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# A table named James or a table named Maya?

## The influence of grammatical gender on the perception of objects in German and Polish

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In French, the noun apple (*la pomme*) is grammatically feminine, in German (*der Apfel*) it is masculine. Does this entail that French speakers perceive apples to be feminine whereas German speakers attribute masculine characteristics to them? Various studies suggest that grammatical gender does indeed influence object perception (Haertlé 2017; Boroditsky & Schmidt 2000), although findings are not always replicated (Bender et al. 2011). The current study investigates this phenomenon for Polish, an understudied language in this domain, and German, a language for which contradictory results have been obtained. We investigated whether Polish ( $N=21$ ) and German ( $N=27$ ) speakers follow the grammatical gender of an object when providing a first name for it (e.g. James or Maya). Results suggest that while Polish speakers provided names that were in accordance with the object's grammatical gender, German speakers did not. Cross-linguistic differences between these two languages (regarding noun transparency) may explain these findings.

**Keywords:** language-cognition interface, cross-linguistic differences, grammatical gender, object perception

### 1. Introduction

The assumption that the language we speak influences the way we see the world around us derives from the linguistic relativity hypothesis (Whorf 1956) which states that the language we speak has an influence on the way we think. Evidence for the relation between language and thought has been generated by studies that focus on various aspects of language. Topics of investigation have included event

memory (Loftus & Palmer 1974) and eyewitness-memories of scenarios which were either presented using agentive or non-agentive constructions (Fausey & Boroditsky 2011). Previous studies on these topics have demonstrated that the linguistic representation that was used to describe an event had an impact on the way the event was perceived. The first study, by Loftus and Palmer (1974), showed that the verb that is used to question participants' memory of a car accident can influence their perception of the accident. That is, when the verb "smashed" was used when participants were asked to estimate the speed that the car was going ("How fast was the red car going when it smashed the other car?"), participants estimated the speed of the car to be the highest, while they estimated a lower speed when verbs such as "contacted" or "hit" were used (Loftus & Palmer 1974). In the second study, Spanish and English speakers saw videos of accidental and intentional actions such as breaking a pencil and were asked to describe these events. These descriptions could either be agentive in nature ("the man broke the pencil") or non-agentive ("the pencil broke"). The memory of the action and agents was tested and a difference between the two speaker groups was found. Intentional actions were remembered similarly well and were described agentively in both the English and the Spanish group. However, English speakers used more agentive language to describe accidental actions than the Spanish speakers and also remembered these events better. This reveals that the manner (agentive or non-agentive) that is typically used in a language to talk about events influences how people remember them (Fausey & Boroditsky 2011). These illustrative previous studies thus suggest that language plays an important role in influencing how people perceive events. The current study investigates to what extent the perception of objects can be influenced by an obligatory grammatical feature that can be found in many languages: grammatical gender.

### 1.1 Cross-linguistic differences in grammatical gender

In languages with grammatical gender (e.g. Spanish, Italian, German and Polish) all nouns have a grammatical gender which has an impact on declension and conjugation, such that grammatical agreement with the grammatical gender is required (Maciuszek et al. 2019). In these languages, nouns, also those referring to inanimate objects, possess a grammatical gender which is independent of natural sex. For instance, a pencil is an object without natural sex but its grammatical gender is masculine in German. This is in contrast to natural gender languages such as English, in which nouns are gendered in accordance with the natural sex of their referents (nouns that relate to clearly feminine entities are referred to using feminine pronouns, those that relate to clearly masculine entities are referred to using masculine pronouns and, with only a small number of exceptions, inani-

mate objects are referred to using neuter pronouns). Within languages that have grammatical gender, the number of genders that are distinguished can differ. A distinction between either two grammatical genders (masculine/ feminine) as in French and Spanish or between three grammatical genders (masculine/ feminine/ neuter) as in German or Polish is commonly found.

