EXTENDING RESEARCH ON THE INFLUENCE OF GRAMMATICAL GENDER ON OBJECT CLASSIFICATION: A CROSS-LINGUISTIC STUDY COMPARING ESTONIAN, ITALIAN AND LITHUANIAN NATIVE SPEAKERS

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Abstract. Using different experimental tasks, researchers have pointed to a possible correlation between grammatical gender and classification behaviour. Such effects, however, have been found comparing speakers of a relatively small set of languages. Therefore, it's not clear whether evidence gathered can be generalized and extended to languages that are typologically different from those studied so far. To the best of our knowledge, Baltic and Finno-Ugric languages have never been examined in this respect. While most previous studies have used English as an example of gender-free languages, we chose Estonian because – contrary to English and like all Finno-Ugric languages – it does not use gendered pronouns ('he' vs. 'she') and is therefore more suitable as a baseline. We chose Lithuanian because the gender system of Baltic languages is interestingly different from the system of Romance and German languages tested so far. Taken together, our results support and extend previous findings and suggest that they are not restricted to a small group of languages.

Keywords: grammatical gender, categorization, object classification, language & cognition, linguistic relativity, Estonian, Lithuanian, Italian

1. Introduction

Research done in recent years suggests that our native language can affect non-verbal cognition and interfere with a variety of tasks. Taken together, psycholinguistic evidence points to a possible correlation between subjects' behaviour in laboratory settings and certain lexical or morphological features of their native language. To investigate language effects on cognition, researchers have conducted cross-linguistic

studies comparing subjects with different native languages. Using this approach, researchers have often found significant differences which apparently reflect lexical and/or morphological asymmetries between the languages under investigation.

Grammatical gender is among the most studied categories in this respect and has been the subject of extensive research. Increasing evidence suggests that grammatical gender can influence object classification (e.g. Athanasopoulos, Boutonnet 2016, Bassetti 2007, 2014, Bender et al. 2016, Boroditsky, Schmidt 2000, Boroditsky et al. 2003, Boutonnet et al. 2012, Sera et al. 1994, 2002, Flaherty 2001, Imai et al. 2013, Kurinski, Sera 2011, Kurinski et al. 2015, Martinez, Shatz 1996, Phillips, Borodistky 2003, Sato et al. 2013, Sedlmeier et al. 2016, Seigneuric et al. 2007, Vigliocco et al. 2004, 2005). Using different paradigms, researchers have often found a significant correlation between participants' choices and grammatical gender. These effects have been found in both adults and children from around age 5–9 and appear to vary depending on specific tasks being used and languages under examination.

To examine grammatical gender effects on cognition, researchers have compared native speakers of languages with a grammatical/formal gender system (mostly Spanish, French, German and Italian) with speakers of languages without grammatical gender (English, Japanese, Tamil). To the best of our knowledge, the influence of grammatical gender on object classification has been tested on a relatively small set of languages; with a few exceptions, all previous studies have used English as a baseline for languages without grammatical gender. In our opinion, this lack of variety represents a limiting factor, because it's not clear whether previous findings can be generalized or just happen to be true for a restricted number of languages.

To address this issue, we decided to carry out a comparison that is quite different from studies previously done. In our study, we will compare two languages with a grammatical gender system (Italian and Lithuanian) and a language without a grammatical gender system (Estonian). This will allow us to shed light on possible differences between Romance (Italian), Baltic (Lithuanian) and Finno-Ugric (Estonian) languages.

Compared to English, Estonian represents a more extreme case of language without grammatical gender. In English, a distinction is made between the pronouns *he/him* vs. *she/her* and it is technically possible to refer to certain objects as either *he* or *she*. In British English, for instance, it is not unusual to refer to a ship as *she* and to a computer as *he*. Such usage is well documented and described in the literature as "opaque gender" (Flaherty 2001, Nicoladis, Fourscha-Stevenson 2011). In Estonian, such usage is not possible because the same third person pronoun (*tema*, short form: *ta*) is used to refer to both men and women (this pronoun is used mostly to refer to animate beings, but it is occasionally used to refer to inanimate objects). Considered that Estonian – like all Finno-Ugric languages – does not use gendered pronouns, it could be said that it lacks gender in a more "extreme" way than English and could therefore represent a better baseline for gender-free languages.

We chose Lithuanian because the grammatical gender system of Baltic languages is interestingly different from that of the Romance and Germanic languages studied so far. Thus, we believe that a comparison between Lithuanian and Italian speakers could be extremely informative. In both Italian and Lithuanian there are two grammatical genders: masculine and feminine. Nouns, adjectives and participles are always marked for gender and have either a masculine or a feminine ending.

In Italian, the most prototypical masculine ending is -*o*, while the most prototypical feminine ending is -*a*. In the case of such endings, the gender can be readily inferred: a word ending in -*o* is masculine, while a word ending in -*a* is usually feminine. The ending -*e* is less transparent: some words ending in -*e* are masculine (e.g. *fiore* 'flower'), while others are feminine (e.g. *tigre* 'tiger'). In Italian, gender and number agreement is required between each noun and any predicate containing an adjective: in the case of a masculine noun, the adjective should be masculine; in the case of a feminine noun, the adjective must be feminine. In addition, masculine and feminine nouns require different articles. Masculine nouns are used with the indefinite article *un/uno* or with the definite article *il/lo/l'*. Femine nouns, by contrast, are used with the indefinite article *una/un'* or with the definite article *la/l'*.

