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FEATURE ARTICLE

The Role of Orthographic Gender in Cognition

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EDITOR'S NOTE

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THE ROLE OF ORTHOGRAPHIC GENDER IN COGNITION

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Abstract

Although grammatical gender category assignment is arbitrary with respect to the semantics of gender, speakers of languages with grammatical gender conceive of non-gendered objects as having gendered characteristics consistent with the grammatical gender category to which they belong, a phenomenon we call conceptual spread. To extend these findings, we ask if orthographic gender – gender information present in the written, but not the spoken form of a language – also leads to conceptual spread. In Experiment 1, monolingual speakers of Chinese, a language that contains orthographic gender, and monolingual speakers of English, a language that does not contain orthographic gender, were asked to rate nouns on a scale assessing masculinity/femininity. Results show no evidence of conceptual spread related to orthographic gender. To rule out methodological concerns, in Experiment 2 we asked monolingual speakers of German, a language with grammatical gender, to complete the same task as in Experiment 1. The expected effect of grammatical gender category membership and conceptual spread was found for the German speakers. This suggests that grammatical gender, unlike orthographic gender, leads to conceptual spread. We discuss various differences between grammatical gender and orthographic gender that may lead to these results.

Introduction

Grammatical gender of the kind present in Indo-European languages is, for the most part, arbitrary with respect to semantics, evidenced by the fact that all nouns are assigned to a grammatical gender category, including inanimate objects that are inherently non-gendered.¹ Despite this, speakers of languages with grammatical gender conceive of inanimate objects as being gendered. In particular, speakers seem to view inanimates as having gendered characteristics that are consistent with the grammatical gender category they are members of. The features associated with inherently gendered objects seem to extend to non-gendered objects, a process we call conceptual spread. For example,

when speakers of Spanish were asked to assign either a male or female voice to inanimate objects, such as ice cream, they consistently chose the voice that matched the grammatical gender category of the inanimate object (Sera, Berge, & del Castillo, 1994).

In the present paper we examine whether orthographic gender – gender information present in the written, but not the spoken, form of a language – can also lead to conceptual spread. In particular, we investigate whether gendered radicals present in Chinese characters for non-gendered objects can lead Chinese speakers to view these objects as gendered. If so, orthographic elements may function in similar ways as syntactic elements.

Grammatical Gender

From a linguistic standpoint, gender can be divided into semantic and grammatical gender. Semantic gender, or sex, is a natural property of some referents, whereas grammatical gender is an abstract syntactic property of a language (Comrie, 1999; Corbett, 1991). All nouns in languages with grammatical gender must be assigned to a

¹ The present discussion refers to gender systems that contain two or three genders, of which at least one is masculine or feminine. In such systems semantics can be related to gender classification, however for non-gendered objects, the topic of the present paper, the relationship between class and semantics is often quite complicated, and, importantly, not related to natural gender (see, e.g., Zubin & Köpcke, 1981).

grammatical gender category, and this is generally accomplished by two main principles involving semantic and/or formal properties of the noun (Corbett, 1991). When assignment is accomplished according to semantics, nouns are assigned to a grammatical gender category based on their meaning (Comrie, 1999). Thus, nouns that have a natural gender tend to be members of the matching grammatical gender category (e.g., woman is assigned to the “feminine” grammatical gender category).² Most real-world objects do not have a natural gender and therefore cannot be assigned to a grammatical gender on this basis. Instead, they are assigned to a grammatical gender category based on their form (Comrie, 1999; Grosjean, Dommergues, Cornu, Guillemon, & Besson, 1994). In particular, the phonology and/or morphology of a word influences grammatical gender category assignment; for example, in Spanish most nouns ending in a are feminine and most nouns ending in o are masculine (Corbett, 1991).³ Thus, across languages, nouns with the same meaning can be assigned to different gender categories. For example, the word rain, which does not possess a natural gender, is feminine in Spanish (*la lluvia*) but masculine in German (*der Regen*).