As Polish and German are the languages that are investigated in the current study, it is relevant to assess similarities and differences in the grammatical gender systems that these languages employ. Although both Polish and German make a three-way distinction between masculine, feminine and neuter grammatical gender, there are various differences between the grammatical gender systems of these two languages. In German, the corresponding articles that mark grammatical gender need to be used when referring to a noun (e.g. *der Apfel*, the apple, not just *Apfel*). Polish, in contrast, does not have articles. That is, ‘the cup’, and ‘cup’ would both be translated as *kubek*. However, other parts of speech, such as pronouns, adjectives and verbs, are informative regarding the grammatical gender of a noun (Maciuszek et al. 2019). For instance, the masculine noun *kubek* requires the demonstrative pronoun *ten* (*ten kubek*, this cup), whereas the feminine noun *piłka*, ball, requires the demonstrative pronoun *ta* (*ta piłka*, this ball) and the neuter noun *jajko*, egg, requires the neuter version *to* (*to jajko*, this egg). Furthermore, although there are exceptions, the grammatical gender of Polish nouns can be derived from the ending of the noun. Usually, masculine nouns end in a consonant, whereas feminine nouns end in *-a*. In German, there are some regularities regarding noun suffixes such as *-heit* or *-ung* (which are associated with feminine grammatical gender), but, generally, German does not provide transparent clues regarding the grammatical gender of nouns (Bender et al. 2011).

## 1.2 Current knowledge regarding the impact of grammatical gender on cognition

Even though the grammatical gender of objects is an arbitrary categorisation and does not follow a consistent system across languages (e.g. an apple is grammatically feminine in French, but masculine in German), previous research suggests that it does influence people’s perception of entities in the world. Studies that investigate the cognitive impact of grammatical gender often focus on object perception. Boroditsky & Schmidt (2000), for instance, conducted a study that compared native speakers of English, German, and Spanish. The experiment tested the participants’ memory of object-name pairs in which the pairs were either congruent with the grammatical gender of the object (e.g. Patrick and apple for German speakers) or incongruent (e.g. Patricia and apple). The study revealed that speakers of Spanish and German showed better memory of pairs in which the

assigned name aligned with the grammatical gender of the object in their native language. In another experiment in this study, speakers of English, German and Spanish were asked to classify objects and animals as either male or female. The researchers concluded that people's perception of the gender of objects is influenced by the grammatical gender system of their language, in that objects and animals were classified according to the grammatical gender of their associated noun (Boroditsky & Schmidt 2000). Similarly, Haertlé (2017) conducted a study with speakers of French and Polish in which the participants saw images of objects that were presented as cartoon characters. Participants were asked to assign female or male voices to the characters. Both speaker groups were more likely to assign female voices to objects that are represented with grammatically feminine nouns and male voices to objects labelled using masculine nouns (Haertlé 2017). The grammatical gender of the nouns that were associated with the cartoon characters thus guided the assignment of voices. For the second task in this study, in which participants were asked to describe the objects using one word, stereotypically feminine adjectives (e.g. *weak*, *gentle*) were assigned to objects with feminine grammatical gender, whereas stereotypically masculine adjectives (e.g. *strong*, *ambitious*) were assigned to objects with masculine grammatical gender. Both parts of the experiment thus confirmed the hypothesis that grammatical gender influences speakers' perception.

However, there have also been conflicting results in this field of research. In a replication of the object-name study by Boroditsky & Schmidt (2000), speakers of German were not able to remember object-name pairs with congruent gender better (Bender et al. 2011). Moreover, in contrast to speakers of French and Spanish, German speakers did not assign matching voices to objects as frequently in a study conducted by Sera et al. (2002). They therefore concluded that the German gender system does not affect thought in the way that the French and Spanish grammatical gender systems do seem to do (Sera et al. 2002). As an explanation, they suggest that the specific characteristics of a grammatical gender system, and not the presence of a grammatical gender system in itself, may determine whether there is an effect on gender-related judgments (Sera et al. 2002). Potentially then, there may be a difference between languages with two grammatical genders such as Spanish and French compared to languages that distinguish three grammatical genders such as German (Sera et al. 2002). However, in contrast to this suggestion, both Maciuszek et al. (2019) and Haertlé (2017) did find a gender effect for speakers of Polish even though Polish does in fact make a three-way grammatical gender distinction.