In Lithuanian, the most prototypical masculine endings are -*as*, -*ias*, -*us*, -*ius*, while the most prototypical feminine endings are -*a* and -*ė*. Words ending in -*is* can be either masculine (e.g. *brolis* 'brother') or feminine (e.g. *akis* 'eye'). Since Lithuanian is a language with a rich inflectional morphology, agreement is required not only with respect to gender and number, but also with respect to case. For example, if a noun is masculine, singular and in dative case, the adjective should be masculine, singular and in dative case as well.

The gender system of the two languages is therefore quite different, the most notable difference being that in Italian there are articles, while in Lithuanian there are specific endings for different cases but articles do not exist.

The aim of our experiment is twofold. First and foremost, we will test whether object classification can be influenced by grammatical gender. Secondly, the results of our experiment will help us understand the interplay between grammatical gender and an apparently universal conceptual distinction between artifacts and natural objects, according to which artifacts tend to be perceived as more male-like, while natural objects as more female-like (Sera et al. 1994). In their experiments, Sera and colleagues found that English speakers assigned a gender according to a folk theory of gender based to a large extent on the distinction artificial/natural. As the authors explain, English speakers start to honor this conceptual distinction already in kindergarten, earlier than Spanish children honor grammatical gender (at approximately 5 years of age).

In our experiment we will compare the results of Italian, Lithuanian and Estonian native speakers in a voice assignment task very similar to that used by Sera et al. (1994) described below. Based on previous research, we will be testing the following hypothesis:

H$_0$: There is no correlation between the subject's native language and their choices in a classification task (i.e. language groups should not differ from each other significantly);

H$_1$: In languages with a grammatical gender system (in our case Italian and Lithuanian), participants will tend to assign a voice matching the grammatical gender of the object in their native language; for those items with an opposite gender in Italian and Lithuanian, Italian speakers will produce a relatively larger amount of assignments congruent with Italian gender, while Lithuanian speakers will produce a relatively larger amount of assignments matching Lithuanian gender.

2. Overview of previous studies

In the field of psycholinguistics, it was traditionally assumed that gender marking is semantically arbitrary: in support of such a view, authors usually noted that – for no apparent reason – different languages assign a different gender to the same object (e.g. the word for APPLE is feminine in Italian and masculine in Lithuanian). Such apparent disagreement of gender assignments across languages was usually interpreted as conclusive evidence for the arbitrary alignment of semantic and grammatical gender (Sera et al. 1994). Grammatical gender was therefore considered as encapsulated from conceptual representations. However, even if a set of universal semantic features cannot explain grammatical gender, this does not mean that grammatical gender lacks semantic force (for a more in-depth discussion of this issue, see Sera et al. 1994, Phillips, Borodistky 2003).

Taken together, recent empirical findings are not compatible with the idea that grammatical gender does not carry any semantic value and suggest, on the contrary, that it could be paramount for conceptual representations (e.g. Athanasopoulos, Boutonnet 2016, Bassetti 2007, 2014, Bender et al. 2016, Boroditsky, Schmidt 2000, Boroditsky et al. 2003, Boutonnet et al. 2012, Sera et al. 1994, 2002, Flaherty 2001, Imai et al. 2013, Kurinski, Sera 2011, Kurinski et al. 2015, Martinez, Shatz 1996, Phillips, Borodistky 2003, Sato et al. 2013, Sedlmeier et al. 2016, Seigneuric et al. 2007, Vigliocco et al. 2004, 2005).

To investigate this issue, different paradigms have been used, including – most notably – the voice-attribution task or VAT (e.g. Sera et al. 1994, 2002, Bassetti 2007), common-noun/proper-noun associations (e.g. Phillips, Boroditsky 2003), semantic ratings and adjective associations (e.g. Flaherty 2001).

In Sera et al. (1994), Spanish and English native speakers were asked to classify pictures depicting familiar objects as either masculine or feminine. As expected, Spanish speakers tended to classify according to Spanish grammatical gender. Such influence was stronger in the condition *pictures + labels* (in which the experimenter named each object); according to the authors, this stresses the importance of language as opposed to some general "cultural factor". Since the words "masculine"/"feminine" might have induced subjects to reason in terms of grammatical gender, the authors developed a second experiment, in which subjects were asked to attribute to common objects the voice of a man or the voice of a woman. This procedure spawned countless replications and has come to be known as a voice attribution task (VAT). As in the first experiment, Spanish speakers tended to classify according to Spanish grammatical gender. In their third experiment, authors found that Spanish speakers' performance started to differ from that of English speakers from 2nd grade.

In a follow-up study, Sera and colleagues (2002) extended the previous findings to French and German speakers. In their first study, monolingual speakers of English, French and Spanish (kindergartens, second graders, fourth graders, adults) were tested in the VAT described above. Based on their results, they noted that the time lag between language acquisition and the time where the first effects are seen – i.e. 7 years – suggests that it might take years for linguistic categories to infiltrate into cognition. The authors demonstrated that the classification done by German speakers did not vary systematically according to grammatical gender

as it did in the case of Spanish and French speakers. According to the authors, this could suggest that only a grammatical gender system with two gender categories can lead to overgeneralization of female and male traits to inanimate objects. A slightly different explanation has been proposed by Bassetti (2007), who notes that in German there are different forms for each case and, consequently, a higher number of forms might have a weaker influence on classification behaviour.

