No grammatical gender effect on affective ratings: evidence from Italian and German languages

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Abstract

In this study, we tested the linguistic relativity hypothesis by studying the effect of grammatical gender (feminine vs. masculine) on affective judgments of conceptual representation in Italian and German. In particular, we examined the within- and cross-language grammatical gender effect and its interaction with participants' demographic characteristics (such as, the raters' age and sex) on semantic differential scales (affective ratings of valence, arousal and dominance) in Italian and German speakers. We selected the stimuli and the relative affective measures from Italian and German adaptations of the ANEW (Affective Norms for English Words). Bayesian and frequentist analyses yielded evidence for the absence of within- and cross-languages effects of grammatical gender and sex- and age-dependent interactions. These results suggest that grammatical gender does not affect judgments of affective features of semantic representation in Italian and German speakers, since an overt coding of word grammar is not required. Although further research is recommended to refine the impact of the grammatical gender on properties of semantic representation, these results have implications for any strong view of the linguistic relativity hypothesis.

Keywords: linguistic relativity; grammatical gender; affective ratings; semantic representation.

Introduction

The hypothesis that the language we speak and the way we perceive the world are inseparable has been termed *linguistic relativity theory* (Whorf, 1956). This idea finds its ultimate expression in the observation that language-specific categories (e.g., vocabulary and grammar) may affect the way of perceiving, analysing, and acting in the world. Within this framework, two main approaches can be identified: 1) the strong view (see, e.g., Levinson 1996) posits that non-linguistic cognitive processes are closely linked to the form and content of a language determining for example, a stable effect of grammatical markers on these processes; 2) the weak view (see, e.g., Slobin 1996a) posits that language affects the thought in particular circumstances only (i.e., during language production and interpretation or in tasks engaging a linguistic coding, where an encoding of grammar is necessary).

An inherent aspect of some languages is the grammatical gender, a noun class system in which the class assigned is reflected in the forms of other elements syntactically related to noun and whose functions are mainly syntactic and morphological (Comrie, 1999). The assignment of the grammatical gender can follow semantic and formal principles, determining the language classification in natural gender and gendered systems, respectively[1]. In the natural gender languages, such as English and Swedish**,** the grammatical gender can be predicted by its biological gender, without reference to its form (Comrie, 1999; Corbett, 1991). For example, nouns denoting male and female humans are masculine and feminine, respectively. In contrast, in gendered languages, such as Italian and German -the two languages we will examine

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[1] Note that genderless languages (such as Finnish, which do not differentiate between genders) exist (Ståhlberg, Braun, Irmen & Sczesny, 2007), but they have been not mentioned because they are irrelevant for the aim of this study.

in this study- the grammatical gender is assigned according to formal rules that depend on the form of the nouns rather than on their meaning (i.e., phonological and morphological properties)[2]. For example, in Italian most nouns ending in -*o* and -*a* are masculine and feminine, respectively (Comrie, 1999; Corbett, 1991)**.** Moreover, while some languages may distinguish between at least two genders, masculine and feminine (e.g., Italian), others may use also the neuter gender (e.g., German).

It has been suggested that the way gender is encoded in a language may promote gender inequality in the respective society (Ståhlberg et al, 2007). Importantly, the prevalence of masculine generics, the common usage of the masculine form as generic for both women and men (e.g., the use of the word *man* as synonym for *person/human* of any sex in the English language), can shape people's social mental constructs that could impact the relative status of men and women at an interpersonal level (Vainapel, Shamir, Tenenbaum, & Gilam, 2015). An example are the attitudes to the use of sexist language. Studies exploring the effects of sex and age showed that women and older persons are more favourable to the use of non-sexist language than are men and young adults (Parks & Roberton, 2008).