### 1.3 The current study

What can be concluded from the current state of knowledge is that there is no consensus regarding the impact of grammatical gender on object perception. Especially for German, the observations have been conflicting. Furthermore, previous studies tend to focus on the same set of languages, namely French (Haertlé 2017; Sera et al. 2002), German (Boroditsky & Schmidt 2000; Bender et al. 2011; Sera et al. 2002), and Spanish (Boroditsky & Schmidt 2000; Sera et al. 1994; Sera et al. 2002), while other languages have only garnered marginal attention. Other languages that have been studied are Polish (Maciuszek et al. 2019; Haertlé 2017), Serbian (Vuksanović et al. 2015), and Arabic (Clarke et al. 1981), but the body of research that has investigated these languages is quite limited. A further investigation of languages with grammatical gender other than French, German and Spanish is thus called for in order to investigate to what extent linguistic differences between gender systems may affect the outcomes. Specifically, the issue regarding the influence of the nature of the distinction that is made is relevant in this respect. As languages that make a three-way masculine/feminine/neuter distinction have received less attention than languages that make a two-way masculine/feminine distinction, further research is required to investigate to what extent this characteristic matters in assessing the influence of grammatical gender on object perception.

The current study aims to build upon existing knowledge and shed more light on current disagreements by investigating whether Polish and German native speakers will differ in the extent to which they name objects in accordance with the grammatical gender the object has in their language. By using the same stimulus set to assess speakers of two languages that both have a three-way grammatical gender distinction, this study provides insight into the effects of grammatical gender for a previously understudied language (Polish) and provides additional evidence regarding the conflicting findings that have been reported in the literature for German.

### 1.4 Predictions

Given the extensive body of previous literature that suggests that grammatical gender influences object perception (e.g. Boroditsky & Schmidt 2000 for German and Haertlé 2017 and Maciuszek et al. 2019 for Polish), we predicted that both the Polish and the German native speakers would be guided by grammatical gender in their naming decisions and thus would provide female first names for objects that are associated with grammatically feminine nouns and male first names for objects that are associated with grammatically masculine nouns. However, we also

entertained the possibility that the effect would differ between the two groups, given the linguistic differences in this respect between the two languages. In Polish, the form of the noun itself is generally informative regarding its grammatical gender, whereas German nouns are not generally transparent in terms of their grammatical gender. There are exceptions to this claim for both languages (e.g. not all words ending in *-a* are feminine in Polish and some suffixes in German are reliably associated with a specific gender), but this difference may entail that the grammatical gender of the noun is more salient for speakers of Polish than for speakers of German. Furthermore, in Polish, the verb also agrees with the noun's grammatical gender which may similarly serve to enhance the prominence of the grammatical gender of nouns for Polish speakers. Consequently, these differences between the two systems may lead to diverging results for the two speaker groups.

## 2. Method

### 2.1 Participants

In total, datasets from 75 participants were collected over a period of approximately two weeks. Datasets from 12 of these participants could not be used, as the participant selected a native language other than German or Polish. Moreover, the data of 8 participants was excluded as they did not complete the survey. In addition, the data of 7 Polish speakers who carried out the tasks incorrectly could not be included in the analysis. This resulted in a total sample size of 48 participants (27 German, 21 Polish) whose data was analysed. The participants were asked to indicate their gender, age, native language as well as their self-assessed English proficiency (on a scale from 0-100). Note that we requested information on English proficiency as the survey was conducted in English, a language without grammatical gender, in order to ensure that participants would not be directly triggered in their judgements by the presence of grammatical gender clues in their native language. Table 1 provides an overview of the participants' demographic characteristics.

**Table 1.** Participant demographic characteristics

	German	Polish
Total number of participants	27	21
Gender		
Female	22	16
Male	4	4
Other	1	1
Age		
Age range	18–60	19–55
Mean age	24.6	35.9
Average English proficiency*	76.4	74.9

Note. \* Scale from 0–100

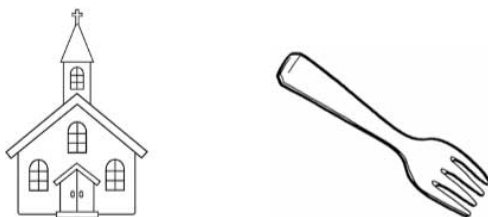
## 2.2 Design and materials

As discussed above, studies that investigate the relationship between object perception and grammatical gender have used a range of different tasks (e.g. assessing memory for (in)congruent object-first name pairs, requiring participants to assign masculine or feminine voices or to categorise objects as masculine or feminine). For this study, the data was collected during the COVID-19 pandemic. This entailed that a measure was required that could be used in an online setting without risking participant cheating (as in memory tasks), requiring functioning audio equipment (as in voice choice) or clearly focusing participants' attention on gender (as in gender categorisation). Given these constraints, requiring participants to provide first names for objects was considered a suitable method of choice for the current study.

