical property.

In summary, the significant effect of grammatical gender on the implicit and explicit object conceptualization reported in Study II largely diminished when the language processing is blocked or is less salient. Thus, Study IV demonstrates that grammatical gender does not affect the nonlinguistic object conceptualization. However, the results of this study provide further evidence for the label-feedback hypothesis which suggests that even when it is task-irrelevant, language automatically gets activated and interacts with the object conceptualization (Lupyan 2012).

10. GENERAL DISCUSSION

The present thesis examined the degree to which grammatical gender influences object conceptualization and whether the effect emerges due to the automatic online use of language. This thesis also investigated whether learning a grammatical gender language as a foreign language affects the object conceptualizations in bilingual speakers and whether individual differences in gender role attitudes play a role in how grammatical and conceptual gender affect object conceptualization.

The main research questions of this thesis are as follows:

1. Does conceptual gender affect the ways in which Turkish and French speakers conceptualize objects (Study I, II, III, and IV)?

2. Does grammatical gender have any effect on the implicit and explicit object conceptualization in native French speakers (Study II and IV)?

3. Does learning French change the object conceptualization in Turkish speakers (Study III)?

4. Does grammatical gender affect object conceptualization even when the online access to language is prevented with the concurrent verbal interference task (Study IV)?

5. Do gender role attitudes of participants play any role in how they are affected by grammatical and conceptual gender (Study I, II, III, and IV)?

To answer these research questions, four different studies were conducted with native Turkish speakers (Study I), native French speakers (Study II and IV), as well as Turkish-French bilinguals (Study III).

10.1 Brief Summaries of the Study Results

Study I tested speakers of a genderless language, Turkish, to evaluate whether the conceptual gender affects their conceptualization of inanimate objects and to confirm that grammatical gender in the French language does not predict their response pattern. As expected, for the conceptually gendered objects, only the conceptual gender of the objects affected the response patterns of Turkish speakers both in the implicit and explicit measures. Further, gender role attitudes participants have modulated the degree to which conceptual gender influences their implicit object conceptualization. For the conceptually gender-neutral objects, although the French grammatical gender did not predict their implicit conceptualization, when they were explicitly asked to assign a gender to each object, Turkish speakers assigned genders to objects consistent with their grammatical gender in French.

Study II examined how grammatical gender affects implicit and explicit object conceptualization of native speakers of French, a grammatical gender language, when the objects have congruent or incongruent conceptual genders with their grammatical gender. Both grammatical and conceptual gender affected their implicit object conceptualization. Individual differences in gender role attitudes modulated these effects with participants with relatively more sexist attitudes being affected more by both grammatical and conceptual gender. When French speakers were required to make explicit gender-based decisions about the objects, only conceptual gender influenced their conceptualization. Gender role attitudes again predicted response patterns. However, whereas participants with relatively high sexist attitudes were affected by conceptual gender, more egalitarian participants in terms of gender role attitudes assigned genders to objects consistent with their grammatical gender. For the conceptually gender-neutral objects, grammatical gender did not affect object conceptualization implicitly. Nevertheless, grammatical gender influenced their explicit gender assignment patterns.

Study III investigated whether L2 grammatical gender affects object conceptualization in Turkish-French bilinguals. Not grammatical gender but conceptual gender affected their implicit object conceptualization. Gender role attitudes predicted how they were affected by conceptual gender. On the other hand, both grammatical and conceptual gender influenced the way they explicitly assigned genders to objects. Participants who were higher in sexist attitudes assigned genders to objects based on their conceptual gender and participants with relatively more egalitarian gender role attitudes assigned genders to objects consistent with their grammatical gender in French. Grammatical gender did not implicitly affect their response patterns for

the conceptually gender-neutral objects but affected their explicit gender assignments.

Study IV was conducted to examine whether the effect of grammatical gender that was found in Study II was due to the automatic activation of object labels and grammatical genders associated with them. When the online use of language was disrupted with the verbal interference task, the effect of grammatical gender diminished. The change suggests that the effect of grammatical gender is at the lexical level and even when labels are not salient or the use of language was irrelevant to the task, language is automatically activated, and grammatical gender can intervene with object conceptualization. Also, when the salience of language was reduced by removing the naming task, neither grammatical gender nor its interaction with gender role attitudes affected explicit gender assignment patterns. For the conceptually gender-neutral objects, grammatical gender did not influence implicit object conceptualization. When participants were explicitly asked to attribute a gender to objects, the response patterns were consistent with grammatical gender, but the effect was not significant.

10.2 The Effect of Grammatical Gender on Implicit Object Conceptualization in Native French Speakers

How grammatical gender affects implicit object conceptualization was assessed using a nonlinguistic IAT in which participants classified human faces based on their gender (female vs. male) and inanimate objects based on a criterion unrelated to gender (tools vs. clothing items). Even in the nonlinguistic task in which the use of language was irrelevant, the grammatical gender of the objects affected the object conceptualization of native French speakers, but not of native Turkish speakers or Turkish-French bilinguals. The finding supports the proposition that grammatical gender affects the implicit object conceptualization in native speakers of a grammatical gender language, even when the task did not require the use of grammatical gender information. By reporting this effect on a nonlinguistic IAT, this study extends the previous findings from linguistic versions of the implicit tasks including the EAST (e.g., Bender, Beller and Klauer 2016b) and IAT (Maciuszek, Polak and Świątkowska 2019). It is also noteworthy that this thesis was the first to use an implicit task to test speakers of a two-gender system language (see Bender, Beller and Klauer 2016a for a study with German speakers and Maciuszek, Polak and Świątkowska 2019 for Polish speakers).

Importantly, when a different group of native French speakers was asked to complete the same IAT while performing verbal interference in Study IV, the effect of grammatical gender diminished. As the effect of conceptual gender remained the same under verbal interference, this elimination of the grammatical gender effect is unlikely due to the high cognitive load imposed by verbal interference. Rather, the findings suggest that the effect diminished due to the inhibition of automatic access to online language use. Thus, the significant effect of grammatical gender found in Study II emerged because of the rapid and automatic activation of the object names and grammatical gender associated with them. These findings are in line with the label-feedback hypothesis (Lupyan 2012) – the thesis that perceiving nonlinguistic stimuli automatically activates the labels, and language modulates perception due to the rapid online use of language. In other words, grammatical gender does not shape nonlinguistic object representations as suggested by the strong view of linguistic relativity, and the effect appears at the lexical level (see also Cubelli et al. 2011).

10.3 The Effect of Grammatical Gender on Explicit Object Conceptualization in Native French Speakers

To assess the effect of grammatical gender on explicit object conceptualization, a gender assignment task was administered. Participants were instructed to indicate which gender, male or female, each of the objects (presented as pictures) reminded them of. Participants wrote the French label corresponding to each object in Study II, but this labeling task was removed in Study IV to further reduce the salience of the language. Although the effect was not significant, French speakers assigned genders to objects in line with their grammatical gender in Study II. However, this pattern diminished when explicitly labeling objects was not required in Study IV. This pattern aligns with the previous studies that found a stronger effect of grammatical gender in linguistic tasks than in nonlinguistic tasks (Sera, Berge and del Castillo Pintado 1994; Sera et al. 2002; see Samuel, Cole and Eacott 2019 for a review). On the other hand, contrary to the present finding, previous studies reported a stronger effect in the explicit measures than implicit measures (e.g., Bender, Beller and Klauer 2016a, 2016b; Kousta, Vinson and Vigliocco 2008). Unlike the current study, most of these previous studies used conceptually gender-neutral objects. Thus, the only systematic cue available for participants was grammatical gender. In the current study, in contrast, participants could make their gender assignments based on two different cues – conceptual gender and grammatical gender.

Thus, when participants were asked to make an explicit gender-based decision, the conceptual gender of the objects might have been more salient than their grammatical gender. In this sense, the results of Study IV are consistent with the findings of Sato, Casaponsa and Athanasopoulos (2020) who also used stimuli varying in their congruency between conceptual and grammatical gender in their explicit task and did not find the grammatical gender effect. The response pattern in the EGAT provides further support to the suggestion by Sato, Casaponsa and Athanasopoulos (2020) that after grammatical gender is no longer active and salient, individuals rely on conceptual gender to complete the task.

10.4 The Effect of Grammatical Gender on Object Conceptualization of Turkish-French Bilinguals

Study III examined the effect of L2 grammatical gender on object conceptualization of Turkish-French bilinguals. Not the grammatical gender but the conceptual gender of inanimate objects affected the implicit object conceptualization of the Turkish-French bilinguals, just as in the case of native Turkish speakers in Study I. However, unlike the case of native Turkish speakers, not only conceptual gender but also grammatical gender of the objects affected the explicit gender assignment patterns of Turkish-French bilinguals – bilinguals saw grammatically feminine objects as more female than male and grammatically masculine objects as more male than female. Thus, when language is not salient and does not require or prompt the strategic use of grammatical gender, visually perceiving objects and accessing their taxonomic categories was not sufficient to activate grammatical gender in bilingual speakers. On the other hand, when language was salient and individuals are required to make explicit gender-based decisions, they can and do use linguistic gender distinctions. The difference between the implicit and explicit measures provides further evidence that bilingual behaviors change depending on the nature of the task and its requirements (see also Park 2020).

Importantly, prior to the current thesis, the effect of learning a grammatical gender as L2 had been studied mostly with explicit measures. Lambelet (2016) studied how L2 grammatical gender affects object conceptualization with a sample with a wide variety of L1. The study reported that native speakers of a language without grammatical gender language were not affected by the L2 grammatical gender. However, in other studies, native speakers of English (Kurinski and Sera 2011) and Hungarian (Kurinski, Jambor and Sera 2016) who learned Spanish as a foreign language were

affected by the Spanish grammatical gender in the voice attribution task (though the effect of grammatical gender was weaker compared to native Spanish speakers). The current study suggests that L2 grammatical gender can affect object conceptualization in native speakers of a genderless language, yet this effect is limited to explicit measures. Considering that the effect of grammatical gender was observed in the explicit task but not in the implicit task, I may conclude that, compared to the native speakers of a grammatical gender language, the effect of grammatical gender is not as automatic and rapid for bilingual speakers of a genderless language and the grammatical gender language.