Martinez & Shatz (1996) compared English and Spanish children (age 3 to 5) in a sorting task and obtained results similar to those of Sera et al. (1994).

Boroditsky & Schimdt (2000) tested bilingual German-English and Spanish-English speakers. Instructions were provided in English: as the authors explain, if a language effect is found even with a different language of instructions, this could suggest that grammatical knowledge shapes "underlying" non-linguistic representations. In Experiment 1, participants learnt proper names (e.g. *Patricia* vs. *Patrick*) for a series of artifacts, animals and natural kinds with opposite grammatical gender in Spanish and German. When tested for recall of the pair name-item, participants remembered the pair better when the name was consistent with the gender of the object in their L1. In Experiment 2, where subjects were asked to write 3 English adjectives to describe English words labelling the same object as in the first experiment, participants tended to use more masculine adjectives when the object had a masculine grammatical gender (for instance, Spanish speakers tended to describe a bridge as strong, while German speakers tended to describe it as elegant). It is perhaps worth mentioning that Mickan et al. (2014) have recently failed to replicate a follow-up of this study (Boroditsky et al. 2003) and suggested that it could be either an artifact of some non-documented aspect of the experimental procedure or "a statistical fluke".

Phillips & Boroditsky (2003) tested Spanish and German speakers in a picture similarity task. In Experiment 1, participants received instructions in English and were asked to rate the similarity of objects and animals to human males and females. Items were presented as unlabeled pictures and all objects were chosen because of opposite grammatical genders in Spanish and German. As the authors explain, subjects found greater similarity between people and objects of matching gender. In Experiment 2, where Spanish-German bilinguals were tested, a significant correlation between relative proficiency in Spanish/German was found. In Experiment 3, the same procedure as Experiment 1 was used, with the addition of a verbal interference task (verbal shadowing) which could rule out the possibility that the effect is due to subjects sub-vocally naming the objects. As expected by the authors, verbal interference did not change the results.

In Flaherty (2001, Experiment 2), children and adult subjects were shown pictures of objects and asked to assign them a typical male or female name and to mark them as male or female by circling the box of a boy or girl. A strong correlation was found between grammatical gender and the choice of gender in Spanish in the groups of adults and 8–10 year-olds (the performance of the 5–7 age group being quite different). Based on these results, the author concludes that children begin to use grammatical gender between 6 and 9 years of age.

In the study by Seigneuric et al. (2007), children were first told a pseudoword without any determiner and then asked to indicate its gender. According to the authors, results of this experiment suggest that phonological cues affected picture classification: masculine endings led to selecting a male picture, while feminine

endings led to selecting a female picture. This effect tended to increase from age 4 to 9. The 3-year-olds were able to provide the gender of a determiner on the basis of the phonological clues at a greater than chance level. However, they were not able to use this knowledge to associate corresponding semantic features. As suggested by Sera and colleagues (2002), a time lag of years is required between grammatical gender acquisition and its observable influence on cognition.

More recently, Imai et al. (2013) compared native speakers of German and Japanese (a language without grammatical gender) in a task involving inferences about sex-specific biological properties. It was found that German speakers tended to erroneously draw inferences when the sex in the premise and grammatical gender of the target animal agreed. As the authors explain, an over-generalization of the grammar–semantics mapping was found even when the sex of the target was explicitly indicated. Interestingly, these effects occurred only when nouns were accompanied by gender-marking articles. According to the authors, similar results suggest that German speakers project sex-specific biological properties onto gender-marking articles but not onto conceptual representations of animals as such.

Sedlmeier et al. (2016) compared German and Tamil speakers and found a substantial grammatical gender effect, even when alternative explanations were statistically controlled for. As the authors explain, there was basically no effect for a task that was only very loosely connected to grammatical gender (similarity rating of word pairs). According to the authors, these results indicate that general grammatical gender effects exist but that the size of these effects may be limited and their range restricted.

Recent studies also suggest that grammatical gender effects could apply also to a second or third language acquired later in life (e.g. Kurinski, Sera 2011, Kurinski et al. 2015, Athanasopoulos, Boutonnet 2016).

The main findings of the behavioural studies described above are compatible with recent neurological evidence suggesting that grammatical gender can affect conceptual representations of artifacts, animals and natural kinds. In their ERP study, Boutonnet et al. (2012) observed a pattern of results suggesting that gender features (whether semantic or not) make it as part and parcel of the pattern of activations in the brain when retrieving conceptual information about the objects on which classification needs to be performed. Access to gender information appears implicit, unconscious and almost automatic; moreover, such information is accessed prior to syntactic and phonological information and activated regardless of whether syntactic information is necessary.