All participants received the same version of the survey that required them to provide a first name (such as James or Maya) for a range of different images that depicted inanimate objects. The independent variable of the study is the grammatical gender that is associated with the objects in the stimulus material. The dependent variable is the gender of the name that was assigned by the participant to each image. A total of 30 images that depict inanimate objects were selected as the stimulus material of the study. An example of the images that have been used can be seen in Figure 1. During the experiment, the participant saw one image at a time. The selected objects included 16 objects of the opposite grammatical gender (feminine and masculine) in Polish and German. Moreover, three objects of each of the following categories were included: masculine grammatical gender in both languages, feminine grammatical gender in both languages, neuter grammatical



gender in both languages (9 objects in total), as well as 3 neuter and masculine pairs and 2 neuter and feminine pairs. Objects with neuter grammatical gender were included in the stimulus list to see whether they would be named differently than objects with feminine or masculine grammatical gender (participants might, for instance, choose gender-neutral names for these objects), but, for the purposes of the current study, only objects that were associated with either masculine or feminine nouns were included in the analyses. Objects that have a strong female or male connotation (e.g. lipstick) were not chosen. Instead, the intention was to select objects that would appear to be neutral. In order to avoid the influence of colour or other variables, all images were simple black and white sketches of the objects. All images were derived from free online sources.<sup>1</sup>



**Figure 1.** Examples of images that were used in the experiment. Intended translations and grammatical genders for these images are: *Kirche* (feminine German)/*kościół* (masculine Polish), *Gabel* (feminine German)/*widelec* (masculine Polish)

### 2.3 Experimental procedure

The study was conducted online using Qualtrics survey software; the participants took part voluntarily without any compensation. All instructions were given in English and there was no time limit on any part of the questionnaire. At the start of the study, participants were told that the experiment investigated the impact of language on thought, but not what the specific aim of the research was (as the survey was sent out to a general audience, it was deemed unlikely that participants would have extensive knowledge of the “language and thought” debate). The main part of the experiment was divided into three separate assignments with responses required for each item. First, the participants had to assign first names to the objects that were depicted in the images (e.g. calling a picture of an apple “James”). The second part of the questionnaire was programmed such that each name that the participant had previously entered was shown and par-

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1. Stimulus material (together with source information) and the data that was obtained for this study can be found here: [https://osf.io/cnxsr/?view\\_only=90c6bb1885234c46af39eb19c481615b](https://osf.io/cnxsr/?view_only=90c6bb1885234c46af39eb19c481615b)

ticipants had to indicate which sex (female/male/gender-neutral) they associated with each of the names. That is, if a participant had entered “James” as a first name for the apple, they were asked to determine whether they considered James to be a male, female or gender-neutral name. This was a necessary part of the procedure in order to gain certainty about which sex was associated with the given name (for instance, participants choosing the name Robin may well have intended it as a feminine name even though the name could be used for male individuals as well). The last task was a translation task in which the participants were required to enter a translation in their native language for each object that they had been shown (e.g. they were shown the image of the apple and were asked to write down the name of this object in their native language). This check was necessary, because it is possible that participants identified a different object with a different grammatical gender than was intended (e.g. if, instead of labelling the apple *der Apfel*, they had labelled it *die Frucht* (the fruit) and had provided a feminine first name, their naming would still be influenced by the grammatical gender of the noun and this should be reflected in the scoring).

## 2.4 Scoring procedure

The answers that were obtained were analysed both per participant and per individual object. The main analysis was conducted for the objects that were associated with feminine and masculine nouns, the objects that were referred to with neuter nouns were not considered in the current analysis. In the scoring procedure, if a participant provided a first name for an object that was in line with the grammatical gender of the noun that they had used for that object in the translation task, they were awarded a score of 1 for that object. If the name did not align with the associated grammatical gender, the score was 0. Note that this entails that items that received a different translation than was initially expected were still incorporated in the analysis.