The significant effect of grammatical gender in the explicit gender assignment of Turkish-French bilinguals is particularly interesting because, for French speakers in Study II, though their response patterns aligned with the French grammatical gender, the effect was not significant. Thus, grammatical gender seems to have affected explicit object conceptualization in L2 learners of French stronger than native French speakers. This stronger effect may be due to the difficulties of grammatical gender processing experienced by bilingual speakers (e.g., Pérez-Pereira 1991; Dasse-Askildson 2008; Dewaele 1994; Guillelmon and Grosjean 2001; Sabourin, Stowe, and De Haan 2006). Even advanced bilinguals experience struggle with gender assignment and grammatical gender production (e.g., Grüter, Lew-Williams and Fernald 2012). Hence, for bilinguals, the object labeling process is not as automatic and easy as it is for native speakers of grammatical gender languages. As previously mentioned, Sato, Casaponsa and Athanasopoulos (2020) suggested that grammatical gender has minimal effect on object conceptualization in the presence of conceptual gender because participants rely on conceptual gender to make their decisions after the transient effect of grammatical gender diminishes. Perhaps, bilinguals could use grammatical gender because the effortful processing of grammatical gender led the associations related to grammatical gender to remain as accessible as conceptual gender. Nevertheless, to understand the exact mechanism behind this effect, further studies are needed.

Although the findings are not consistent, previous research has reported that factors such as proficiency level, age of acquisition, and frequency predict the cognitive shift towards the L2-like pattern. Previous research on the effect of L2 grammatical gender on object conceptualization reported that whereas L2 proficiency was not found to affect the cognitive switch towards L2 (e.g., Kurinski and Sera 2011), bilinguals with high L2 exposure were affected by the L2 grammatical gender (Kaushanskaya and Smith 2016). In the current study, as in the study of Kurinski and Sera (2011), L2 proficiency was not found to modulate the cognitive shift towards L2 grammatical gender either in the IAT or EGAT. However, whereas previous research reported

frequency as affecting the cognitive shift (Kaushanskaya and Smith 2016), the current study did not find a significant effect frequency in either task. Unexpectedly, whereas previous studies found that participants who learn L2 at a later age are less likely to be affected by L2 grammatical categories (e.g., Boroditsky 2001), in the current study, participants who learned French at a younger age and speak French for a shorter time were affected by grammatical gender more. These reverse patterns may be because of another variable that is independent of the language background of the participants. As reported in Chapter 8.3.2, participants' attitudes toward gender roles were correlated with AoA and Years of Speaking French. Participants who learned French at an older age and speak French for a shorter time had more egalitarian gender role attitudes compared to the participants who learned French at a younger age and speak French for a longer time. Considering the effect of gender role attitudes with less sexist native French speakers and Turkish-French bilinguals being affected by grammatical gender more, the significant effect of those language background variables might have been mediated by the gender role attitudes.

10.5 Effect of Gender Role Attitudes on Object Conceptualization

This study is among the first to examine whether individual differences in gender role attitudes play a role in the degree to which grammatical and conceptual gender affect object conceptualization. Gender role attitudes were found to modulate how individuals are affected by conceptual and grammatical gender in different ways. First, individual differences in the attitudes toward gender roles significantly modulated how participants were implicitly affected by conceptual gender in Study I, II, and III, and although it was not statistically significant, a similar pattern was observed in Study IV. In Study III and IV, participants with more egalitarian gender role attitudes were slower in the gender incongruent trials than in congruent trials presumably because they were more concerned about not making mistakes. In Study I, and II, participants who are higher in sexist role attitudes performed better in the conceptual gender congruent trials than incongruent trials. These findings align with the previous studies reporting that individuals' attitudes toward sexism influence how individuals perceive physical objects (e.g., Meagher 2017).

In the explicit measure, gender role attitudes modulated how participants were affected by conceptual gender in Study II, III, and IV, where the sexist participants were more likely to assign genders to objects consistent with conceptual gender; however, they did not affect how native Turkish speakers were affected by conceptual

gender. One possible explanation for this nonsignificant effect is that, only for Turkish speakers, there were no other cues that could affect their response patterns (i.e., grammatical gender). Importantly, however, in Study IV, too, the more salient cue was conceptual gender, but gender role attitudes still modulated the effect of conceptual gender on gender assignments. One may speculate that the difference in the modulation of gender role attitudes is due to the overall gender equality in these societies. In the recent Global Gender Role Report by World Economic Forum (2021), whereas France was ranked 16th among 156 countries with an overall 0.78 parity score, Turkey was ranked 133rd with a score of 0.64. As the gender distinction and gender roles are generally more pronounced in Turkish society, the stereotypes concerning genders may be more available for individuals in Turkey of all gender role attitudes, especially when they need to make a gender-based explicit decision.

The results of the present thesis also show an interesting pattern regarding the relationship between gender role attitudes and their effect on how participants are affected by grammatical gender. Gender role attitudes of native French speakers modulated the way they were implicitly affected by grammatical gender. In particular, native French speakers with less egalitarian gender role attitudes were more accurate in the grammatical gender congruent trials than incongruent trials (Study II), and less accurate in grammatical gender incongruent trials compared to more egalitarian participants (Study IV). Thus, although grammatical gender is an arbitrary linguistic system, the findings of the current study suggest that as in the case of conceptual gender, this linguistic gender distinction is more salient for participants with more sexist attitudes. Considering this pattern, it can be suggested that categories in a language do not affect its speakers to the same degree and perhaps individual differences among the speakers can modulate the relationship between language and thought.

In addition, when participants were explicitly asked to assign genders to objects and the language in the task was more salient, gender role attitudes of participants modulated the degree to which native French speakers (Study II) and Turkish-French bilinguals (Study III) were affected by grammatical and conceptual gender. Whereas participants with relatively more egalitarian gender role attitudes assigned genders to objects in line with grammatical gender, relatively more sexist participants assigned genders to objects consistent with the conceptual gender. This pattern occurred, perhaps, because participants with more egalitarian gender role attitudes were more concerned about stereotypical gender associations, and as the task was open to the strategic use of language, they used grammatical gender distinctions to avoid gendering objects consistent with stereotypical associations. But as participants were not asked if they strategically used grammatical gender in the task, this

task alone is not sufficient to speculate whether the use of grammatical gender was a conscious or an unconscious choice. However, if the grammatical gender of the objects were more salient for participants with more egalitarian gender role attitudes in general, one would expect to observe the similar pattern when the task did not prompt the language or require gender-based decision. However, the same pattern was not observed in the implicit measure in which strategic use of language was task-irrelevant, and in the explicit measure when the saliency of language was reduced by excluding the labeling part (Study IV). Thus, the significant modulation of gender role attitudes that was found in Study II and III can be interpreted as when the grammatical gender is primed in the task, instead of relying on overt conceptual gender, participants with more egalitarian gender role attitudes strategically choose to make their explicit gender assignment based on grammatical gender.

As far as I am aware, there is no study that investigated the relationship between individual differences in gender role attitudes and the way participants were affected by grammatical gender. Thus, it is hard to interpret the current finding and propose a mechanism that can be behind the modulation of individual differences in gender role attitudes on the way grammatical gender affects cognition. Previous research on grammatical gender and sexism mainly assessed the effect of speaking a grammatical gender language on sexism and suggested that gender distinction in the language prime sexist tendencies. For example, in a study on the effects of grammatical gender on sexist attitudes Wasserman and Weseley (2009) found that, when English-Spanish and English-French bilinguals took surveys that assessed social attitudes in a language with grammatical gender, their sexist attitudes scores increased. The authors argued that thinking in a language with grammatical gender may enhance attention to the gender distinction and in turn, it promotes expressions of more sexist attitudes. Also, countries in which a grammatical gender language is predominantly spoken were found to score lower in the Global Gender Gap ranking compared to countries with natural or genderless language (Prewitt-Freilino, Caswell and Laakso 2012). Further, in a recent study, Lewis and Lupyan (2020) compared the performance obtained from speakers of twenty-five different languages on the IAT that assessed gender stereotypes regarding career-gender associations. They found the career-gender association to be stronger for the people whose languages mark gender in occupation terms (i.e., grammatical gender languages). And the authors argued that the findings may suggest that language shapes implicit attitudes towards gender role. Different from these studies, the current research examined how individual differences in gender role attitudes play a role in the degree to which speakers of grammatical gender languages are affected by the language-based gender distinctions. Thus, this thesis expands the previous findings reporting that language

plays a role in shaping people's attitudes, by suggesting that individual differences in the gender role attitudes modulate how participants are affected by linguistic gender distinctions at least for inanimate objects, and proposes a more complex picture for the relationship between grammatical gender and gender role attitudes.

10.6 Grammatical Gender and Conceptually Gender-Neutral Objects

In none of the studies, grammatical gender was found to affect the response patterns in the IAT for conceptually gender-neutral objects. This finding differs from the IAT study by Maciuszek, Polak and Świątkowska (2019) that found a significant effect of grammatical gender on the conceptualization of gender-neutral objects. One reason for this discrepancy may be that Maciuszek, Polak and Świątkowska (2019) used object labels instead of pictures, and the linguistic nature of their task might have enhanced the effect of grammatical gender. However, this possibility cannot fully explain why, in the present study, grammatical gender affected the implicit object conceptualization of the conceptually gendered object but not conceptually gender-neutral objects. One may also wonder that, as this study tested 16 conceptually gendered objects and eight gender-neutral objects, the number of the gender-neutral trials was insufficient to detect the effect. I argue otherwise because the average error rates and reaction times for grammatically feminine objects and grammatically masculine objects were comparable in each study (see Tables 6.6, 7.6, 8.10, 9.6). Thus, considering that response patterns did not seem to differ in grammatically masculine and feminine trials, it seems unlikely that the non-significant results were due to insufficient trial number. It should also be noted that, in the current study, the eight conceptually gender items were presented thirty-two times in the IAT (each item was presented once in each of Part 3,4,6 and 7) and fifty participants were tested. Each study had 1600 observations and met the minimum requirement of detecting a large effect size in the mixed model recommended by Brysbaert ad Stevens (2018). Further studies are needed to understand why the effect did not emerge in the IAT for conceptually gender-neutral objects.

It is also noteworthy that grammatical gender predicted the explicit gender assignments, even when participants were not familiar with the French grammatical gender (i.e., native Turkish speakers in Study I). These results are in concert with the previous findings that found English speakers to assign objects to gender consistent with Spanish (Sera, Berge and del Castillo Pintado 1994; Sera et al. 2002) and Arabic (Almutrafi 2015), suggesting that grammatical gender is not fully arbitrary. Thus,

this effect may be attributed to another categorical object property (round-angular, light-heavy; Sera et al. 2002) that is shared by different cultures.

10.7 The Implications for the Language and Thought Debate

As discussed in the Introduction, the relationship between language and thought has been studied in a variety of domains including color categorization (e.g., Davidoff, Davies and Roberson 1999; Winawer et al. 2007), spatial frame of reference (e.g., Levinson et al. 2002), number (e.g., Gordon 2004; Frank et al. 2008), time and space (e.g., Casasanto and Boroditsky 2008), as well as motion events (e.g., Athanasopoulos and Albright 2016). Whereas most of these domains are related to sensory experiences, grammatical gender is abstract – gender assignments to inanimate objects are typically unrelated to the physical features of the objects. The arbitrary gender-object relations makes grammatical gender an ideal domain to examine the effect of language on thought (e.g., Boroditsky, Schmidt and Phillips 2003; Basetti 2007).