3. Method

3.1. Participants

We tested 120 subjects (40 Lithuanians, 40 Estonians, 40 Italians). Participants were university students in the age range 18–26 (mean: 21.82, median: 22.00, sd: 2.04). Lithuanians were recruited at Vytautas Magnus University of Kaunas; Estonians were recruited at Tallinn University; Italians were recruited at the Catholic University of the Sacred Heart of Milan. Even though previous studies have concluded that similar tasks are not affected by the gender of the participant (e.g. Sera

et al. 1994), we decided to test 20 males and 20 females for each language group. Careful screening was carried out as to exclude bilinguals and/or subjects with a native language different from those under examination. Given that English lacks grammatical gender, subjects proficient in English were not considered as bilinguals for the purpose of the present experiment.

3.2. Materials

For this experiment we used a series of 31 black and white drawings (Appendix 1 contains some examples), so as to avoid gender connotations of colors (Flaherty 2001). With a few exceptions, we used drawings depicting the same referents used by Sera et al. (1994) (see Appendix 2 for a full list with relevant translation). Careful consideration was used as to include objects with opposite grammatical gender in Italian and Lithuanian. There were 8 control pictures and 23 test pictures. Control pictures depicting humans with obvious natural/biological gender (king, knight, mechanic, boy, woman, girl, ballerina, bride) were added to check whether the subject understood the instructions. Test pictures represented objects without a natural gender. Three randomly determined orders of presentation were used.

3.3. Procedure

We used the experimental design described by Sera et al. (1994). Subjects were tested singularly with pictures presented on a 15.6" laptop screen. Subjects were told the following instructions in their native language (instructions were exactly the same as in Sera et al. 1994):

> "We are thinking about making a new movie in which some everyday objects come to life. We are going to show you a series of pictures of these objects and want you to write down, on this sheet of paper, by each number, whether you think each pictured object should have a man's voice or a woman's voice. Okay, here is picture number one [the Experimenter would then show one picture to the subject, and for half of the subjects labeled the picture], should this have a woman's voice or a man's voice in the movie?"

Each stimulus was displayed for 4 seconds, after which the next stimulus was automatically displayed. As pictures were shown one by one, subjects marked the corresponding answer on a numbered response table. As in Sera et al. (1994), there were two experimental conditions, which we called 'NO word' (when displaying the object, the Experimenter did not name it) and 'PLUS word' (the Experimenter also said the name of the item displayed).