## 3. Results

### 3.1 Descriptive statistics

An overview of the descriptive statistics of the outcomes of this study is provided in Table 2. The German speakers named on average 52% of the objects in accordance with their German grammatical gender, while the Polish speakers named 62% of the objects according to the Polish grammatical gender. In some cases, participants provided responses that could not be analysed (e.g. providing a first

name again instead of a translation in the translation task). In total, 2.5% of the results of the German speakers and 6.5% of the Polish speakers' results could not be analysed. In these cases, responses to specific items could not be analysed and the maximum possible score for the participant was reduced. This entailed that for each participant the percentage of answers that was in line with the associated grammatical gender of the objects was taken as the score (instead of the summed total score).

**Table 2.** Summary of scores obtained. ( $N$  = sample size,  $M$  = Mean,  $SD$  = Standard Deviation)

German speakers ( $N=27$ )			Polish speakers ( $N=21$ )		
$M$	$SD$	Range	$M$	$SD$	Range
0.53 <sup>*</sup>	0.12	0.29 – 0.73	0.62 <sup>*</sup>	0.13	0.38 – 0.92

*Note.*

\* Maximum score: 1

### 3.2 Inferential statistics

The inferential statistics are based on the scores per participant which combine the results of the object-naming, first name gender indication, and translation tasks. Only items that had either feminine or masculine grammatical gender in the native language of the participant and that were given male or female names by the participants were considered in this analysis (i.e. the objects that were associated with nouns with neuter grammatical gender and items that received names that were specified as being gender-neutral were not considered). A separate single sample t-test was carried out for each speaker group in order to determine whether the scores that were obtained differed from chance (if speakers were randomly assigning names to objects, the expectation would be that, for each object, their responses would be in alignment with the grammatical gender of the object half of the time).

For the German participants, a single sample t-test demonstrated that there was no statistically significant difference between the assignment of names to objects and what would be expected on the basis of chance:  $t(26) = 1.50$ ;  $p = .15$ . This means that the German speakers did not name objects more frequently in line with grammatical gender than would be expected on the basis of chance. The t-test for the Polish participants, on the other hand, revealed that there was a statistically significant difference between the assignment of names in accordance with grammatical gender and the outcome that would be expected based on chance:  $t(20) = 4.26$ ;  $p \leq .001$ . Polish speakers thus named the objects more fre-

quently in line with their grammatical gender than would be expected on the basis of chance. Finally, an independent samples t-test was conducted in order to compare the two groups directly and to assess whether there would be a statistically significant difference between the two groups in terms of the influence of grammatical gender on object perception. The outcome of this test revealed a significant difference:  $t(41) = -2.40$ ;  $p = .02$ , with the Polish group naming objects in line with grammatical gender more often than the German group.

## 4. Discussion

### 4.1 Interpretation

This study aimed to address the question whether Polish and German native speakers would name objects in accordance with the grammatical gender of the Polish or German noun that they are associated with. The outcomes of this study suggest that whereas Polish speakers named objects in line with the grammatical gender of their associated nouns, this pattern was not demonstrated for the German participants. Furthermore, a direct comparison of the two groups demonstrated that Polish speakers provided names that were in line with Polish grammatical gender significantly more often than German speakers provided object names that were in line with German grammatical gender. Whereas grammatical gender thus does seem to influence the names that Polish speakers provide for objects, this does not seem to be the case for speakers of German. Although we had initially expected the naming practices of both groups to be influenced by grammatical gender, these findings do fit into the general framework of previous research, since other studies have also suggested that German speakers are not influenced by grammatical gender in their behaviour in these kinds of tasks (Sera et al. 2002; Bender et al. 2011). As both Polish and German distinguish between three grammatical genders, the suggestion put forward by Sera et al. (2002) that the nature of the grammatical gender system (two-way or three-way) affects whether the influence of grammatical gender will be demonstrated is not supported by this study. Possible alternative explanations for our findings thus need to be sought.

Although the distinction between a two-way or a three-way grammatical gender system cannot explain our results, other differences in the gender systems of German and Polish may be relevant (Maciuszek et al. 2019). More specifically, the transparency of the gender system may play a role in explaining our outcomes. In Polish, the grammatical gender of a noun can usually be inferred from its ending, with masculine nouns typically ending in a consonant and feminine nouns in *-a*.