Even though some empirical findings from different domains suggest that language can affect thought, scholars have not reached a consensus on the extent of this effect. For example, Casasanto and colleagues (2004) found that the way languages encode time (e.g., a long time vs. much time) affects how speakers of different languages conceptualize time and space even when the task that did not require the use of language. Based on the results, the authors argued that language affects nonlinguistic cognition. In contrast, some studies on color found that speakers of languages that encode two colors with different labels discriminate these colors faster compared to colors from the same linguistic category. Critically, this category advantage diminished when the access to language was prevented through verbal interference (Winawer et al. 2007; Roberson, Pak and Hanley 2008). This disruption of the language effect arguably points to the online use of language in the task as opposed to the habitual use of language shaping the nonlinguistic perception. Yet another study found the effects of spatial metaphors on the mental representations of musical pitches to persist even under verbal interference (Dolscheid et al. 2013).

Based on these mixed results, one may speculate that language affects perception and cognition differently across domains (see Wolff and Holmes 2011 for a review). Although plausible, the cross-domain differences can only be part of the complex picture, as the findings are mixed even within the domain, including the domain of grammatical gender. Cubelli et al. (2011) found that the effect of grammat-

ical gender diminishes under verbal interference and argued that the effect is at the lexical level. In contrast, Phillips and Boroditsky (2003) reported the effect of grammatical gender even under verbal interference. To better understand the effect of grammatical gender on nonlinguistic representations, the current thesis examined the object conceptualization of native French speakers in the IAT under verbal interference. Under verbal interference, only conceptual gender, and not grammatical gender, appeared to affect object conceptualization. Hence, the findings of this thesis supports the previous remark that language does not alter nonlinguistic concepts (e.g., Winewar et al. 2007; Frank et al. 2012; Cardini 2010). Instead, language is automatically activated even in a nonlinguistic task, and language affects thought through this lexical access (Lupyan 2012). This study also provides further support for the preposition that linguistic categories can affect performance even when language is not salient, and thus using nonlinguistic tasks is not enough to fully understand the effects of language on nonlinguistic cognition.

Some researchers also raised the concern that behavioral differences exhibited by speakers of different languages may be partially due to cultural or environmental differences that are unrelated to language (e.g., Li and Abarbanell 2018; Spaepen et al. 2011). Whereas some studies found that, when the differences related to environment and task instructions are controlled, speakers of languages with different spatial frames of reference systems adapts the same spatial strategies (e.g., Li and Abarbanell 2018; Li and Gleitman 2002), others argued that the difference remains even when the environmental differences are controlled (Levinson et al. 2002). In the domain of grammatical gender, researchers investigated to what extent the effect of grammatical gender is driven by cultural associations (e.g., Beller et al. 2015; Bender, Beller and Klauer 2016b). Beller et al. (2015) compared the object categorization of speakers of two different Norwegian dialects differing in their grammatical gender systems and suggested that culture has a stronger effect than language. Further, in another study using stimuli with congruent or incongruent grammatical and conceptual gender, the effect of grammatical gender only was found when the grammatical and conceptual gender of the objects were congruent (Bender, Beller and Klauer 2016b). The authors suggested that the effect of grammatical gender is driven by cultural associations. Although the current thesis also manipulated congruency of grammatical and conceptual gender, the effect of grammatical gender in the IAT was found to be independent of the effect of conceptual gender. Nonetheless, when participants were explicitly asked to assign a gender to objects, it was the conceptual gender that significantly affected response patterns. Overall, the results suggest that, although grammatical gender affects implicit object conceptualization and this effect is independent of cultural associations, when individuals were asked

to make a gender-based decision and the task was open to the use of different cues, cultural categories may be more strong and salient compared to linguistic categories. However, more studies are needed to examine to what extent the effect of language is driven by culture-related factors and disentangle linguistic and cultural effects.

Recently, researchers have begun to examine the effect of learning a language with different grammatical categories than one's native language on cognition. Although findings show that cognitive categories of bilinguals shift towards an L2-like pattern (e.g., Boroditsky 2001; Park and Zeigler 2014; Cook et al. 2006), the factors that may be affecting this cognitive shift have not been fully understood. Previous research found factors such as the length of stay in the L2-speaking country (e.g., Athanasopoulos 2009; Cook et al. 2006), the age of acquisition (e.g., Boroditsky, 2001), frequency (e.g., Athanasopoulos et al. 2011, Park and Zeigler 2014), task type (e.g., Park 2020), as well as L2 proficiency (e.g., Athanasopoulos 2007; Park 2020) as affecting this shift. Nevertheless, none of these factors was consistently reported as modulating the effect of language on bilingual cognition. Not many studies have examined the effect of L2 grammatical gender on object conceptualization and possible factors modulating this effect. The findings of this thesis showed that grammatical gender affects the object conceptualization of bilinguals only in the explicit task, when the strategic use of language is possible and language is salient. This pattern suggests that learning another language can affect representations of bilinguals. However, for bilinguals, the linguistic associations are not as automatic as they are for monolingual speakers presumably because of the processing difficulties they have. In addition, to investigate the factors that may modulate the effect of L2 grammatical gender on object conceptualization, factors related to the language background including the age of acquisition, L2 frequency, and L2 proficiency were tested. Any of these factors were found significant. Rather, individual differences modulated the degree to which bilinguals are affected by grammatical gender. Thus, the current study suggests that not only the difference in the linguistic background but also the individual differences in attitudes may modulate how bilinguals are affected by the categories in their second language.

Lastly, as mentioned above, research has examined factors that can influence the language and thought relationship such as task characteristics (e.g., implicit vs. explicit), domains (e.g., grammatical gender vs. color), and environmental or cultural factors (e.g., laboratory vs. outdoor setting). However, as far as I am aware, no study thus far has examined whether individual differences among the speakers of a language predict the degree to which they are affected by linguistic categories. The current thesis examined whether individual differences in attitudes towards gender roles play any role in how grammatical and/or conceptual gender affects the object

conceptualization. The results indicated that individual differences influence this effect, although the patterns of the influence differ depending on the task. More specifically, the implicit object conceptualization of French speakers with relatively high sexist attitudes was affected more by grammatical and conceptual gender. On the other hand, when participants were explicitly asked to make gender-based decisions, participants with relatively high sexist attitudes were affected more by conceptual gender, whereas less sexist participants were affected more by grammatical gender. Taken together, these findings suggest that in an implicit manner, some linguistic distinctions may be more or less salient for the native speakers of the same language. The response pattern in the explicit task also suggests that, when the task is open the strategic use of available cues, individual differences modulates which cue people will rely on to complete the task. Further studies are needed to fully understand the influence of individual differences on the degree to which individuals are affected by the linguistic categories.

10.8 Limitations and Future Directions

Relying on the IAT to assess the implicit influence of grammatical gender can be considered one of the limitations of the study because the IAT has been criticized due to its relatively low test-retest reliability (Lane et al., 2007; Bar-Anan and Nosek 2014; Gawronski et al. 2017) and external validity (Fazio and Olson 2003). Notably, however, the IAT still has higher test-retest reliability than many other methodologies of response latency such as Stroop Task (see Jost 2019 for a review). It should also be emphasized that the current thesis also tested conceptual gender and found its effect to be consistent across different populations, even when the cognitive system of participants was burdened with a verbal interference task. Further, the effect of conceptual gender on the performance in both the IAT and EGAT appeared comparable across all studies. It was the influence of grammatical gender that was not stable across language groups and tasks as expected. Thus, the methodological concerns regarding the reliability of the IAT should be considered largely irrelevant to the current work.

Another methodological concern may be that there was no non-verbal interference control condition in Study IV. It has been suggested that, when there is no control condition (i.e., non-verbal interference), it is hard to conclude whether the change observed in the verbal interference condition is due to the inhibition of the language processing or of the general cognitive system (e.g., Nedergaard, Wallentin

and Lupyan 2022). I argue that the lack of the control task is less of a concern in the current work because, in the main task that was subjected to concurrent verbal interference, two different variables (i.e., grammatical, and conceptual gender) were tested, and only one of them was related to language (i.e., grammatical gender). As verbal interference only disrupted the effect of grammatical gender, it seems safe to argue that this effect of grammatical gender was eliminated because of the disruption of online language processing. For a more conclusive result, however, future studies may also include a nonverbal interference task.

It should be also noted that most participants reported knowing at least some English. Previous findings as well as the current work show that speaking more than one language causes bilinguals' concepts to shift towards an L2-like pattern (e.g., Athanasopoulos 2009; Cook et al. 2006; Daller, Treffers-Daller and Furman 2011). Although no participants had advanced proficiency in another grammar gender language (e.g., German, Spanish), knowledge of other languages, in general, may have weakened grammatical gender associations in French-speaking participants. Perhaps the lack of significant effect of grammatical gender in the response patterns in some tasks (e.g., EGAT in Study II) was due to these weaker associations, which could have been found significant with fully monolingual French speakers.

Relatedly, the variability in the language background was high among the bilingual participants. As the language background variables were correlated with each other, it is difficult to determine whether the effects of these factors are due to the differences in their language learning backgrounds or individual differences among them. Further, instead of directly assessing the French proficiency level of the bilingual participants, the study relied on self-reports to estimate their language level. To overcome these limitations, future studies may examine factors by controlling for some variables. For example, a study with participants that have similar L2 proficiency but vary in their age of acquisition can be conducted to investigate whether the age of acquisition modulates the relationship between grammatical gender and object conceptualization.

Additionally, unlike native French speakers, grammatical gender significantly affected the gender assignments of bilinguals in the EGAT. I speculated that the effect was stronger for bilinguals because labeling was a more effortful process for them compared to native speakers and it caused object labels to be more salient for them. This prediction requires further testing and to investigate this possibility, the explicit gender assignment patterns of bilinguals may be examined in a test similar to the EGAT that was used in Study I and IV which did not require labeling.

Finally, this thesis suggests that gender role attitudes play a role in how speakers of

grammatical gender languages are affected by grammatical gender. However, as this study was the first to examine this relationship, further studies are certainly needed to gain a better understanding of the influence of individual differences on the relationship between language and thought. As discussed before, the findings about the relationship between object conceptualization and grammatical gender are inconsistent for grammatical gender languages with more than two genders (Samuel, Cole and Eacott 2019). It would be important to examine whether individual differences modulate how grammatical gender affects the object conceptualization of speakers with a more-than-two-gender system such as German.