4. Results

We calculated the relative frequency of feminine and masculine voice attributions for each item and each language group. Figures 1 to 7 below show the cross-linguistic pattern of attributions.
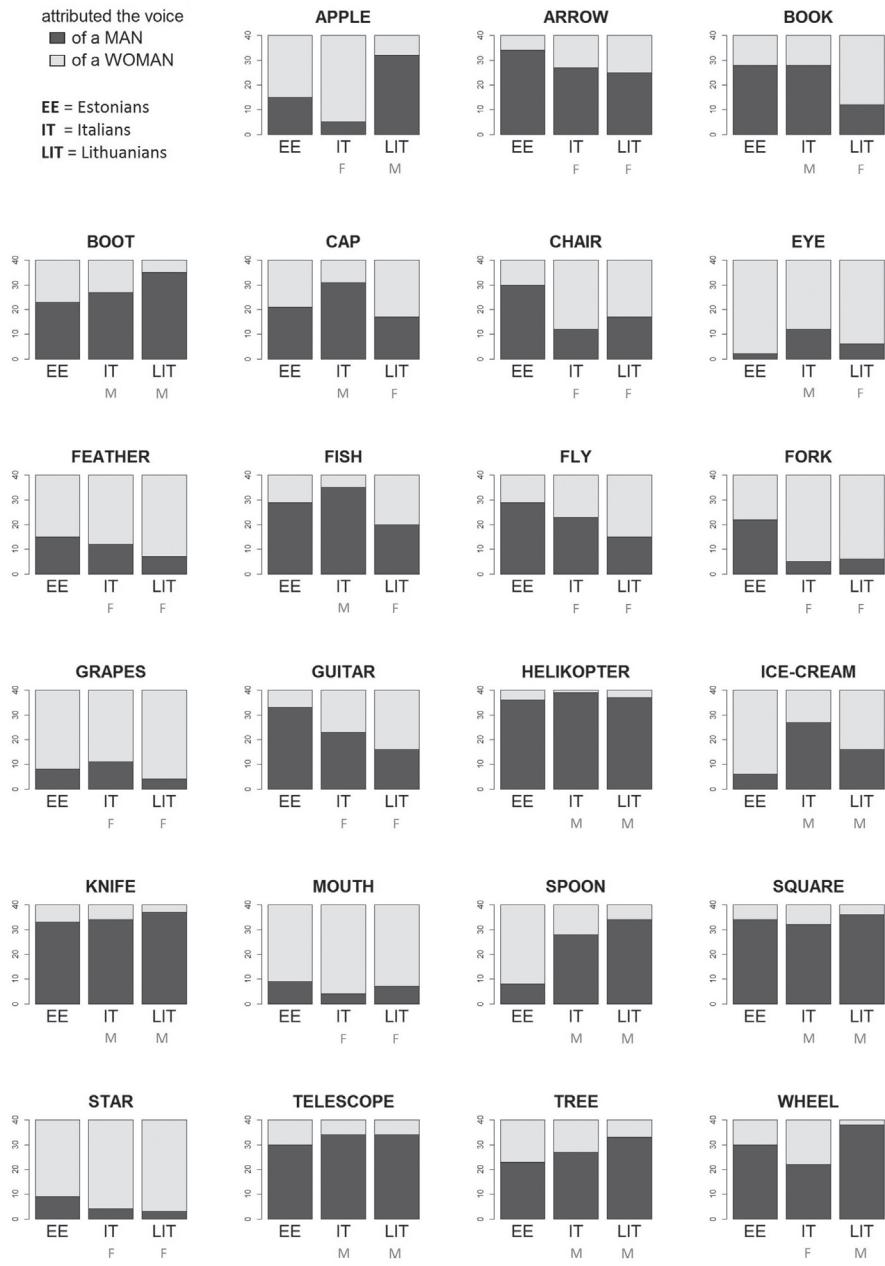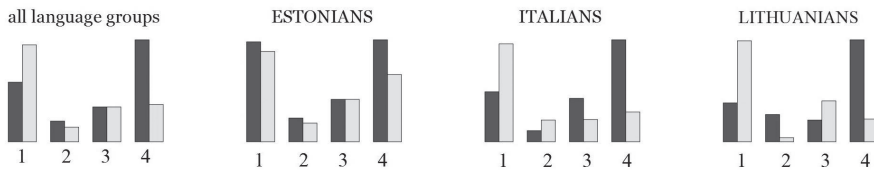
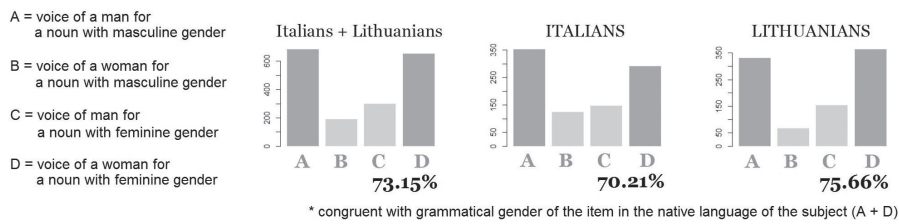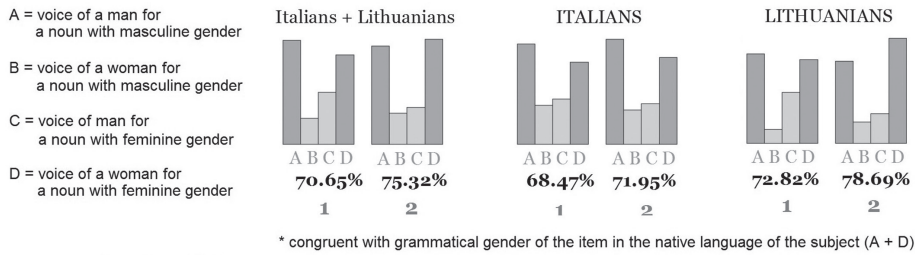**Figure 1.** Relative frequency of voice attributions for each item

attributed the voice
■ of a MAN
□ of a WOMAN

EE = Estonians
IT = Italians
LIT = Lithuanians

Group 1 - Feminine in both languages
Group 2 - Feminine only in Italian
Group 3 - Feminine only in Lithuanian
Group 4 - Masculine in both languages

EE   IT   LIT

Figure 2. Voice attributions for each group of objects (cross-linguistic comparison)

all language groups   ESTONIANS   ITALIANS   LITHUANIANS

1   2   3   4

Figure 3. Voice attributions for each group of objects

A = voice of a man for a noun with masculine gender

B = voice of a woman for a noun with masculine gender

C = voice of man for a noun with feminine gender

D = voice of a woman for a noun with feminine gender

Italians + Lithuanians   ITALIANS   LITHUANIANS

A B C D   A B C D   A B C D
73.15%   **70.21%**   **75.66%**

* congruent with grammatical gender of the item in the native language of the subject (A + D)

Figure 4. Relative frequency of attributions that are congruent with the native language

A = voice of a man for a noun with masculine gender

B = voice of a woman for a noun with masculine gender

C = voice of man for a noun with feminine gender

D = voice of a woman for a noun with feminine gender

Italians + Lithuanians   ITALIANS   LITHUANIANS

A B C D   A B C D   A B C D   A B C D   A B C D   A B C D
70.65% **75.32%**   **68.47%** **71.95%**   **72.82%** **78.69%**
1   2   1   2   1   2

* congruent with grammatical gender of the item in the native language of the subject (A + D)