Despite the fact that grammatical gender category assignment is arbitrary with respect to the semantics of gender, speakers of languages with grammatical gender conceive of inanimate objects as having gendered characteristics consistent with the grammatical gender category to which the inanimate object belongs (Boroditsky, Schmidt, & Phillips, 2003; Jakobson, 1966; Konishi, 1993; Sera, et al., 1994). For example, when Russian speakers were asked to personify the days of the week, the masculine days (Monday, Tuesday, Thursday) were personified as males, whereas the feminine days (Wednesday, Friday, Saturday) were personified as females (reported in Jakobson, 1966). In another study, Spanish and German speakers were asked to rate a set of inanimate objects for potency, an attribute strongly associated with masculinity

(Konishi, 1993). Importantly, the test items were selected such that the grammatical gender category was mismatched across languages (i.e., grammatically feminine words in Spanish were masculine in German and vice versa). Konishi found that both Spanish and German speakers rated the nouns that were grammatically masculine in their native language as more potent than the nouns that were grammatically feminine. This suggests that the semantic features associated with inherently gendered objects appear to spread out and become associated with the non-gendered inanimate objects in the same category. But are these effects only possible for grammatical gender, a syntactic category, or can this type of association also occur in other language systems that contain a different type of gender information?

Orthographic Gender

Approximately 96% of Chinese characters are composed of at least two parts: (1) the radical, which generally carries cues as to the meaning of the word, and (2) the stem, which generally carries cues as to the sound/pronunciation of the word (Dictionary of Chinese Character Information, 1988; Flores d’Arcais, 1992; Li, 1977; Wang, 1997). Most radicals are derived from early ideographs, simplified and static drawings that were designed to directly represent specific objects (Cheng, 1992; DeFrancis, 1984; Wang, 1997). While many of these radicals are derived from non-gendered words (e.g., 木 mu4, tree, and 水 shui3, water), some are derived from words that explicitly refer to gendered nouns (e.g., 女 nu3, woman), or words that are stereotypically associated with one gender (e.g., 力 li4, strength; male). These gendered radicals are present in words that are consistent with the gender of the radical such as 妈妈 (ma1ma1, mother), but they can also occur in the characters for inanimate, non-gendered objects such as 茄子 (qie2zi1, eggplant). In this way, gender information is present in the written form of the language but not in the spoken form. Evidence shows that Chinese characters are not processed holistically; rather, there is independent activation of the component parts (Fang & Wu, 1989; Lai & Huang, 1988; Taft & Zhu, 1997). Although radicals contribute to the overall meaning of the character, their individual, original meanings are also activated (Peng, Zhang, & Liu, 1993). A radical can therefore prime the meaning not only of the whole character in which it appears, but also its own, individual

² There are notable (and famous; Twain, 1880) exceptions, such as in German where *das Mädchen* (the girl) is assigned to the neuter gender category. Such cases of natural and grammatical gender category mismatch are the exception, however, not the norm.

³ Sometimes there is an interplay between semantic and formal principles that can be quite complex, as in German, where smaller clusters of class/category membership also dictate grammatical gender category assignment (Mills, 1986; Zubin & Köpcke, 1981). However, the semantics involved are not the semantics of natural gender.

meaning, even when the individual meaning is unrelated to the meaning of the whole character (Flores d'Arcais, 1992). As in other languages, phonological factors also affect semantic activation and interact with character form, but the influence of orthography (or character) is quite strong (Zhou & Marlsen-Wilson, 1999). A gendered radical could therefore prime gendered semantic information, even when gender is irrelevant or unrelated to the overall meaning of the character. Here we ask whether orthographic gender can lead to conceptual spread, and if this causes speakers (who are also competent readers) to attribute gendered characteristics to non-gendered objects.

EXPERIMENT 1

In order to investigate whether orthographic gender affects speakers' conceptions of non-gendered objects, we asked monolingual Chinese and English speakers to rate a set of nouns as either masculine or feminine. Nouns either contained a feminine radical, a masculine radical, or a neutral (i.e., non-gendered) radical. If orthographic gender also leads to conceptual spread, speakers of Chinese should rate the nouns in line with the gender expressed in the orthography, while speakers of English should not.