11. CONCLUSION

The question of whether language affects thought has been the topic of the heated debate among scholars from a variety of fields including psychology and linguistics. Studies on domains such as color categorization, number and motion events provide evidence for the effect of linguistic categories on the way speakers of different languages think. However, the condition under which language affects thought and the pervasiveness of this effect have not been fully understood yet. This thesis examined the relationship between language and thought in the domain of grammatical gender which is an arbitrary linguistic category. The thesis focused on the effect of grammatical gender on conceptualization because as grammatical gender is an abstract domain which is less affected by the sensory experiences, it is considered as a better domain to examine the effect of language on thoguht (e.g., Boroditsky, Schmidt and Phillips 2003; Basetti 2007). Grammatical gender can help us see the pure effect of language on cognition because the grammatical gender of an object label is not related to the physical properties of the object, and the categorization based on grammatical gender cannot be affected by reality or perceptual differences (Basetti 2007). Further, even though grammatical gender is assigned arbitrarily, the distinction is based on gender and, in the current study, to examine whether the effect of grammatical gender depends on the stereotypical gender associations of objects which are driven by culture or the effect is purely linguistic, the conceptual gender of the objects was manipulated.

This thesis is one of the first to test the influence of grammatical gender on implicit and explicit object conceptualization of the same group of participants in the presence of another cue (i.e., conceptual gender). The main aims were to investigate the extent to which grammatical gender affects object conceptualization and how persistent this effect is. In addition, I examined whether learning a grammatical gender language as L2 affects the object-related concepts of bilinguals and factors that play a role in this effect including the age of acquisition, L2 frequency, and L2 proficiency. Further, to investigate the degree to which grammatical gender af-

fects object conceptualization, I used a dual-task methodology and asked a different group of native French speakers to complete the same IAT under verbal interference. Lastly, I examined how individual differences in gender role attitudes modulate the way grammatical and conceptual gender affects object conceptualization.

This thesis provides evidence that the grammatical gender of a language affects the way in which its native speakers conceptualize objects implicitly, even when the task does not require or prompt the use of language. The findings suggest that this effect is independent of the conceptual gender of the object meaning that French speakers did not conceptualize grammatically feminine objects as more feminine when the conceptual gender of the objects was female or grammatically masculine objects as more masculine when the conceptual gender of the objects was male. Therefore, the effect of grammatical gender does not depend on the cultural associations of objects related to gender but rather due to the linguistically assigned genders to objects. Nevertheless, when the online use of language was disrupted with a concurrent verbal interference task the effect of grammatical gender, but not of conceptual gender, disappeared. Thus, the effect reported in Study II emerged due to the online use of language, even though language use was irrelevant to task. Taken together with the findings of previous studies that used verbal interference methodology and reported the diminished effect of language when the use of language is prevented, the results of the thesis show that language does not shape nonlinguistic representations. Rather, language affects thought through the immediate online use of language in the task.

When the task required an explicit gender-based decision, on the other hand, conceptual gender dominated over the gender assignment patterns of native French speakers independent of whether the task prompted the use of language (Study II) or not (Study IV). This pattern suggests that even though language rapidly and automatically become activated in the task, once a stimulus is perceived, in the presence of another cue, the linguistic cues may be not salient enough for participants to rely on their gender assignments. Further, when the task is open to strategically use the available cues, the individual differences in the attitudes towards gender roles modulate which cue participants based their gender assignments on.

Moreover, French grammatical gender was found to affect explicit but not implicit object conceptualization of Turkish-French bilinguals. As the effect was found only in the explicit measure, but not in the implicit measure, I conclude that L2 grammatical gender affects object conceptualization but this effect is not as automatic as that it is for the native French speakers. In this regard, the findings of the study align well with the previous research on bilingual cognition that reported a cognitive shift towards the L2-like pattern and that bilinguals behave somehow between the

monolingual speakers of their native and second languages. However, the different effect of grammatical gender on the response patterns of the same participants in the implicit and explicit measures provides further evidence that the effect of L2 grammatical gender is task-dependent. In addition, contradictory to previous research, in the explicit task, grammatical gender affected the gender assignment patterns of Turkish-French bilinguals stronger than of native French speakers. Compared to native speakers, even advanced bilinguals were reported to have difficulties in processing grammatical gender. Presumably because the labeling requires more effort for bilinguals, grammatical gender remains active and salient long enough to affect the gender assignments of bilinguals. However, further studies are needed to test this speculation. Lastly, none of the factors related to linguistic backgrounds of Turkish-French bilinguals such as the age of acquisition, L2 frequency and L2 proficiency was found to affect the shift towards L2-like patterns. The individual differences in the gender role attitudes, however, modulated the degree to which Turkish-French speakers were affected by grammatical and conceptual gender. To gain a better understanding of the effect of second language learning and its implicit and explicit effects on thought more studies are needed.

Overall, the current thesis makes an important contribution to the language and thought debate by demonstrating that even in a nonlinguistic implicit task that does not prime object labels or does not require the strategic use of language, labels automatically get activated, and through this online use of language, language intervenes with conceptualization. Therefore, the findings of this thesis suggest that language does not shape nonlinguistic object conceptualization. Also, this study found the effect of language on cognition in an abstract domain, i.e., grammatical gender, while controlling for the conceptual associations between gender and objects. The observed effects thus can be attributed purely to mental associations related to object labels. Finally, this thesis suggests that individual differences among the speakers can play a role in how much they are affected by linguistic and cultural categories. Future research is needed to broaden the understanding of the conditions under which language intervenes with cognition and the factors that affect this relationship.

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APPENDIX A

GRAS that was used in Study II and IV (French version)

	Pas du tout d'accord	Pas d'accord	Indifférent	D'accord	Totalement d'accord
1. Une personne peut être agressive ou compréhensive, peu importe son sexe.					
2. Chaque personne doit être traitée de façon égale, peu importe son sexe.					
3. Il faut donner de la liberté aux enfants en fonction de leur âge et de leur niveau de maturité, mais pas en fonction de leur sexe.					
4. Les garçons ont les mêmes obligations d'aider avec les corvées ménagères que les filles.					
5. Les tâches ménagères ne doivent pas être attribuées en fonction du sexe.					
6. Nous devrions arrêter de nous demander si les personnes sont des hommes ou des femmes et à la place nous concentrer sur d'autres caractéristiques.					
7. Si mon partenaire considérait que j'avais la charge des tâches ménagères, cela me causerait du stress.					
8. Le mari est responsable de sa famille donc la femme doit lui obéir.					
9. Une femme ne doit pas contredire son partenaire.					
10. Je pense qu'il est pire de voir un homme pleurer plutôt qu'une femme.					
11. Les filles doivent êtres plus propres et ordonnées que les garçons.					
12. Les hommes doivent occuper des postes à responsabilités.					
13. Je pense que les garçons doivent être élevés différemment des filles.					
14. Je pense qu'il est vrai que dans mon cercle d'amis, mon activité domestique future est considérée comme étant plus importante que mon activité professionnelle.					
15. La responsabilité principale du père est d'aider ses enfants au niveau financier.					
16. Certaines professions ne sont pas appropriées pour les femmes.					
17. Je suis d'accord que, dans mon cercle d'ami, la future profession de mon partenaire est plus importante que la mienne.					
18. Les mères doivent prendre la plupart des décisions qui concernent l'éducation des enfants					
19. Seulement certains types de professions sont appropriés pour les hommes et les femmes.					
20. Dans beaucoup de professions importantes, il vaut mieux embaucher un homme plutôt qu'une femme.					

APPENDIX B

GRAS (English version)

	Totally disagree	Disagree	Neither agree nor disagree	Agree	Totally agree
1. People can be aggressive and understanding, regardless of their sex.					
2. People should be treated equally, regardless of their sex.					
3. Children should be given freedom depending on their age and how mature they are, not depending on their sex.					
4. Boys have the same obligations to help with household chores as girls.					
5. Household chores should not be allocated by sex.					
6. We should stop thinking about whether people are men or women and focus on other characteristics.					
7. My partner thinking that I am responsible for doing the household chores would cause me stress.					
8. The husband is responsible for the family so the wife must obey him.					
9. A woman must not contradict her partner.					
10. I think it is worse to see a man cry than a woman.					
11. Girls should be more clean and tidy than boys.					
12. Men should occupy posts of responsibility.					
13. I think boys should be brought up differently than girls.					
14. I think it is right that in my circles of friends, my future domestic activity is considered more important than my professional activity.					
15. A father's main responsibility is to help his children financially.					
16. Some jobs are not appropriate for women.					
17. I accept that in my circle of friends, my partner's future job is considered more important than mine.					
18. Mothers should make most of the decisions on how to bring up their children.					
19. Only some kinds of job are equally appropriate for men and women.					
20. In many important jobs it is better to contract men than women.					

APPENDIX C

Demographic Form in Study I (Turkish Version)

1. Doğum tarihiniz (Gün/Ay/Yıl)

2. Cinsiyetiniz

__Kadın
__Erkek
__Diğer (lütfen belirtiniz)
__Belirtmek istemiyorum

3. Baskın olarak kullandığınız el

__Sağ
__Sol
__İki elimi de eşit kullanıyorum

4. Tamamlamış olduğunuz en yüksek eğitim seviyesi

__İlkokul
__Ortaokul
__Lise
__Üniversite
__Yüksek lisans
__Doktora
__Diğer (lütfen belirtiniz)

5. Ana diliniz

__Türkçe
__Diğer (lütfen belirtiniz)

6. Konuştuğunuz herhangi bir yabancı dil var mı?

__Evet, Türkçeden başka bir dil/diller konuşuyorum.
__Hayır, sadece Türkçe konuşuyorum.

6a. Kaç tane yabancı dil konuşuyorsunuz?

__1
__2
__3
__4

6b. Lütfen konuştuğunuz yabancı dili belirtiniz.

6c. Lütfen bu dili ne sıklıkta kullandığınızı belirtiniz. (1= çok nadir, 10= çok sık)

1 2 3 4 5 6 7 8 9 10

6d. 1-9 arası bir derecelendirmede bu dildeki seviyenizi nasıl değerlendirirsiniz?