Figure 5. Relative frequency of attributions congruent with the native language – Comparison between the 'NO word' condition (1) and the 'PLUS word' condition (2)
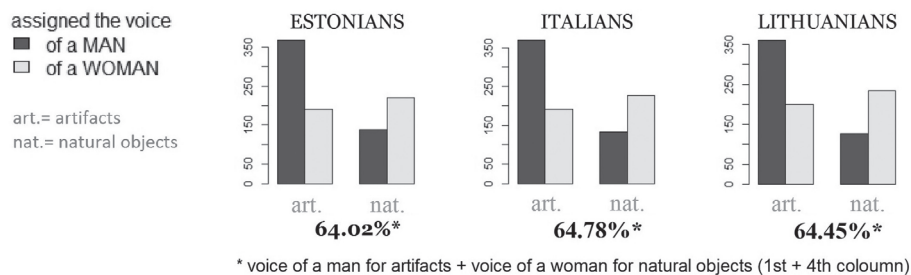
Figure 6. Relative frequency of attributions congruent with the conceptual distinction 'artifact' vs. 'natural object'
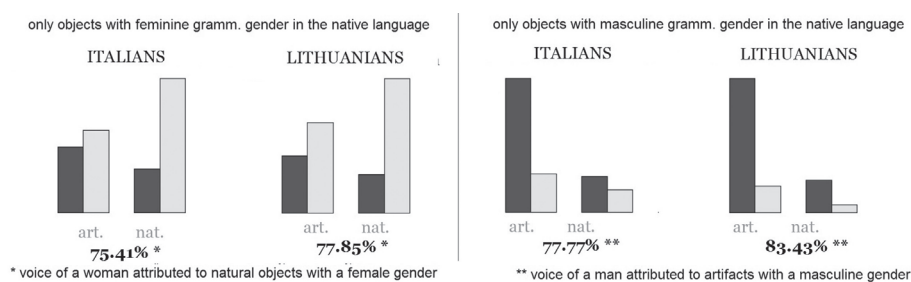
Figure 7. Voice attributions with respect to the conceptual distinction 'artifact' vs. 'natural object' and grammatical gender

We modeled our data using the *glmer* function in R (*lme4* package) and created a series of mixed-effects generalized linear models based on different variables. In all of these models, we performed a logistic regression on the same binary dependent variable indicating whether given item was attributed the voice of a woman (1) or the voice of a man (0). As random effects, we had intercepts for subjects and items. As fixed effects, we investigated the influence of the following variables: sex, age, native language, experimental condition ('NO word' vs. 'PLUS word') and the distinction artifact vs. natural object. Fixed effects were assessed with a Likelihood Ratio Test using the Anova function. p-values were obtained by likelihood ratio tests of the full model with the effect in question against the model without the effect under investigation.

As expected, our preliminary logistic regression on control items (humans with a clear biological gender) confirmed that neither age ($\chi^2(1) = 0.4272$, $p = 0.5134$), sex ($\chi^2(1) = 0.52$, $p = 0.4686$) nor native language ($\chi^2(4) = 1.62$, $p = 0.8035$) affected voice attributions.

When we performed a logistic regression on test items (objects without a clear biological gender), we found a significant effect of grammatical gender ($\chi^2(1) = 203.55$, $p = 2.2*e^{-16}$, where e is approximately 2.71). Considered that $2.2*e^{-16}$ is the smallest number larger than zero that can be stored on a computer, our results suggest that grammatical gender of a given item in the native language of each subject was a very significant predictor. It is worth noting that we did not find a significant effect of native language *per se* ($\chi^2(2) = 1.9986$, $p = 0.3681$), which suggests that the effect was due specifically to grammatical gender.

We also found a smaller yet significant effect of experimental condition ('NO word' vs. 'PLUS word'): $\chi^2 (1) = 5.1953$, $p = 0.02265$.

We also conducted a logistic regression using as predictor the distinction artifact vs. natural object (i.e. whether the item was a natural object or an artifact) when controlling for different native languages. The results were as follows: $\chi^2(1) = 9.3599$, $p = 0.002218$ (all language groups), $\chi^2(1) = 6.6895$, $p = 0.009698$ (Estonians), $\chi^2(1) = 6.609$, $p = 0.01015$ (Italians), $\chi^2(1) = 6.0546$, $p = 0.01387$ (Lithuanians).

5. Discussion

We compared the relative pattern of results of Estonian, Italian and Lithuanian speakers in a voice attribution task. The results of our logistic regressions show that grammatical gender was a significant predictor of voice attributions. We found a significant correlation between grammatical gender and specific categorization behaviour. Therefore, our findings are not compatible with the idea that classification is entirely independent of native language (H_0).

Both Lithuanians and Italians made a large amount (respectively 75.66% and 70.21%) of voice attributions matching the grammatical gender of the objects in their native language. From Figure 8 below, it can be seen that Italians and Lithuanians exhibited a very similar pattern for those items with the same grammatical gender in the two languages and an opposite pattern (compared to baseline Estonians) for objects with a different grammatical gender.

Figure 8. Cross-linguistic pattern of voice attributions with respect to grammatical gender

In general, Estonians' assignments were split more evenly (i.e. closer to 50%–50%) for all groups of objects, while Italians' and Lithuanians' assignments were somewhat "pulled" towards the grammatical gender in the native language. For those items where Italians and Lithuanians disagree on the grammatical gender, Italians produced a relatively larger amount of assignments matching Italian gender, while Lithuanians produced a larger amount of assignments matching Lithuanian gender. Taken together, such results provide strong support to our H_1.