However, while the link between social constructs and grammatical gender appears quite consistent, the link between this latter and semantic representation -i.e., the mental construct that holds meaning about the world- appears less stable. Boroditsky and colleagues (2013) reported that the grammatical gender of a term for an inanimate object influenced the perception of that object in German and Spanish speakers. For example, German speakers found key (*der Schlussel*, masculine) as hard, metallic and useful more often than did Spanish speakers, who more often saw key (*la llave*,

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[2] However, Corbett (1991) plausibly remarked that while pure semantic systems exist, pure formal systems do not exist.

feminine) as shiny, intricate or golden. This is consistent with the idea that maleness is associated with higher values in semantic dimensions measuring affective meaning such as *potency* and *activity*, while femaleness is associated with higher values in the semantic/affective dimension *evaluation* (Osgood, Suci & Tannenbaum, 1957). However, German and Spanish speakers showed mixed results about the grammatical gender effect on these semantic differential scales (Konishi, 1993; 1994). In addition, Vigliocco and colleagues (2005) investigated the effect of grammatical gender on semantic representation in Italian and German and, in line with the weak view of the linguistic relativity theory, revealed that this effect was limited to Italian words only and more specifically only for the semantic category of animals and for tasks requiring verbalization.

Thus, taken together, previous studies seem to suggest that grammatical gender can sometimes affect aspects of semantic representations, but only under some constraints. Further complicating matters, individuals' sex and age can affect grammatical gender effects in language use (see above), as well as word judgments on semantic differential scales reflecting the affective dimensions valence, arousal, and dominance[3] (see e.g., Fairfield, Ambrosini, Mammarella, & Montefinese, 2017; Montefinese, Ambrosini, Fairfield, & Mammarella, 2014b).

Here, we investigated grammatical gender effects on the semantic differential scales valence, arousal, and dominance in German and Italian speakers. In particular, we investigated within- and cross-languages grammatical gender effects and the interaction of grammatical gender with participants' sex and age (only for Italian

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[3] Note that these scales were originally created on the basis of the same semantic differential scales created by Osgood and colleagues (i.e., evaluation, activity, and potency, respectively) that were used in a number of early studies designed to elicit the semantic content of grammatical gender.

speakers) (Fairfield et al., 2017; Montefinese et al., 2014b). We expect the coding of the grammatical gender to be not necessary to provide judgments about word affective features. Therefore, in line with a weak view of the linguistic relativity theory, we predict to find evidence favoring the null hypothesis of no within-language grammatical gender effects or interactions with participants' language, sex and age.

Methods

We used German and Italian affective norms developed from translations of English words taken from the Affective Norms for English Words (ANEW ; Bradley & Lang, 1999), on which ratings for three affective dimensions have been provided: 1) valence, the way an individual judges a stimulus; 2) arousal, the degree of activation an individual feels towards a stimulus; and 3) dominance, the degree of control an individual feels over a given stimulus.

In particular, we derived valence, arousal, and dominance ratings for 1003 German words from the German affective norms by Schmidtke and colleagues (2014) and for 1121 Italian words from the Italian adaptations of the ANEW (Fairfield et al., 2017; Montefinese et al., 2014b) obtained from younger (mean age: 22.27 years) and older (mean age: 69.36 years) adults, which also included 87 words derived from Italian semantic norms (Montefinese, Ambrosini, Fairfield, & Mammarella, 2013). We also extracted affective ratings separated by raters' sex gathered from the Italian younger adults (Montefinese et al., 2014b). Valence ratings for German words were converted to the 9-point scale used in both the original ANEW and its Italian adaptation.

We then coded the grammatical gender of the words composing the German and Italian ANEW adaptations. For both languages, we excluded words that do not have a grammatical gender (like verbs and some adjectives), those that are the same in the

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different forms (like the Italian word *folle,* which can be either feminine or masculine), and those whose translation from English has both masculine and feminine forms (like the Italian and German translations of *fiancé*, *il fidanzato*/*la fidanzata* and *die Verlobte*/*der Verlober*, respectively). For German, we also excluded words that are used as plural nouns only (e.g., *die Ferien*), while the grammatical gender of the single form was used for the other plural words. The materials and data we used are available from our project repository on the Open Science Framework (osf.io/pqaxk).