The task we used is different from those typically employed in studies of conceptual spread. Previous studies have used tasks that tap into speakers' conceptions in an indirect fashion, such as selecting voices for an object (Sera et al., 1994), generating descriptive adjectives (Boroditsky et al., 2003), or assessing potency (Konishi, 1993). These tasks were used to avoid having speakers base their decisions directly on grammatical gender, and thereby forcing them to rely on their abstract concepts of the objects at test (Boroditsky, 2001). A direct rating method is less problematic for orthographic gender, as nouns are not overtly classified as masculine or feminine, and so Chinese speakers must rely on their concepts of the nouns themselves rather than any overtly learned classification system. In addition, indirect measures may be less effective at detecting weaker effects. Given the exploratory nature of this research, we had no prior expectations regarding the strength of conceptual spread due to orthographic gender. Thus, we selected a more direct measure in which we asked participants to rate each noun as masculine or feminine on a scale from 1-7. This method therefore has the advantage of being more sensitive than indirect methods, while still requiring participants to rely on their abstract concepts of nouns in order to rate them.

Methods

Participants

Twenty-four (12 female, 12 male; mean age 21.25) monolingual Chinese undergraduates from Beijing University, Beijing, People's Republic of China participated in this study. They received no compensation for their participation. An additional group of 24 (19 female, 5 male; mean age 20.63) monolingual English undergraduates from the University of California, Berkeley participated for research participation credit.

Stimuli

Chinese stimuli. Chinese stimuli were selected to fit into one of three categories: nouns containing a masculine radical (力 li4, strength), a feminine radical (女 nu3, woman), or a neutral radical (e.g., 水 shui3, water). The Concise English-Chinese Chinese-English Dictionary (Cowie, Evison, Wang, Wu, & Yin, 1986) containing approximately 20,000 Chinese entries was searched and every noun with a gendered radical was noted. Selected nouns were checked for frequency using the Modern Chinese Frequency Dictionary (Xiandai hanyu pinlu cidian, 1986), until 6 nouns for each gendered category (masculine, feminine) with matching frequencies were found. (The frequencies ranged from 230-5,500 words/million.) These were the test items.

A separate task was used to select the filler nouns. Here, 50 nouns containing non-gendered radicals were rated by four native Chinese speakers (3 female, 1 male) on a scale from 1 to 7, where 1 corresponded to *masculine* and 7 corresponded to *feminine*. Nouns whose average rating fell between 3.5 and 5.5 were then checked for frequency again using the Modern Chinese Frequency Dictionary (*Xiandai hanyu pinlu cidian*, 1986). Twelve nouns with frequencies falling in the same range as the nouns containing gendered radicals were selected as fillers. Fillers were included to make the purpose of the experiment less obvious to participants.

English stimuli. English stimuli were the translation equivalents of the Chinese stimuli. Initial translations were made by TB, a highly proficient speaker of Chinese, and acceptability was checked through the process of back-translation (Brislin, 1970) by a native speaker of Chinese. See the appendix for all stimuli.

Materials

Questionnaires were compiled with all 24 nouns (6 masculine radical, 6 feminine radical, 12 fillers) in one of four predetermined orders so that no more than two nouns of the same type appeared in a row. Only one noun appeared per page. Below the character (Chinese) or word (English) was a rating scale from 1 to 7, with 1 corresponding to *masculine* and 7 corresponding to *feminine*.

Procedure

The study took place in a quiet room with one to six participants. After signing a consent form, participants were asked to rate the nouns. They were told that there were no right or wrong answers and to give their best response for all items. Upon completion, all participants were debriefed and thanked for their participation. For the Chinese group, a native Chinese speaker gave all instructions, and all written material was presented in Chinese. For the English participants, a native English speaker gave all instructions, and all written material was presented in English.

Results

Average ratings for the nouns containing a masculine or feminine radical were calculated for each participant. Mean ratings by the Chinese and English participants are shown in Figure 1. Here and in all other figures error bars represent standard error.

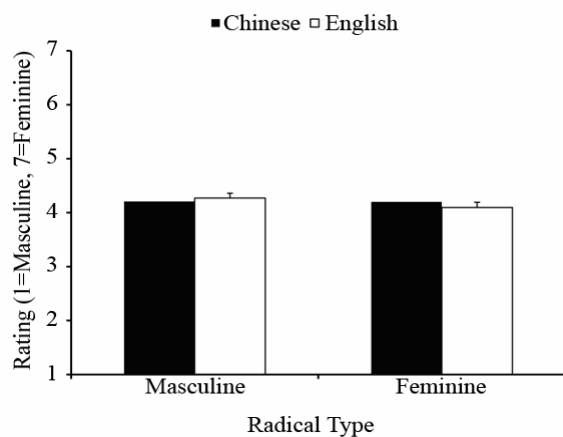


Figure 1. Mean ratings by radical type by Chinese and English speakers.