__ 1- Başlangıç (Beginner): Bu dili hiç konuşamıyorum.
__ 2- Temel (Elementary (A1/A2)): Bu dilde birkaç şey söyleyebiliyor ve anlayabiliyorum.
__ 3- Orta Seviye Öncesi (Pre-intermediate (A2)): Basit şekilde iletişim kurabilir ve alışık olduğum durumları anlayabilirim ama biraz zorluk yaşarım.
__ 4- Düşük Orta Seviye (Low Intermediate (B1)): Basit cümleler kurabiliyor ve bir konuşmanın ana noktalarını anlayabiliyorum fakat daha çok kelime bilmeye ihtiyacım var.
__ 5- Orta Seviye (Intermediate (B1)): İyi bir şekilde konuşabiliyor ve anlayabiliyorum. Basit zaman kiplerini kullanabiliyorum ama daha karmaşık dilbilgisi ve kelime dağarcığıyla ilgili sorunlarım var.
__ 6- Orta Seviyenin Üstü (Upper Intermediate (B2)): Çok zorlanmadan iletişim kurabiliyorum ama hala çok fazla hata yapıyorum ve bazen yanlış anlıyorum.
__ 7- İleri Seviye Öncesi (Pre-advanced (C1)): İyi bir şekilde konuşuyor ve anlıyorum ama bazen diğer insanlar beni net olarak anlamıyor.
__ 8- İleri Seviye(Advanced (C2)): Oldukça iyi bir şekilde konuşuyor ve anlıyorum fakar bazen alışık olmadığım durumlarla ve kelimelerle sorun yaşıyorum.
__ 9- Oldukça ileri Seviye (Very Advanced (C2)): Bu dili tamamen akıcı bir şekilde anlıyor ve konuşuyorum.

APPENDIX D

Demographic Form in Study II and IV (French Version)

1. Votre date de naissance (jour/mois/année)

2. Votre genre

__Femme
__Homme
__Autre (spécifiez svp)
__Je préfère ne pas répondre.

3. Quelle est votre main dominante ?

__Droite
__Gauche
__Ambidextre

4. Quel est votre niveau d'instruction le plus élevé ?

__École primaire
__École secondaire inférieure
__École secondaire supérieure
__Université
__Master
__Doctorat
__Autre (spécifiez svp)

5. Votre langue meternelle

__Français
__Autre (spécifiez svp)

6. Parlez-vous des langues étrangères ?

__Oui, je parle une ou plusieurs langue(s) autre que le français.
__Non, je ne parle que français.

6a. Combien de langues étrangères parlez-vous ?

__1
__2
__3
__4

6b. Veuillez indiquer la langue étrangère que vous parle.

6c. Veuillex indiquer la fréquence avec laquelle vous parlez cette langue dans votre vie de tous les jours (1 est le moins, 10 le plus)

1	2	3	4	5	6	7	8	9	10

6d. Sur une échelle de 1 à 9, à combien estimez-vous votre niveau dans cette langue ?

__ 1- Débutant: Je ne parle pas du tout cette langue.
__ 2- Élémentaire (A1/A2): Je sais dire et comprendre quelques choses simples dans cette langue.
__ 3- Pre-intermédiaire (A2): Je peux communiquer simplement et comprendre les situations familières, mais avec certaines difficultés.
__ 4- Intermédiaire inférieur (B1): Je sais faire des phrases simples et je comprends les points principaux d'une conversation mais j'ai encore besoin de beaucoup de vocabulaire.
__ 5- Intermédiaire (B1): Je peux parler et comprendre relativement bien et je peux utiliser les temps basiques mais j'ai encore quelques problèmes avec les constructions grammaticales et le vocabulaire plus complexes.
__ 6- Intermédiaire supérieur (B2): Je peux communiquer sans trop de difficultés mais je fais encore beaucoup d'erreurs et j'ai des soucis de compréhension parfois.
__ 7- Pré-advancé (C1): Je parle et comprends bien mais fais encore des erreurs et parfois certaines personnes ne me comprennent pas clairement.
__ 8- Advancé (C2): Je parle et comprends très bien, mais j'ai parfois des problèmes avec des situations ou du vocabulaire peu fréquents.
__ 9- Très avancé (C2): Je parle et comprends cette langue couramment.

APPENDIX E

Demographic Form in Study I, II and IV (English Version)

1. Your date of birth (Day/Month/Year)

2. Your gender

__Female
__Male
__Other (please specify)
__I prefer not to answer

3. Whic one is your dominant hand?

__Right
__Left
__I use both of my hands equally

4. What is your highest level of education?

__Primary school
__Secondary school
__High school
__University
__Masters
__Doctorate/PhD
__Other (please specify)

5. Your native language

__Turkish/French
__Other (please specify)

6. Other languages you can speak

__Yes, I speak other language/s than Turkish/French.
__No, I only speak Turkish/French.

6a. How many foreign languages you speak?

__1
__2
__3
__4

6b. Please indicate the foreing language you speak

6c. Please indicate how frequently you use this language in your everyday life (1 is the least, 10 is the most)

1	2	3	4	5	6	7	8	9	10

6d. On a scale of 1-9, how would you rate your proficiency in this language

__ 1- Beginner: I do not speak this language.
__ 2- Elementary (A1/A2): I can say and understand a few things in this language.
__ 3- Pre-intermediate (A2): I can communicate simply and understand in familiar situations but only with some difficulty.
__ 4- Low Intermediate (B1): I can make simple sentences and can understand the main points of a conversation but need much more vocabulary.
__ 5- Intermediate (B1): I can speak and understand reasonably well and can use basic tenses but have problems with more complex grammar and vocabulary.
__ 6- Upper Intermediate (B2): I can communicate without much difficulty but still make quite a lot of mistakes and misunderstand sometimes.
__ 7- Pre-advanced (C1): I speak and understand well but still make mistakes and sometimes people do not understand me clearly.
__ 8- Advanced (C2): I speak and understand very well but sometimes have problems with unfamiliar situations and vocabulary.
__ 9- Very Advanced (C2): I speak and understand this language completely fluently.

APPENDIX F

Demographic Form in Study III (Turkish Version)

1. Doğum tarihiniz (Gün/Ay/Yıl)

2. Cinsiyetiniz

__Kadın
__Erkek
__Diğer (lütfen belirtiniz)
__Belirtmek istemiyorum

3. Baskın olarak kullandığınız el

__Sağ
__Sol
__İki elimi de eşit kullanıyorum

4. Tamamlamış olduğunuz en yüksek eğitim seviyesi

__İlkokul
__Ortaokul
__Lise
__Üniversite
__Yüksek lisans
__Doktora
__Diğer (lütfen belirtiniz)

5. Ana diliniz

__Türkçe
__Diğer (lütfen belirtiniz)

6. Fransızcayı kaç yaşında öğrenmeye başladınız?

6a. Kaç yıldır Fransızca konuşuyorsunuz?

6b. 1-9 arası bir derecelendirmede Fransızca seviyenizi nasıl değerlendirirsiniz?

__ 1- Başlangıç (Beginner): Bu dili hiç konuşamıyorum.
__ 2- Temel (Elementary (A1/A2)): Fransızca birkaç şey söyleyebiliyor ve anlayabiliyorum.
__ 3- Orta Seviye Öncesi (Pre-intermediate (A2)): Basit şekilde iletişim kurabilir ve alışık olduğum durumları anlayabilirim ama biraz zorluk yaşarım.
__ 4- Düşük Orta Seviye (Low Intermediate (B1)): Basit cümleler kurabiliyor ve bir konuşmanın ana noktalarını anlayabiliyorum fakat daha çok kelime bilmeye ihtiyacım var.
__ 5- Orta Seviye (Intermediate (B1)): İyi bir şekilde konuşabiliyor ve anlayabiliyorum. Basit zaman kiplerini kullanabiliyorum ama daha karmaşık dilbilgisi ve kelime dağarcığıyla ilgili sorunlarım var.
__ 6- Orta Seviyenin Üstü (Upper Intermediate (B2)): Çok zorlanmadan iletişim kurabiliyorum ama hala çok fazla hata yapıyorum ve bazen yanlış anlıyorum.
__ 7- İleri Seviye Öncesi (Pre-advanced (C1)): İyi bir şekilde konuşuyor ve anlıyorum ama bazen diğer insanlar beni net olarak anlamıyor.
__ 8- İleri Seviye(Advanced (C2)): Oldukça iyi bir şekilde konuşuyor ve anlıyorum fakar bazen alışık olmadığım durumlarla ve kelimelerle sorun yaşıyorum.
__ 9- Oldukça ileri Seviye (Very Advanced (C2)): Fransızcayı tamamen akıcı bir şekilde anlıyor ve konuşuyorum.

6c. Lütfen Fransızcayı ne sıklıkta kullandığınızı belirtiniz. (1= çok nadir, 10= çok sık)

1 2 3 4 5 6 7 8 9 10

6d. Lütfen Fransızcayı arkadaşlarınız/aileniz ile iletişime geçmek için ne sıklıkta kullandığınızı belirtiniz. (1= çok nadir, 10= çok sık)

1 2 3 4 5 6 7 8 9 10

6e. Lütfen Fransızcayı sınıfınızda/iş yerinizde ne sıklıkta kullandığınızı belirtiniz. (1= çok nadir, 10= çok sık)

1 2 3 4 5 6 7 8 9 10

6f. Lütfen ne sıklıkta Fransızca film, video veya televizyon kanalı izlediğinizi belirtiniz. (1= çok nadir, 10= çok sık)

1 2 3 4 5 6 7 8 9 10

7. Türkçe ve Fransızcadan başka konuştuğunuz herhangi bir yabancı dil var mı?

__Evet, Türkçe ve Fransızcadan başka bir dil/diller konuşuyorum.
__Hayır, sadece Türkçe ve Fransızca konuşuyorum.

7a. Kaç tane yabancı dil konuşuyorsunuz?

__1
__2
__3
__4

7b. Lütfen konuştuğunuz yabancı dili belirtiniz.

7c. Lütfen bu dili ne sıklıkta kullandığınızı belirtiniz. (1= çok nadir, 10= çok sık)

1 2 3 4 5 6 7 8 9 10

7d. 1-9 arası bir derecelendirmede bu dildeki seviyenizi nasıl değerlendirirsiniz?

__ 1- Başlangıç (Beginner): Bu dili hiç konuşamıyorum.
__ 2- Temel (Elementary (A1/A2)): Bu dilde birkaç şey söyleyebiliyor ve anlayabiliyorum.
__ 3- Orta Seviye Öncesi (Pre-intermediate (A2)): Basit şekilde iletişim kurabilir ve alışık olduğum durumları anlayabilirim ama biraz zorluk yaşarım.
__ 4- Düşük Orta Seviye (Low Intermediate (B1)): Basit cümleler kurabiliyor ve bir konuşmanın ana noktalarını anlayabiliyorum fakat daha çok kelime bilmeye ihtiyacım var.
__ 5- Orta Seviye (Intermediate (B1)): İyi bir şekilde konuşabiliyor ve anlayabiliyorum. Basit zaman kiplerini kullanabiliyorum ama daha karmaşık dilbilgisi ve kelime dağarcığıyla ilgili sorunlarım var.
__ 6- Orta Seviyenin Üstü (Upper Intermediate (B2)): Çok zorlanmadan iletişim kurabiliyorum ama hala çok fazla hata yapıyorum ve bazen yanlış anlıyorum.
__ 7- İleri Seviye Öncesi (Pre-advanced (C1)): İyi bir şekilde konuşuyor ve anlıyorum ama bazen diğer insanlar beni net olarak anlamıyor.
__ 8- İleri Seviye(Advanced (C2)): Oldukça iyi bir şekilde konuşuyor ve anlıyorum fakar bazen alışık olmadığım durumlarla ve kelimelerle sorun yaşıyorum.
__ 9- Oldukça ileri Seviye (Very Advanced (C2)): Bu dili tamamen akıcı bir şekilde

anlıyor ve konuşuyorum.