We tested one- and two-sided hypotheses, respectively, for the within-language effects and for their language-, age-, and sex-dependent modulations. We employed a Bayesian approach to hypothesis testing by computing the Bayes Factor (BF). We made this choice mainly because of the ability of Bayesian inference, as opposed to classical one, to quantify evidence in favour of the null hypothesis (see Wagenmakers et al., 2017, for a detailed discussion). We will report the BF indicating the amount of evidence that the data provide for the null hypothesis versus the alternative one. We also performed frequentist equivalence testing based on independent-sample Welch's *t*-tests which does not assume equal variances. This approach allows to "statistically reject the presence of effects large enough to be considered worthwhile" (i.e., the smallest effect size of interest: SESOI; Lakens, 2017). Both the scale factor for the Bayesian prior and the standardized SESOI were conservatively set at .29. For a detailed explanation of this choice, a complete description of the data analyses, and additional analyses controlling for the robustness of the results, see supplementary materials available from our project repository on the Open Science Framework (osf.io/pqaxk).

Results

German affective norms for younger participants

There were 273 feminine (F) and 251 masculine (M) words in the German sample. Table 1 reports the descriptive statistics for the affective ratings. The analyses supported the conclusions that no feminine-related (positive) difference existed for the valence and no substantial masculine-related (negative) differences existed for the arousal and dominance. Indeed, as can be seen in Table 2, the M-F differences were all close to 0 and non-significant, the BFs indicated stronger support for the null model, and the equivalence tests were all significant, indicating that the observed effects were smaller than the SESOI (i.e., they were not substantial).

=== Table 1 near here ===

=== Table 2 near here ===

Italian affective norms for younger participants and sex-dependent comparison

There were 343 feminine and 405 masculine words in the Italian sample derived from the Italian ANEW adaptation (Montefinese et al., 2014). Table 1 reports the descriptive statistics for the affective ratings. Again, the analyses supported the conclusions that no substantial feminine-related (positive) difference existed for the valence and no substantial masculine-related (negative) difference existed for the arousal and dominance (Table 2).

We then investigated whether the raters' sex modulated the pattern of grammatical gender-dependent differences in affective ratings. To this aim, we computed the female-male sex difference in affective ratings and submitted these

differential measures to feminine vs. masculine independent-sample t-tests[4]. This analysis supported the conclusion that there was not a substantial effect of raters' sex in modulating the grammatical gender effect (Table 2).

Comparison between German and Italian samples of younger participants

First, we selected the words that had the same grammatical gender in both languages. This resulted in the inclusion of 179 feminine and 157 masculine words. Then, to assess cross-cultural effects modulating the pattern of grammatical gender-dependent differences in affective ratings, we computed the German-Italian differences in affective ratings (collapsed across raters' sex) and submitted them to feminine vs. masculine independent-sample t-tests (see Footnote 4).

This analysis supported the conclusion that the raters' language did not modulate the grammatical gender effect for arousal and dominance (Table 2). By contrast, there was a significant interaction between raters' language and the grammatical gender of the words for the valence (Table 2). Importantly, however, this interaction indicates that the F-M difference was significantly more negative for German (-.349, $_{95\%}CI = [-.755$ .057]) as compared to Italian (-.084, $_{95\%}CI = [-.508 .340]$), but both were non-significant and opposite in sign to that expected. Thus, this result confirmed those described in previous sub-sections, indicating the absence of a reliable positive F-M difference in valence ratings for both languages.

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[4] Note that performing these independent-sample t-tests contrasting female–male differential ratings between F and M words is mathematically equivalent to testing for a between-within interaction effect in a mixed-design ANOVA with raters' sex (female vs. male) as a within-items factor and the grammatical gender of the words (F vs. M) as a between-items factor.

Italian affective norms for older adults and age-dependent comparison

Table 1 reports the descriptive statistics for the affective ratings derived from the Italian ANEW adaptation for older adults (Fairfield et al., 2017). Again, the analyses on affective ratings supported the conclusions that no substantial feminine-related (positive) difference existed for the valence and no substantial masculine-related (negative) difference existed for the arousal and dominance (Table 2).