Data were examined by an ANOVA with language (Chinese, English) as a between-subjects variable and orthographic gender (masculine, feminine) as a within-subjects variable. As is clear from the figure, orthographic gender had no effect on participants' ratings of non-gendered objects, regardless of whether the language contained orthographic gender or not. There were no significant main effects for language ($F_{(1,46)} = .04, p = .840$) or orthographic gender ($F_{(1,46)} = .41, p = .524$). There was also no significant interaction between the two factors ($F_{(1,46)} = .35, p = .557$).

Discussion

The data show that orthographic gender does not lead to conceptual spread. Ratings given by participants did not differ according to orthographic gender category. While this outcome was expected for speakers of English, a language without orthographic gender, this was not expected for speakers of Chinese, a language with orthographic gender. Thus we found no evidence for conceptual spread effected by orthographic gender.

EXPERIMENT 2

Because our task is quite different from those typically used, the lack of findings in Experiment 1 could be a result of our methodology. In order to rule out this possibility, we conducted a second experiment with speakers of a language that contains grammatical gender – German. We asked monolingual German speakers to rate the same set of nouns and examined whether their ratings differed according to the grammatical gender of the noun, and compared their ratings to those given by the English speakers from Experiment 1. If the task was the problem in Experiment 1, then we should not expect ratings to correspond with grammatical gender. If our task taps into the same conceptual processes as the other less direct tasks, then we would expect ratings given by the German speakers to correspond with German grammatical gender categories.

Methods

Participants

Twenty-four monolingual German undergraduates at the Universität Heidelberg, Federal Republic of Germany participated in this study (9 female, 15 male; mean age 19.33). They received no compensation for their participation.

Stimuli

The stimuli in Experiment 2 are identical to those in Experiment 1, except that they were in German. (Translations were made by TB, a native speaker of German.) In German, cues to grammatical gender category are carried on the article, not the noun itself, when it is in the nominative case. All stimuli were presented without the article and in the nominative case; thus no overt cues to grammatical gender were provided by the stimuli themselves. Because the stimuli were not selected based on their German categories, but rather were translations of the previously used Chinese items, the nouns did not form equal categories. Nine items were masculine, eight were feminine, and seven were neuter. The English-speakers' ratings from Experiment 1 were divided according to the German classification. That is, ratings for the English words whose translational equivalents were classified as masculine in German were compared to the German-speakers' ratings for masculine words, similarly for the feminine and neuter words. See the appendix for all stimuli.

Materials and Procedure

The materials and procedure were identical to those in Experiment 1, except that all instructions and testing material were given in German. A native speaker of German administered all tasks.

Results

Average ratings for the masculine, neuter, and feminine nouns were calculated for each participant. Neutral items were not included in Experiment 1, since there was no consistent classifier in these nouns. However, *neuter* items are included in Experiment 2 because neuter is a consistent and a potentially meaningful class to speakers of languages with grammatical gender (Zubin & Köpcke, 1981). This departs from previous work on conceptual spread in languages with three genders, which has typically focused only on masculine and feminine gender categories. Mean ratings for the three categories by the German and English participants are shown in Figure 2.

Data were examined by an ANOVA with language (German, English) as a between-subjects variable and grammatical gender (masculine, neuter, feminine) as a within-subjects variable. The main effect for language was not significant ($F_{(1,46)} = .79, p = .379$).

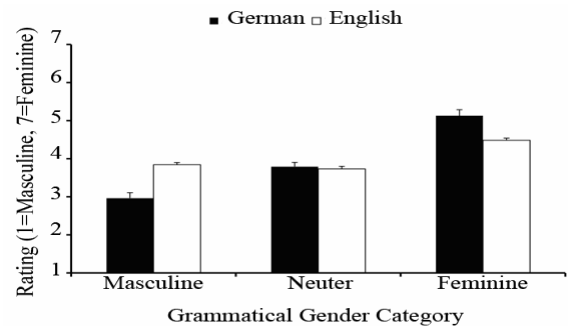


Figure 2. Mean ratings by grammatical gender category by German and English speakers.