APPENDIX G

Demographic Form in Study III (English Version)

1. Your date of birth (Day/Month/Year)

2. Your gender

__Female
__Male
__Other (please specify)
__I prefer not to answer

3. Which one is your dominant hand?

__Right
__Left
__I use both of my hands equally

4. What is your highest level of education?

__Primary school
__Secondary school
__High school
__University
__Masters
__Doctorate/PhD
__Other (please specify)

5. Your native language

__Turkish/French
__Other (please specify)

6. At what age, did you start to acquire French?

6a. How long have you been speaking French?

6b. On a scale of 1-9, how would you rate your proficiency in this language

__ 1- Beginner: I do not speak this language.
__ 2- Elementary (A1/A2): I can say and understand a few things in French.
__ 3- Pre-intermediate (A2): I can communicate simply and understand in familiar situations but only with some difficulty.
__ 4- Low Intermediate (B1): I can make simple sentences and can understand the main points of a conversation but need much more vocabulary.
__ 5- Intermediate (B1): I can speak and understand reasonably well and can use basic tenses but have problems with more complex grammar and vocabulary.
__ 6- Upper Intermediate (B2): I can communicate without much difficulty but still make quite a lot of mistakes and misunderstand sometimes.
__ 7- Pre-advanced (C1): I speak and understand well but still make mistakes and sometimes people do not understand me clearly.
__ 8- Advanced (C2): I speak and understand very well but sometimes have problems with unfamiliar situations and vocabulary.
__ 9- Very Advanced (C2): I speak and understand French completely fluently.

6c. Please indicate how frequently you use French in your everyday life. (1= the least, 10= the most)

1 2 3 4 5 6 7 8 9 10

6d. Please indicate how frequently you use French to communicate with your friends/family? (1= the least, 10= the most)

1 2 3 4 5 6 7 8 9 10

6e. Please indicate how frequently you use French in your school or work. (1= the least, 10= the most)

1 2 3 4 5 6 7 8 9 10

6f. Please indicate how frequently you you watch movies, videoas and TV channels in French. (1= the least, 10= the most)

1 2 3 4 5 6 7 8 9 10

7. Is there any language you speak other than Turkish and French?

__Yes, I speak other language/s than Turkish and French.
__No, I only speak Turkish and French.

7a. How many foreign languages you speak?

__1
__2
__3
__4

7b. Please indicate the foreing language you speak

7c. Please indicate how frequently you use this language in your everyday life (1 is the least, 10 is the most)

1	2	3	4	5	6	7	8	9	10

7d. On a scale of 1-9, how would you rate your proficiency in this language

__ 1- Beginner: I do not speak this language.
__ 2- Elementary (A1/A2): I can say and understand a few things in this language.
__ 3- Pre-intermediate (A2): I can communicate simply and understand in familiar situations but only with some difficulty.
__ 4- Low Intermediate (B1): I can make simple sentences and can understand the main points of a conversation but need much more vocabulary.
__ 5- Intermediate (B1): I can speak and understand reasonably well and can use basic tenses but have problems with more complex grammar and vocabulary.
__ 6- Upper Intermediate (B2): I can communicate without much difficulty but still make quite a lot of mistakes and misunderstand sometimes.
__ 7- Pre-advanced (C1): I speak and understand well but still make mistakes and sometimes people do not understand me clearly.
__ 8- Advanced (C2): I speak and understand very well but sometimes have problems with unfamiliar situations and vocabulary.
__ 9- Very Advanced (C2): I speak and understand this language completely fluently.

APPENDIX H

Consent Form in Study I (Turkish Version)

Sabancı Üniversitesi

Araştırma Katılım Formu

Çalışmanın Başlığı: Dil ve Biliş

Baş Araştırmacı: Junko Kanero

Yardımcı Araştırmacı: Elif Tutku Tunalı

Çalışmanın Amacı:

Bu çalışma insanların nesnelere karşı olan örtük tutumlarıyla ilgildir. Çalışmanın amacı insanların belirli nesneler ve cinsiyetler arasında ne kadar kolay bir şekilde çağrışım kurabildiklerini ve bu çağrışımı etkileyen faktörleri ölçmektir.

Çalışma Süresince Sizden İstenecekler:

Öncelikle belirli nesneler ile insan yüzlerini olabildiğince hızlı bir şekilde gruplandırmanızı gerektiren Örtük Çağrışım Testi'ni çözeceksiniz. Ardından, birkaç anket doldurmanız gerekmektedir. Çalışma yaklaşık olarak 20 dakika sürmektedir.

Bu çalışmaya katılım gönüllüdür. Kimliğiniz anonim olacak ve verdiğiniz cevaplarla kimliğiniz eşleştirilmeyecektir. Data Qualtrics üzerinden toplanacaktır. Bu yüzden data ilk önce Qualtrics'in üst düzey korumalı Avrupa sunucularında tutulacaktır. Qualtrics bu dataları Avrupa'nın dışına çıkartmayacaktır. Araştırmacı tarafından indirildikten sonra datalar anonim bir şekilde size atanan katılımcı numarası ile şifreli bir bilgisayarda tutulacaktır.

Katılımınız için 15 TL değerinde CarrefourSA hediye kartı kazanacaksınız. Eğer Prolific hesabınız varsa ve çalışmaya Prolific üzerinden katılmayı istiyorsanız, katılımınız karşılığında £2.50 (1 saatlik katılım için £7.50) alacaksınız.

Eğer Sabancı Universitesi'nde PSY kodlu bir ders alıyorsanız, her 30 dakikalık çalışmaya katılımınız için 1 Çalışma Puanı alabilirsiniz. Çalışma puanına ek olarak ödeme yapılmayacaktır. Eğer çalışmaya katılmak istemiyor ama yine de 1 Çalışma

Puanı kazanmak istiyorsanız, alternatif seçenekler için baş araştırmacı Dr. Junko Kanero (jkanero@sabanciuniv.edu) ile iletişime geçebilirsiniz.

Bu çalışmaya katılımınız sırasında riskli ve rahatsız edici bulabileceğiniz durumlar:

Bu çalışma herhangi bir risk içermemektedir ve çalışmadaki herhangi bir sorunun sizi rahatsız hissettirmesi beklenmemektedir. Yine de kendinizi çalışma sırasında rahasız hissederseniz, çalışmadan istediğiniz anda herhangi bir yaptırım olmaksızın çekilebilirsiniz. Eğer çalışma hakkında endişeleriniz veya sorularınız varsa lütfen baş araştırmacı Dr. Junko Kanero (jkanero@sabanciuniv.edu) ile iletişime geçiniz.

Eğer çalışma sırasında herhangi bir şekilde haklarınızın ihlal edildiğini düşünüyorsanız, lütfen Sabancı Üniversitesi Araştırma Etik Kurulu Başkanı Prof. Mehmet Yıldız ile (216) 300-1301 telefon numarası veya meyildiz@sabanciuniv.edu e-posta adresi üzerinden iletişime geçiniz.

Katılımcının Beyanı

Yukarıda açıklanan çalışma hakkında bilgilendirildiğinizi onaylıyor ve çalışmaya gönüllü olarak katılıyorsanız, lütfen "onaylıyorum" kutucuğunu işaretleyip, sonraki sayfaya geçiniz

__Onaylıyorum

APPENDIX I

Consent Form in Study II and III (French Version)

Sabancı University

Consentement pour participation à une étude de recherche

Titre de l'étude : Langage et cognition

Chercheure principale : Junko Kanero

Co-chercheure : Elif Tutku Tunalı

Le but de cette étude :

Cette étude porte sur l'attitude implicite que les gens ont des objets. Le but de cette étude est de déterminer la facilité avec laquelle les personnes créent des liens entre certains objets et les facteurs ayant un impact sur ces liens.

Durant l'expérience, vous devrez :

Tout d'abord, vous devrez accomplir une tâche d'association implicite, durant laquelle nous vous demanderons d'associer des objets à des visages humains le plus rapidement possible. Ensuite, vous remplirez un questionnaire. L'étude dure environ 20 minutes dans son entièreté.

Votre participation à cette étude est volontaire. Votre identité sera anonyme et ne sera pas associée pas à votre réponse. Les données seront collectées via Qualtrics et seront donc d'abord stockées sur des serveurs Qualtrics en Europe avec des systèmes de pare-feu haut de gamme. À aucun moment, Qualtrics ne déplacera sciemment ces données hors de l'UE. Une fois téléchargées par le chercheur, les données anonymes seront conservées dans un ordinateur protégé par un mot de passe uniquement avec un identifiant de participant qui vous sera attribué.

Pour votre participation, vous recevrez une carte cadeau Amazon d'une valeur de 5€. Si vous avez un compte Prolific et que vous souhaitez participer à l'étude via Prolific à la place, vous pouvez recevoir 2,50 £ (7,50 £ par heure) pour votre participation.

Si vous suivez en ce moment un cours de psychologie à l'université de Sabancı, vous recevrez un point de recherche pour 30 minutes de participation. Vous ne recevrez

pas de compensation supplémentaire. Si vous ne voulez pas participer à l'étude mais souhaitez tout de même gagner un point de recherche, vous devrez contacter la chercheure principale Dr. Junko Kanero (jkanero@sabanciuniv.edu) pour une alternative.

Vous pourrez rencontrer les risques et inconforts durant votre participation à cette étude :

Cette étude ne comporte aucun risque et aucune des questions qui vous seront posées ne devraient vous faire vous sentir mal à l'aise. Si vous n'êtes pas confortable, vous pouvez quitter l'expérience dès que vous le voulez, sans pénalité. Si vous avez certaines questions ou préoccupations concernant l'étude, veuillez envoyer un e-mail à la chercheure principale Dr. Junko Kanero (jkanero@sabanciuniv.edu).

Si vous pensez que vos droits ont été violés de quelque façon, veuillez contacter Prof. Mehmet Yıldız, Directeur du Comité d'Ethique de Recherche à l'Université de Sabancı au numéro (216) 300-1301 ou par email à meyildiz@sabanciuniv.edu.