We then investigated whether the raters' age modulated the pattern of differences in affective ratings between feminine and masculine words. We thus computed the younger-older differences in affective ratings and submitted them to feminine vs. masculine independent-sample *t*-tests (see Footnote 8). This analysis supported the conclusion that there was not a substantial effect of the raters' age in modulating the grammatical gender effect for the valence and arousal ratings, but the analysis on dominance ratings provided inconclusive evidence (Table 2). It is thus not possible to draw convincing conclusions about this latter effect, which should be taken with caution (see supplementary materials).

Control analyses

Additional analyses controlling for the effect of lexical-semantic confounding variables confirmed the overall pattern of results (see supplementary materials).

Discussion

Our analyses provided convincing evidence for the absence of grammatical gender effects on judgments of word affective features: feminine and masculine words in German and Italian affective norms received the same ratings on different affective dimensions. Moreover, this invariance in affective meaning between feminine and

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masculine words was not modulated by either cross-language or age- and sex-dependent characteristics of the raters. These results thus question any strong version of the linguistic relativity theory, according to which the grammatical gender of words should affect the rating of their affective properties. Rather, our results find their place in a more dynamic view of the linguistic relativity theory, which proposes that language properties, such as grammatical gender, may influence cognition in tasks involving a deep encoding of lexical properties of words (Vigliocco et al., 2005). For example, a grammatical gender preservation has been found in semantic substitution error tasks only when speakers produce phrases with gender-marked determiners (Vigliocco, Vinson, Indefrey, Levelt, & Hellwig, 2004). In line with that study, an effect of other language-specific properties have been found only when tasks engaged a verbal encoding (Brysbaert, Fias, & Noël, 1998).

Thus, our finding of no grammatical gender effects on affective features of semantic representations may be explained by the fact that, in our case, the rating of affective properties of concepts did not strongly rely on an explicit encoding of the word lexical properties and the lexico-syntactic coding was not even furthered by the presence of determiners. More importantly, our results can be framed within theoretical approaches to the meaning, which distinguish between (lexico-)semantic representation and conceptual representation (Vigliocco, Vinson, Lewis, & Garrett, 2004). For example, in the Featural and Unitary Semantic Space (FUSS) model, while conceptual representations are characterized by semantic features (like sex-related, sensorial, affective, motor ones and so forth) (Montefinese, Ambrosini, Fairfield, & Mammarella, 2014a; Montefinese, Zannino, & Ambrosini, 2015; Vigliocco et al., 2004), semantic representations interface with both conceptual and lexico-syntactic representations and, consequently, bind semantic features to lexico-syntactic information (like the

grammatical gender). In other words, semantic representations communicate with both conceptual and lexico-syntactic ones and contain both kinds of information. In this scenario, an effect of grammatical gender on semantic representations is expected when the mapping between genders of words and the male- or female-like properties of their referents is consistent. For example, Vigliocco and colleagues (2005) found a grammatical gender-dependent effect only for words describing animals but not for man-made objects in Italian speakers while in German speakers ones, no effect was found. Indeed, the authors pointed out that the effects of grammatical gender should be greater for languages with only two genders (like Italian) compared to languages with more than two genders (like German), in which the mapping between grammatical gender and biological sex is less transparent. Consequently, the lack of gender-dependent effects in German speakers was predictable in the current study. However, we did not observe a grammatical gender effect also in Italian speakers. This pattern of results could be due to the relative predominance, in our sample of Italian words, of abstract concepts and concrete ones not referring to biological entities. Indeed, only a very small portion of words used here belonged to the human beings category and had a clear correspondence between sex of the biological referent and grammatical gender of the word label.

Unexpectedly, however, we observed a significant interaction between grammatical gender and language on the valence ratings, which revealed a rather surprising pattern of data. Indeed, this result indicates that the F-M difference (which should have been positive in sign based on the assumed positive association between femaleness and the evaluation/valence dimension, see Introduction), had negative sign in both languages and was significantly more negative for German as compared to Italian. We thus do not have a reasonable explanation for this interaction. Rather, we

underline that the feminine vs. masculine comparisons for both German and Italian samples confirmed the stable and reliable result found in this study: the absence of any of the grammatical gender effects that were hypothesized to exist in the literature based on a strong view of linguistic relativity theory.