The main effect for grammatical gender was significant ($F_{(2,92)} = 73.16, p < .001$), as was the interaction between language and grammatical gender ($F_{(2,92)} = 20.34, p < .001$). When the ratings are examined for the two language groups individually, the effect of grammatical gender is significant for both the German ($F_{(2,46)} = 47.20, p < .001$) and English speakers ($F_{(2,46)} = 43.75, p < .001$). Although grammatical gender assignment is significant for both groups, the two groups show very different patterns of responses. In particular, the significant effect of grammatical gender for the English speakers seems to stem from the fact that the feminine items were rated as more feminine than both the masculine ($t_{(23)} = 7.99, p < .0001$) and neuter ($t_{(23)} = 7.68, p < .0001$) items. These ratings are likely due to the specific nouns selected, not because German grammatical gender categories are meaningful for English speakers as their ratings for masculine and neuter items did not differ ($t_{(23)} = 1.36, p < .187$). In contrast, the German speakers rate the items according to their grammatical gender category: masculine items are rated as more masculine, feminine items are rated as more feminine, and neuter items are rated as neutral. A linear contrast confirmed that the difference between the German and English speakers was significant ($F_{(1,46)} = 16.97, p < .001$), indicating that the predicted linear relationship was a better fit for the German than for the English speakers.

Discussion

The results from Experiment 2 indicate that our task appears to tap into the same conceptual processes as the more commonly used indirect tasks. The lack of support for our original hypothesis that orthographic gender might lead to conceptual spread is therefore

unlikely due to methodological differences between previous studies and our own. In Experiment 2, German, but not English speakers, rated items according to their grammatical gender category. Test items that are grammatically masculine in German were rated as more masculine, items that are grammatically feminine were rated as more feminine, and finally neuter items were rated as more neutral. This last result is especially interesting, as the relationship of neuter items and conceptual spread has never been shown before, to our knowledge.

General Discussion

The present work set out to extend our knowledge of conceptual spread and gender by investigating whether orthographic gender – gender information present in the written, but not the spoken form of the language – would lead to similar effects as those which have been found with grammatical gender. In particular, we asked whether orthographic gender would lead speakers to view inherently non-gendered objects as gendered, in accordance with the gendered radical contained in the character. The overall findings show that orthographic gender does not lead to conceptual spread, whereas grammatical gender does. Specifically, speakers of Chinese, a language with orthographic gender, do not show an influence of orthographic gender in their ratings, much like speakers of English, a language without orthographic gender.

Importantly, the findings from Experiment 1 were not caused by our methodology. Studies on conceptual spread generally use indirect measures to tap into speakers’ conceptions of items, however, the task used here was a direct rating measure. This task was chosen because we anticipated that, if present, the conceptual spread due to orthographic gender might be quite small, and therefore that an indirect task might miss the effects. However, when this same task was utilized with speakers of a language with grammatical gender (German), conceptual spread was found – speakers rated items according to their grammatical gender. This control confirms that direct measures can be used to measure conceptual spread with grammatical gender.

Another important finding from the present study is the extension of the conceptual spread findings to neuter gender. Prior studies on grammatical gender and cognition have generally focused on two genders, even in languages with a three-gender system, such as German. Thus, previous studies have

not shown that speakers conceive of neuter items as being neutral with respect to conceptual gender.

Individual Item Ratings

The German speakers’ ratings showed that our methodology can capture differences in how speakers conceive of the ‘genderedness’ of objects. Although orthographic category membership was not predictive of ratings in Experiment 1, based on the findings from Experiment 2, we re-examined the ratings from Experiment 1. In particular, we examined the ratings given to individual items, and compared these for the Chinese and English speakers. Was it the case that in languages without grammatical gender all of the non-gendered objects were rated as equally neutral, or would we see differences in how individual objects are viewed, and would these ratings be culturally dependant?