We also examined the relationship between grammatical gender and a universal tendency to consider artifacts as more male-like and natural objects as more female-like (Sera et al. 1994). Our results confirm the universality of this effect, which appeared slightly stronger on Estonian subjects (arguably because of the lack of a grammatical gender system). When grammatical gender went in the same direction as the natural/artificial distinction (artifacts with a masculine gender and natural objects with a feminine gender), grammatical gender apparently reinforced this tendency. Compared to the Estonian baseline (64.02%), we found that to natural objects with a

feminine gender in Italian, Italians assigned the voice of a woman 75.41% of the time, while to natural objects with a feminine gender in Lithuanian, Lithuanians assigned the voice of a woman 77.85% of the time; similarly, we found that to artifacts with a masculine gender in Italian, Italians assigned the voice of a man 77.77% of the time, while to artifacts with a masculine gender in Lithuanian, Lithuanians assigned the voice of a man 83.43% of the time. When grammatical gender went in the opposite direction of the artifact/natural distinction (natural objects with a grammatical masculine gender, artifacts with a feminine grammatical gender), grammatical gender was shown to counterbalance this tendency. Figure 9 below shows the relative pattern for artifacts with feminine gender in Italian and Lithuanian.

Figure 9. Pattern for artifacts with feminine gender in both Italian and Lithuanian

Similarly to Sera et al. (1994), we found a smaller difference between the condition where the experimenter simply showed the pictures ('NO word') and the condition where the experimenter labelled the pictures ('PLUS word'). In both conditions, language effects appeared stronger on Lithuanians than Italians, and more so in the 'PLUS word' condition (see Figure 5 above). This asymmetry could suggest that hearing the object's label influenced Lithuanians more and could be related to certain structural differences between the two languages. As explained in the introduction, Italian nouns are normally accompanied by an article of the same gender. While the relative strength of these two clues to gender (noun ending and article preceding the noun) is hard to assess, both linguistic devices contribute to the marking of the gender. Since participants were given only one of these two clues (word ending), it is possible that labels provided in the 'PLUS word' condition might have proved incomplete for Italians. In Lithuanian, on the other hand, articles do not exist. Therefore, our presentation might have favoured Lithuanians over Italians. An alternative – and simpler – explanation is possible. The asymmetry between Italians and Lithuanians could simply be a reflection of a minor difference in the execution of the experiment. In our attempt to replicate as closely as possible the original design of Sera et al. (1994), we did not use pre-recorded labels and did not control for onset time and duration. Since Italians and Lithuanians were not tested by the same experimenter (Italians were tested by the first author, while Lithuanians were tested by the third author), we cannot rule out a minor difference in the time lag between presentation and labelling by the first and third author. It is possible that one of the experimenters had a slightly faster onset time or simply pronounced each word faster. Thus, the difference between Lithuanians and Italians might be due to the fact that the third author either pronounced each label faster and/or had a faster onset time. Both explanations are possible and require further investigation.

Our analysis was admittedly limited to the interplay between grammatical gender and the conceptual distinction artificial/natural. However, in order to assess the

relative strength of grammatical gender, it is also necessary to consider perceptual features and – most importantly – cultural factors (Nicoladis, Fourscha-Stevenson 2011). Needless to say, objects such as KNIFE, HELICOPTER, TELESCOPE and WHEEL are quite different from objects such as CHAIR and CAP: while all objects are artifacts, the first group has arguably stronger associations with men. To put it another way, the second group of artifacts is relatively free of strong gender connotations and might, as such, be more informative with respect to the influence of language on categorization. Similarly, objects such as FISH and TREE, while belonging to the natural realm, have strong cultural associations with the male gender. Cultural association should also be separated and distinguished from perceptual features. If we consider an object such as SPOON, while the artifact/natural distinction would suggest a closer association with the male gender, its perceptual traits (round shape) are closely associated with female gender. The same goes for an object such as ICE-CREAM, which can be characterized as being "soft" – which is a trait traditionally associated with women. Therefore it is not a surprise that, while the vast majority of Italians and Lithuanians chose the voice of a man for both objects (arguably because of masculine grammatical gender), the vast majority of Estonians attributed to both items the voice of a woman. Disentangling grammatical gender effects from culture, perceptual features and conceptual tendencies was admittedly beyond the scope of the present paper and calls for the development of a rigorous methodology in which all relevant factors (e.g. 'round' vs. 'sharp', 'usually used by men' vs. 'usually used by women' etc.) should be carefully controlled for.

6. Conclusion

Our findings confirm and extend previous research on grammatical gender effects on inanimate objects categorization. Comparing Estonian, Italian and Lithuanian speakers, we have shown that previous findings are not limited to languages previously studied. Taken together, results of our experiment support previous research pointing to a correlation between specific cognitive behaviour and one's native language. Moreover, we have shown that grammatical gender can counterbalance – and in some cases over-ride – an apparently universal conceptual tendency to perceive artifacts as more male-like and natural objects as more female-like.