To conclude, this study revealed no reliable effect of Italian and German grammatical gender within- and across-languages as well as no reliable interactions with speakers' age- and sex-dependent characteristics, suggesting that grammatical gender does not influence the judgment of word affective features in Italian and German speakers. However, the grammatical gender invariance we found here does not necessarily exclude that other language-specific lexico-syntactic properties could influence the organization of semantic representation. In our opinion, a more moderate view of linguistic relativity theory, assuming that some language-specific characteristics may affect thought under some specific circumstances, may explain better the dynamic link between language and cognition.

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Table 1. Descriptive statistics for the affective ratings in the different samples used in the study.

	Valence		Arousal		Dominance	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*
German						
Feminine	5.092	2.010	5.097	1.305	5.109	0.913
Masculine	5.198	1.872	5.103	1.267	5.149	0.874
Italian, young raters						
Feminine	5.364	2.026	5.556	0.925	5.306	0.998
Masculine	5.397	1.874	5.522	0.947	5.238	0.878
Italian, female young raters						
Feminine	5.351	2.124	5.717	0.959	5.234	1.078
Masculine	5.356	1.969	5.673	0.965	5.176	0.937
Italian, male young raters						
Feminine	5.398	1.891	5.186	1.077	5.475	0.995
Masculine	5.487	1.756	5.170	1.107	5.386	0.928
Italian, older raters						
Feminine	5.217	2.069	5.047	1.528	5.215	1.017
Masculine	5.307	1.941	4.981	1.535	5.268	0.981

Table 2. Results of the frequentist and Bayesian analyses.

	H1	F-M difference		Welch's *t*-test			BF$_{10}$	Equivalence test	
		Mean	$_{95\%}$CI	*DoF*	*T*	*p*		*t*	*p*
German									
Valence	F > M	-0.106	[-.439 .227]	521.91	-0.625	.734	6.742	-3.946	< .001
Arousal	M > F	-0.006	[-.227 .215]	520.44	-0.055	.478	4.303	3.263	< .001
Dominance	M > F	-0.040	[-.194 .113]	521.13	-0.516	.303	2.920	2.804	< .001
Italian									
Valence	F > M	-0.033	[-.315 .250]	704.23	-0.226	.589	6.173	-4.166	< .001
Arousal	M > F	0.035	[-.100 .169]	730.91	0.504	.693	7.378	4.460	< .001
Dominance	M > F	0.067	[-.069 .204]	687.35	0.970	.834	9.367	4.902	< .001
Italian, female - male (sex)									
Valence	F ≠ M	0.083	[-.022 .189]	722.13	1.556	.120	1.747	-2.393	.009
Arousal	F ≠ M	0.028	[-.084 .140]	714.29	0.483	.629	4.712	-3.462	< .001
Dominance	F ≠ M	-0.030	[-.132 .072]	705.87	-0.586	.558	4.479	3.354	< .001
German – Italian									
Valence	F ≠ M	-0.265	[-.435 -.095]	333.48	-3.071	.002	0.072	-0.411	.659
Arousal	F ≠ M	0.049	[-.145 .244]	333.89	0.500	.617	3.353	-2.162	.016
Dominance	F ≠ M	-0.085	[-.252 .081]	333.49	-1.006	.315	2.455	1.654	.050
Italian, older raters									
Valence	F > M	-0.091	[-.381 .199]	708.51	-0.615	.731	7.907	-4.557	< .001
Arousal	M > F	0.066	[-.155 .286]	726.87	0.584	.720	7.749	4.537	< .001
Dominance	M > F	-0.053	[-.197 .092]	716.61	-0.715	.237	2.763	3.231	< .001
Italian, younger – older									
Valence	F ≠ M	0.058	[-.049 .166]	713.96	1.067	.286	3.122	-2.878	.002
Arousal	F ≠ M	-0.031	[-.204 .142]	714.72	-0.353	.724	4.950	3.592	< .001
Dominance	F ≠ M	0.120	[.020 .220]	692.03	2.353	.019	0.405	-1.580	.057

Notes: H1, alternative hypothesis; $_{95\%}$CI, 95% confidence interval; *DoF*, degrees of freedom; BF$_{01}$, Bayes factor favoring the null hypothesis.

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