This means that the grammatical gender of a word can in general be derived easily from the characteristics of the noun itself. This general pattern also applies to the nouns that have been used in this study (only the Polish term for “bone”, which is female but ends in *-c* is an exception). German generally lacks this kind of transparency and the regularities that are found in German (suffixes such as *-heit* or *-ung*) are not used for objects, and thus do not apply to the materials of this study. Potentially then, the association between nouns and their gender is stronger for Polish than German which may well entail that Polish speakers are more likely to be influenced by grammatical gender in their characterisation of an object than German speakers. It should be noted that as the current study was conducted in English, we purposely minimised the likelihood of grammatical gender markers directly triggering participants in choosing names that were in line with the object’s grammatical gender. However, at least for the Polish speakers, it seems that the association between the object and the grammatical gender of the noun in their native language was strong enough to still play a role in their decisions.

Perhaps then, the outcome of the current study underscores the importance of noun transparency in explaining previous findings regarding grammatical gender and object perception. After all, previous studies demonstrate that German, a language with low transparency, shows conflicting results on this front (e.g. Boroditsky and Schmidt 2000 did find an effect, whereas Bender et al. 2011 did not), whereas Spanish, a language with high transparency, does show the effect (e.g. Sera et al. 2002). Similarly, in the current study an effect for German was not found, but the effect was found for the much more transparent Polish system (which is in alignment with the findings reported in Maciuszek et al. 2019 and Haertlé 2017). The suggestion that transparency is a relevant factor in determining whether grammatical gender influences object perception may seem at odds with studies that demonstrate the presence of this effect for French (e.g. Haertlé 2017). However, although French is less transparent than highly transparent languages like Spanish, there are many more reliable grammatical gender cues available for French as compared to a low transparency language like German (see Hohlfeld 2006).

Our study thus suggests that participants automatically activate the lexical representation for the object in their native language and, if the grammatical gender cue is a prominent part of this representation, they are then guided by this linguistic knowledge in their naming decision. It should be noted though, that other factors may also have played a role in this process. Previous work by Vuksanović et al. (2015) regarding grammatical gender and the mental representation of musical instruments suggests that participants will rely on linguistic knowledge if that is the only information they have, but visual information is also likely to play a role if that is available. In our study, it is possible that the visual representations of

the objects also influenced the German and Polish participants in different ways. However, it should also be noted that there were some striking similarities in the gender associations that the participants in the different speaker groups had. For instance, the object “teapot” was assigned a female name by many participants in both groups (German 81%, Polish 75%) even though it is grammatically masculine in Polish. The fact that the teapot was mostly given female names suggests that teapots may be associated with femininity regardless of their grammatical gender. This may be due to their round shape or the stereotypical association with tea as a rather female beverage. A similar observation could be made for the object “ball”. It is grammatically masculine in German and feminine in Polish but was mainly given male names (German 63%, Polish 75%). This may be related to the association of a ball with sports that are predominantly associated with men such as football or basketball. Visual characteristics and stereotypical object associations may thus also have influenced people’s perception of the objects that were shown.

#### 4.2 Limitations and suggestions for future research

Although the results of the current study are not at odds with outcomes of previous studies on the topic, there are some limitations that could have affected the outcomes. Several participants reported having difficulties coming up with new names for the objects which suggests that perhaps too many objects were included. It would furthermore be fruitful to conduct an offline face-to-face experiment because this may ensure greater attention and effort on the part of the participants. This may be relevant given the fact that some participants explicitly criticised the length of the study which thus suggests declining effort or focus. In addition, the consistency of the observed pattern could be tested with other tasks of a similar nature, such as the assignment of voices to objects. Moreover, as has been suggested above, the characteristics of specific objects may have influenced the naming practices. For future studies, it would thus be relevant to pay more attention to possible associations when selecting the stimulus material and either choosing objects that pre-tests suggest to be gender neutral in terms of their associations or choosing objects that do have a clearly associated gender and investigate which factor (grammatical gender or gender associations) is more important in the naming decision. In a general sense, the study has offered evidence for the assumption that the specific characteristics of a language’s grammatical gender system, particularly regarding the transparency of the noun itself, have an influence on speakers’ object perception. Future research could thus investigate to what extent the transparency of the grammatical gender system influences the decisions that participants make when other languages are investigated.

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