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Appendix 1. Examples of drawings used in our experiment
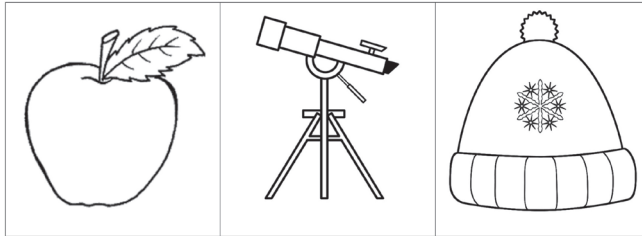
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Appendix 2. List of stimuli and their translation into Estonian, Italian and Lithuanian

control pictures					
ENGLISH	ESTONIAN	ITALIAN		LITHUANIAN	
MECHANIC	mehhaanik	meccanico	M	meistras	M
WOMAN	poiss	ragazzo	M	berniukas	M
KING	kuningas	re	M	karalius	M
KNIGHT	rüütel	cavaliere	M	riteris	M
WOMAN	naine	donna	F	moteris	F
GIRL	tüdruk	bambina	F	mergaitė	F
BRIDE	pruut	sposa	F	nuotaka	F
BALLERINA	baleriin	ballerina	F	balerina	F

TEST PICTURES					
ENGLISH	ESTONIAN	ITALIAN		LITHUANIAN	
ICE-CREAM	jäätis	gelato	M	ledai[1]	M
TREE	puu	albero	M	medis	M
EYE	silm	occhio	M	akis	F
FISH	kala	pesce	M	žuvis	F
SQUARE	nelinurk	quadrato	M	kvadratas	M
CAP	müts	cappello	M	kepurė	F
KNIFE	nuga	coltello	M	peilis	M
BOOT	kuumik/saabas	stivale	M	batas	M
BOOK	raamat	libro	M	knyga	F
HELICOPTER	helikopter	elicottero	M	sraigtasparnis	M
TELESCOPE	teleskoop	telescopio	M	teleskopas	M
SPOON	lusikas	cucchiaio	M	šaukštas	M
FORK	kahvel	forchetta	F	šakės	F*
GRAPES	viinamarjad	uva	F	vynuogės	F
STAR	täht	stella	F	žvaigždė	F
FEATHER	sulg	piuma	F	plunksna	F
GUITAR	kitarr	chitarra	F	gitara	F
CHAIR	tool	sedia	F	kėdė	F
ARROW	nool	freccia	F	strėlė	F
FLY	kärbes	mosca	F	musė	F
WHEEL	ratas	ruota	F	ratas	M
MOUTH	suu	bocca	F	burna	F
APPLE	õun	mela	F	obuolys	M

Compared to Sera et al.(1994) study, we did the following substitutions: instead of "shoe", we used "boot"; instead of "table", we used "chair"; instead of "spider", we used "fly"; instead of "ear", we used "mouth". Sera and colleagues (1994) used "fire", but we tought that such a referent could be interpreted in different ways. For instance, it could be interpreted both as "fire"/*fuoco* (masculine in Italian) and as "flames"/*fiamme* (feminine and plural in Italian). We therefore used "tree" instead of "fire". We also used "knight" instead of "giant", as the latter could be more difficult to represent and interpret.

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1   This noun is only plural in Lithuanian

GRAMMATILINE SUGU OBJEKTIDE KATEGORISEERIMISE MÕJUTAJANA: EESTI, ITAALIA JA LEEDU KEELE VÕRDLEV UURIMUS

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Eri tüüpi eksperimente kasutades on uurijad osutanud grammatilise soo ja objektide klassifitseerimise võimalikele seostele. Senised tulemused on saadud siiski suhteliselt väheste keelte andmete võrdlemisel. Seetõttu ei ole teada, kas need järeldused on üldistatavad ka nendele keeltele, mille struktuur erineb siiani uuritud keeltest.

Probleemi uurimiseks laiendasime vaadeldavate keelte hulka ja tegime grammatilise soo ja objektide kategoriseerimise seoste katse läbi balti ja soome-ugri keelte hulka kuuvate keeltega, mida ei ole kõnealusest vaatenurgast uuritud. Enamik seniseid uuringuid on seadnud nn lähtepunktiks ehk grammatilise soota keeleks inglise keele. Siinses uuringus valisime aga selliseks lähtepunktiks hoopis eesti keele, kus erinevalt inglise keelest ei ole ka isikulistel asesõnadel sootunnuseid ja mis on seetõttu grammatilise soota keelte ekstreemsem esindaja.

Teiseks uuritavaks keeleks valitud leedu keeles on grammatilise soo süsteem võrreldes seni uuritud romaani ja germaani keeltega paljuski eripärane. Ühe sellise eripärana olgu mainitud asjaolu, et leedu keeles ei ole artikleid. Kolmas uuritud keel on itaalia, kus grammatiline sugu realiseerub indo-euroopa keeltele üsna tavapärasel moel.

Saadud tulemused kinnitavad seost emakeele grammatilise soo ja objektide kategoriseerimise vahel. Eesti, itaalia ja leedu keele kõnelejate vastuste võrdlus näitas, et senised tulemused on üldistatavad ka tüpoloogiliselt erinevate keeltele. Kokkuvõtlikult võib väita, et kõneldav keel ja keelespetsiifiline kognitiivne käitumine on seotud. Veelgi enam, tulemustest selgus, et kõneldava keele grammatiline sugu kaalub üle ja vahel isegi jätab täiesti tähelepanuta ilmselt universaalse kontseptuaalse kalduvuse tajuda artefakte kui pigem meessoost ja looduslikke objekte pigem kui naissoost objekte.

Võtmesõnad: grammatiline sugu, kategoriseerimine, keel ja kognitsioon, keeleline relatiivsus