Déclaration du participant

Si vous confirmez avoir été informé au sujet de l'étude mentionnée ci-dessus et si vous acceptez de participer à l'étude volontairement, veuillez cliquer sur 'accord' ci-dessous et continuez sur la page suivante

__Accord

APPENDIX J

Consent Form in Study I, II and III (English Version)

Sabancı University

Consent to Participate in a Research Study

Study Title: Dil ve Biliş

Principal Investigator: Junko Kanero

Co-Investigator: Elif Tutku Tunalı

The purpose of this study:

This study is about implicit attitudes people have about objects. The purpose of the study is to assess how easily people can make associations between some objects and genders, and other factors affecting these associations.

During the experiment you will be asked to:

First, you will take an Implicit Association Task in which you will be asked to associate objects with human faces as fast as you can. Then, you will be asked to fill out surveys. The whole study takes about 20 minutes.

Participation in this study is voluntary. Your identity will be anonymous, and it will not be matched with your answer. The data will be collected via Qualtrics and thus will be first stored in Qualtrics servers in Europe with high-end firewall systems. At no time will Qualtrics knowingly move that data out of the EU. When downloaded by the researcher, the anonymous data will be kept in a password protected computer only with a participant ID assigned to you.

For your participation, you will receive a [15 TL or 5€] gift card. If you have a Prolific account and would like to participate the study via Prolific instead, you may receive £2.50 (£7.50 per hour) for your participation.

If you are currently taking a PSY course at Sabancı University, you can instead receive 1 Research Point for 30 minutes of participation. No additional compensation will be provided. If you do not want to participate but still wish to earn

1 Research Point, you may contact the Principal Investigator Dr. Junko Kanero (jkanero@sabanciuniv.edu) for an alternative option.

You may find the following risks or discomfort from participating in this Study:

This study does not contain any risk and none of the questions in the study is expected to make you feel unpleasant. In case you feel uncomfortable, you can withdraw from the study whenever you want, without penalty. If you have questions or concerns about the study, please email the Principal Investigator Dr. Junko Kanero (jkanero@sabanciuniv.edu).

If you believe that your rights have been violated in any way, please contact Prof. Mehmet Yıldız, Chair of the Research Ethics Committee at Sabancı University at (216) 300-1301 or by email at meyildiz@sabanciuniv.edu.

Participant's Declaration

If you agree that you have been informed about the study explained above and to participate voluntarily, please click "I agree" below and proceed to the next page.

__I agree

APPENDIX K

Consent Form in Study IV (French Version)

Sabancı University

Consentement pour participation à une étude de recherche

Titre de l'étude : Langage et cognition

Chercheure principale : Junko Kanero

Co-chercheure : Elif Tutku Tunalı

Le but de cette étude :

Cette étude porte sur l'attitude implicite que les gens ont des objets. Le but de cette étude est de déterminer la facilité avec laquelle les personnes créent des liens entre certains objets et les facteurs ayant un impact sur ces liens.

Durant l'expérience, vous devrez :

Dans un premier temps, vous accomplirez une tâche d'association implicite, dans laquelle nous vous demanderons d'associer des objets à des visages humains le plus vite possible, tout en répétant une séquence de nombres à voix haute. En complétant cette tâche, vous devrez vous enregistrer et nous envoyer l'enregistrement. Ensuite, vous remplirez un questionnaire. L'étude dure environ 20 minutes dans son entièreté.

Votre participation à cette étude est volontaire. Votre identité sera anonyme et ne sera pas associée pas à votre réponse. Les données seront collectées via Qualtrics et seront donc d'abord stockées sur des serveurs Qualtrics en Europe avec des systèmes de pare-feu haut de gamme. À aucun moment, Qualtrics ne déplacera sciemment ces données hors de l'UE. Une fois téléchargées par le chercheur, les données anonymes seront conservées dans un ordinateur protégé par un mot de passe uniquement avec un identifiant de participant qui vous sera attribué.

Pour votre participation, vous recevrez une carte cadeau Amazon d'une valeur de 5€. Si vous avez un compte Prolific et que vous souhaitez participer à l'étude via Prolific à la place, vous pouvez recevoir 2,50 £ (7,50 £ par heure) pour votre participation.

Si vous suivez en ce moment un cours de psychologie à l'université de Sabancı, vous

recevrez un point de recherche pour 30 minutes de participation. Vous ne recevrez pas de compensation supplémentaire. Si vous ne voulez pas participer à l'étude mais souhaitez tout de même gagner un point de recherche, vous devrez contacter la chercheure principale Dr. Junko Kanero (jkanero@sabanciuniv.edu) pour une alternative.

Vous pourrez rencontrer les risques et inconforts durant votre participation à cette étude :

Cette étude ne comporte aucun risque et aucune des questions qui vous seront posées ne devraient vous faire vous sentir mal à l'aise. Si vous n'êtes pas confortable, vous pouvez quitter l'expérience dès que vous le voulez, sans pénalité. Si vous avez certaines questions ou préoccupations concernant l'étude, veuillez envoyer un e-mail à la chercheure principale Dr. Junko Kanero (jkanero@sabanciuniv.edu).

Si vous pensez que vos droits ont été violés de quelque façon, veuillez contacter Prof. Mehmet Yıldız, Directeur du Comité d'Ethique de Recherche à l'Université de Sabancı au numéro (216) 300-1301 ou par email à meyildiz@sabanciuniv.edu.

Déclaration du participant

Si vous confirmez avoir été informé au sujet de l'étude mentionnée ci-dessus et si vous acceptez de participer à l'étude volontairement, veuillez cliquer sur 'accord' ci-dessous et continuez sur la page suivante.

__Accord

APPENDIX L

Consent Form in Study IV (English Version)

Sabancı University

Consent to Participate in a Research Study

Study Title: Dil ve Biliş

Principal Investigator: Junko Kanero

Co-Investigator: Elif Tutku Tunalı

The purpose of this study:

This study is about implicit attitudes people have about objects. The purpose of the study is to assess how easily people can make associations between some objects and genders, and other factors affecting these associations.

During the experiment you will be asked to:

First, you will take an Implicit Association Task in which you will be asked to associate objects with human faces as fast as you can, while you are rehearsing a random sequence of numbers out loud. While completing the task, you need to record your voice/video and send that record to us. Then, you will be asked to fill out surveys. The whole study takes about 20 minutes.

Participation in this study is voluntary. Your identity will be anonymous, and it will not be matched with your answer. The data will be collected via Qualtrics and thus will be first stored in Qualtrics servers in Europe with high-end firewall systems. At no time will Qualtrics knowingly move that data out of the EU. When downloaded by the researcher, the anonymous data will be kept in a password protected computer only with a participant ID assigned to you.

For your participation, you will receive a 5€ gift card. If you have a Prolific account and would like to participate the study via Prolific instead, you may receive £2.50 (£7.50 per hour) for your participation.

If you are currently taking a PSY course at Sabancı University, you can instead receive 1 Research Point for 30 minutes of participation. No additional compen-

sation will be provided. If you do not want to participate but still wish to earn 1 Research Point, you may contact the Principal Investigator Dr. Junko Kanero (jkanero@sabanciuniv.edu) for an alternative option.

During the experiment you will be asked to:

This study does not contain any risk and none of the questions in the study is expected to make you feel unpleasant. In case you feel uncomfortable, you can withdraw from the study whenever you want, without penalty. If you have questions or concerns about the study, please email the Principal Investigator Dr. Junko Kanero (jkanero@sabanciuniv.edu).

If you believe that your rights have been violated in any way, please contact Prof. Mehmet Yıldız, Chair of the Research Ethics Committee at Sabancı University at (216) 300-1301 or by email at meyildiz@sabanciuniv.edu.

__I agree

APPENDIX M

Debriefing Form in Study I (Turkish Version)

Bilgilendirme Formu

Zamanınızı ayırıp, çalışmamıza katıldığınız için teşekkür ederiz.

Çalışmanın başındaki Araştırma Katılım Formu'nda çalışmanın insanların belirli nesneler ile cinsiyetler arasında ne kadar kolay bir şekilde çağrışım kurabildikleri ve bu çağrışımı etkileyen faktörler hakkında olduğu şeklinde bilgilendirildiniz. Aslında katılmış olduğunuz çalışma, konuştuğumuz dilin bilişsel süreçleri etkileyip etkilemediğini inceleyen diller arası bir çalışmadır. Dilbilgisel cinsiyet içermeyen bir dil konuşan bireyler (örn., Türkçe) ile dilbilgisel cinsiyet içeren bir dil konuşan bireyleri (örn., Fransızca) karşılaştırarak, dilbilgisel cinsiyetin nesnelerin kavramlaştırılması üzerindeki örtük etkisini ölçmeyi amaçlıyoruz. Kavramsal olarak feminen, maskülen ve nötr nesneler kullandık. Nesnelerin yarısında dilbilgisel ve kavramsal cinsiyetler birbiriyle eşleşirken, diğer yarısında eşleştirilmemiştir. Bu şekilde bir deney tasarımı, dilbilgisel cinsiyetin etkisini örtük bir şekilde ölçmemizi sağlamaktadır.

Örtük Çağrışım Testi'ndeki performansınızı etkilememesi için bu bilgiyi deneyin başında sizinle paylaşmadık. Deneyin amacının bilinmesi, deneye katılacak kişilerin cevaplarını etkileyebileceğinden, sizden bu formda sizinle paylaşılan bilgileri deneye katılma ihtimali bulunan kişilerle paylaşmamanızı rica ediyoruz.

Gizlilik

Araştırma Katılım Formu'nda belirtildiği gibi, verileriniz gizli tutalacaktır. Eğer bu bilgilendirme formunu okuduktan sonra verilerinizin kullanılmasını istemiyorsanız, lütfen yardımcı araştırmacı Elif Tutku Tunalı ile elif.tunali@sabanciuniv.edu mail adresi üzerinden iletişime geçiniz.

Verilerinizin araştırma için kullanılmasını isteyip istememenizden bağımsız olarak, 15 TL değerindeki CarrefourSA hediye kartını alacaksınız.

Çalışma hakkında daha fazla bilgi edinmek ya da çalışma tamamlanınca çalışmanın bulgularının sizinle paylaşılmasını istiyorsanız, lütfen bizimle iletişime geçiniz.

APPENDIX N

Debriefing Form in Study II (French version)

Formulaire de Bilan

Nous vous remercions d'avoir pris le temps de participer à notre étude. Dans le formulaire de consentement, nous vous avons seulement expliqué que le but de cette étude était de déterminer la facilité avec laquelle les personnes forment des associations entre certains objets et les facteurs ayant un impact sur ces associations. En réalité, il s'agit d'une étude cross-linguistique dont le but est de déterminer si notre langue a un impact sur différents processus cognitifs. En comparant des locuteurs d'une langue sans genre grammatical (ex : locuteurs du turc) et les locuteurs d'une langue avec genre grammatical (ex : le français), nous cherchons à déterminer l'effet implicite du genre grammatical sur la conceptualisation des objets. Nous avons choisi des objets qui sont conceptuellement féminins, masculins, et neutres. Le genre grammatical et conceptuel de ces objets est le même pour la moitié d'entre eux, et différent pour l'autre moitié. Ce protocole nous permet de déterminer les effets du genre grammatical de manière implicite.

Nous ne vous avons pas donné ces informations à l'avance afin de ne pas vous influencer dans les tâches de l'étude. Si les participants connaissent le but d'une étude, cela pourrait avoir un impact sur leurs réponses, donc nous vous demandons de ne pas partager ces réponses avec des participants futurs potentiels.

Confidentialité

Comme mentionné dans le formulaire de consentement, vos données personnelles sont strictement confidentielles. Cependant, après avoir lu ce bilan, si vous voulez que vos données soient retirées de l'étude, veuillez envoyer un e-mail à la co-chercheure Elif Tutku Tunalı (elif.tunali@sabanciuniv.edu).

Que vous vouliez que vos données soient utilisées ou non pour l'étude, vous recevrez tout de même une compensation.

Si vous voulez en apprendre plus sur l'étude et/ou recevoir le rapport final une fois complétez, n'hésitez pas à nous contacter.

APPENDIX O

Debriefing Form in Study I and II (English Version)

Debriefing Form

Thank you for taking your time and participating in our study. In the consent form, we only informed you that the purpose of the study is to assess how easily people can make associations between some objects and genders and the factors affecting these associations. In actuality, this is a cross-linguistic study that examines whether the language we speak affects the cognitive process. By comparing speakers of a language without grammatical gender (e.g., Turkish speakers) and speakers of a language with grammatical gender (e.g., French), we aim to assess the implicit effect of the grammatical gender on object conceptualization. We chose objects that are conceptually feminine, masculine and neutral. The grammatical and conceptual gender of the objects were matched for half of them and not matched for the other half. This design lets us assess the effect of grammatical gender in a more implicit way.

We withheld this information so that it wouldn't influence how you performed the tasks. If other people know the specific purpose of the study, it might affect how they respond, so we are asking you not to share the information above with any potential future participants.

Confidentiality

As mentioned in the consent form, we will keep your data confidential. However, after reading this debrief, if you want your data to be removed, please email Elif Tutku Tunalı (elif.tunali@sabanciuniv.edu).

Independent of whether you agree or disagree about having your data used for the research, you will still receive the compensation.

If you want to learn more about the study and/or receive a final report when it is completed, please feel free to contact us.

APPENDIX P

Debriefing Form in Study III (Turkish Version)

Bilgilendirme Formu

Zamanınızı ayırıp, çalışmamıza katıldığınız için teşekkür ederiz. Çalışmanın başındaki Araştırma Katılım Formu'nda çalışmanın insanların belirli nesneler ile cinsiyetler arasında ne kadar kolay bir şekilde çağrışım kurabildikleri ve bu çağrışımı etkileyen faktörler hakkında olduğu şeklinde bilgilendirildiniz. Aslında katılmış olduğunuz çalışma, konuştuğumuz dilin bilişsel süreçleri etkileyip etkilemediğini inceleyen diller arası bir çalışmadır. Dilbilgisel cinsiyet içermeyen bir dil konuşan bireyler (örn., Türkçe) ile dilbilgisel cinsiyet içeren bir dil konuşan bireyleri (örn., Fransızca) karşılaştırarak, dilbilgisel cinsiyetin nesnelerin kavramlaştırılması üzerindeki örtük etkisini ölçmeyi amaçlıyoruz. Ayrıca hem Türkçe hem de Fransızca konuşabilen bireyleri çalışmamıza dahil ederek, dilbilgisel cinsiyet içeren bir dil öğrenmenin nesnelerin kavramlaştırılması üzerinde bir etkisi olup olmadığını gözlemlemeyi amaçlıyoruz. Kavramsal olarak feminen, maskülen ve nötr nesneler kullandık. Nesnelerin yarısında dilbilgisel ve kavramsal cinsiyetler birbiriyle eşleşirken, diğer yarısında eşleştirilmemiştir. Bu şekilde bir deney tasarımı, dilbilgisel cinsiyetin etkisini örtük bir şekilde ölçmemizi sağlamaktadır. Çalışmanın ilk bölümünün Fransızca olmasının nedeni, Fransızca düşünmenizi istememizdir.

Örtük Çağrışım Testi'ndeki performansınızı etkilememesi için bu bilgiyi deneyin başında sizinle paylaşmadık. Deneyin amacının bilinmesi, deneye katılacak kişilerin cevaplarını etkileyebileceğinden, sizden bu formda sizinle paylaşılan bilgileri deneye katılma ihtimali bulunan kişilerle paylaşmamanızı rica ediyoruz.

Gizlilik

Araştırma Katılım Formu'nda belirtildiği gibi, verileriniz gizli tutalacaktır. Eğer bu bilgilendirme formunu okuduktan sonra verilerinizin kullanılmasını istemiyorsanız, lütfen yardımcı araştırmacı Elif Tutku Tunalı ile elif.tunali@sabanciuniv.edu mail adresi üzerinden iletişime geçiniz.

Verilerinizin araştırma için kullanılmasını isteyip istememenizden bağımsız olarak, 5€ değerindeki Amazon.fr hediye kartını alacaksınız.

Çalışma hakkında daha fazla bilgi edinmek ya da çalışma tamamlanınca çalışmanın bulgularının sizinle paylaşılmasını istiyorsanız, lütfen bizimle iletişime geçiniz.

APPENDIX Q

Debriefing Form in Study III (English Version)

Debriefing Form

Thank you for taking your time and participating in our study. In the consent form, we only informed you that the purpose of the study is to assess how easily people can make associations between some objects and genders and the factors affecting these associations. In actuality, this is a cross-linguistic study that examines whether the language we speak affects the cognitive process. By comparing speakers of a language without grammatical gender (e.g., Turkish speakers) and speakers of a language with grammatical gender (e.g., French), we aim to assess the implicit effect of the grammatical gender on object conceptualization. In addition, by including individuals who can speak both Turkish and French in our study, we aim to examine whether learning a language with grammatical gender has an effect on the conceptualization of objects. We chose objects that are conceptually feminine, masculine and neutral. The grammatical and conceptual gender of the objects were matched for half of them and not matched for the other half. This design lets us assess the effect of grammatical gender in a more implicit way.

We withheld this information so that it wouldn't influence how you performed the tasks. If other people know the specific purpose of the study, it might affect how they respond, so we are asking you not to share the information above with any potential future participants.

Confidentiality

As mentioned in the consent form, we will keep your data confidential. However, after reading this debrief, if you want your data to be removed, please email Elif Tutku Tunalı (elif.tunali@sabanciuniv.edu). Independent of whether you agree or disagree about having your data used for the research, you will still receive the compensation.

If you want to learn more about the study and/or receive a final report when it is completed, please feel free to contact us.

APPENDIX R

Debriefing Form in Study IV (French Version)

Formulaire de Bilan

Nous vous remercions d'avoir pris le temps de participer à notre étude. Dans le formulaire de consentement, nous vous avons seulement expliqué que le but de cette étude était de déterminer la facilité avec laquelle les personnes forment des associations entre certains objets et les facteurs ayant un impact sur ces associations. En réalité, il s'agit d'une étude cross-linguistique dont le but est de déterminer si notre langue a un impact sur différents processus cognitifs. En comparant des locuteurs d'une langue sans genre grammatical (ex : locuteurs du turc) et les locuteurs d'une langue avec genre grammatical (ex : le français), nous cherchons à déterminer l'effet implicite du genre grammatical sur la conceptualisation des objets. Nous vous avons demandé de répéter la séquence de nombres à voix haute lorsque vous étiez en train d'accomplir la tâche parce que nous voulions bloquer votre accès à la langue et ainsi tester si le genre grammatical des mots influences les processus cognitifs non-linguistiques. Nous avons choisi des objets qui sont conceptuellement féminins, masculins, et neutres. Le genre grammatical et conceptuel de ces objets est le même pour la moitié d'entre eux, et différent pour l'autre moitié. Ce protocole nous permet de déterminer les effets du genre grammatical de manière implicite.

Nous ne vous avons pas donné ces informations à l'avance afin de ne pas vous influencer dans les tâches de l'étude. Si les participants connaissent le but d'une étude, cela pourrait avoir un impact sur leurs réponses, donc nous vous demandons de ne pas partager ces réponses avec des participants futurs potentiels.

Confidentialité

Comme mentionné dans le formulaire de consentement, vos données personnelles sont strictement confidentielles. Cependant, après avoir lu ce bilan, si vous voulez que vos données soient retirées de l'étude, veuillez envoyer un e-mail à la co-chercheure Elif Tutku Tunalı (elif.tunali@sabanciuniv.edu).

Que vous vouliez que vos données soient utilisées ou non pour l'étude, vous recevrez tout de même une compensation.

Si vous voulez en apprendre plus sur l'étude et/ou recevoir le rapport final une fois complétez, n'hésitez pas à nous contacter.

APPENDIX S

Debriefing Form in Study IV (English Version)

Debriefing Form

Thank you for taking your time and participating in our study. In the consent form, we only informed you that the purpose of the study is to assess how easily people can make associations between some objects and genders and the factors affecting these associations. In actuality, this is a cross-linguistic study that examines whether the language we speak affects the cognitive process. By comparing speakers of a language without grammatical gender (e.g., Turkish speakers) and speakers of a language with grammatical gender (e.g., French), we aim to assess the implicit effect of the grammatical gender on object conceptualization. We asked you to repeat numbers out loud while you were taking the task because we want to block access to the language and to see whether grammatical gender influences even the non-linguistic cognitive processes. We chose objects that are conceptually feminine, masculine and neutral. The grammatical and conceptual gender of the objects were matched for half of them and not matched for the other half. This design lets us assess the effect of grammatical gender in a more implicit way.

We withheld this information so that it wouldn't influence how you performed the tasks. If other people know the specific purpose of the study, it might affect how they respond, so we are asking you not to share the information above with any potential future participants.

Confidentiality

As mentioned in the consent form, we will keep your data confidential. However, after reading this debrief, if you want your data to be removed, please email Elif Tutku Tunalı (elif.tunali@sabanciuniv.edu).

Independent of whether you agree or disagree about having your data used for the research, you will still receive the compensation.

If you want to learn more about the study and/or receive a final report when it is completed, please feel free to contact us.