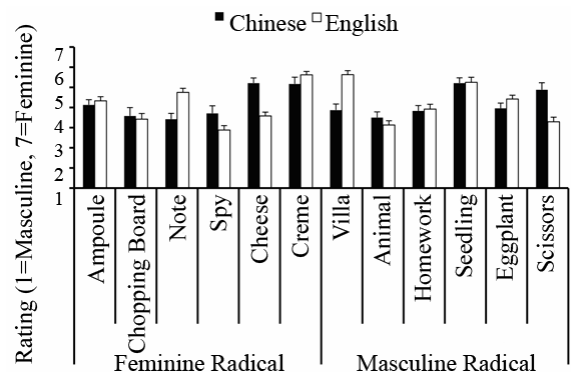


Figure 3. Mean ratings for individual items by Chinese and English speakers.

Figure 3 shows ratings for each of the test items for Chinese and English speakers. There was no significant main effect for language ($F_{(1,46)} = .04, p = .840$), however, there was a significant main effect for test items ($F_{(11,506)} = 12.84, p < .001$). This reflects the fact that both Chinese and English speakers consistently rated some items as more feminine or masculine. For example, *animal* (orthographically masculine) and *chopping board* (orthographically feminine) were both rated as more masculine, whereas *cream* (orthographically feminine) and *seedling* (orthographically masculine)

were both rated as more feminine. However, there was also a significant interaction between test item and language ($F_{(11,506)} = 7.17, p < .001$), reflecting the fact the Chinese and English speakers rated some items quite differently. For example, *note* (orthographically feminine) is rated more masculine by Chinese than English speakers, whereas *scissors* (orthographically masculine) is rated as more feminine by Chinese than English speakers.

Thus, we did find evidence for systematic variation in ratings given to different non-gendered objects. These ratings appear to reflect aspects of the objects themselves. However, sometimes ratings differed between the Chinese and English speakers. These ratings are, we assume, likely due to different culturally-based experiences, either with the objects themselves, or in terms of how the objects are typically employed or used by males and females. Due to the small and varied nature of the stimuli, it is not possible to precisely state how culturally-based experiences (or what aspects thereof) affected these rating differences. As pointed out by one reviewer, it may be the case that Chinese speakers typically focus more on who uses an object, while English speakers typically focus more on what material an object is typically made of. It has been shown that Chinese children use relational-contextual information when grouping objects, whereas American children group the same objects on the basis of isolable properties (Chiu, 1972). It is not clear to what extent this holds for adult speakers of Chinese and English, and whether this also affects the categorization (and rating) of abstract nouns, however, it is an intriguing possibility. Further research would be needed to evaluate this possibility. The main point, however, is that seeing non-gendered objects as gendered is not only possible for speakers of languages with grammatical gender.

Is grammatical gender special?

Radicals have been shown to produce semantic priming (Flores d'Arcais, 1992), a possible mechanism for conceptual spread, and so the notion that orthographic gender could lead to similar effects as grammatical gender is not, on its face, implausible. Why, then, might grammatical gender have such robust effects on speakers' concepts of non-gendered items, when orthographic gender does not?

There are several general differences between orthographic and grammatical gender that could potentially lead to the findings of the present study. First, orthographic gender is learned relatively late (with writing) as compared to grammatical gender,

which is present in the earliest input a child receives. Thus, it is possible that conceptual effects of language occur in early learning, and that orthographic gender is simply presented too late to have any effect on concepts. Certainly, there is evidence that language categories affect concepts quite early in life (Bowerman & Choi, 2001). Another difference is the fact that orthographic gender is not very pervasive – only a small set of nouns contain orthographic gender – whereas grammatical gender is quite pervasive – every noun has a grammatical gender. Related, grammatical gender forms categories in a language. All nouns in each gender category share properties, such as particular phonemes. Moreover, category membership has syntactic and morphological correlates, to the point of there being consequences for grammatical gender category membership. Orthographic gender, in contrast, is not a category in the same way. Items with the same radical tend not to behave in any consistent and shared fashion.

We believe that category structure is the difference between grammatical and orthographic gender most likely responsible for the findings of Experiments 1 and 2. Category structure might be the crucial variable that leads to conceptual spread: conceptual spread occurs within a semantic network created by the linguistic category. This is similar to arguments by Boroditsky et al. (2003), and in fact, Boroditsky's work on conceptual spread is situated within work on categories in human cognition more generally. With respect to orthographic gender then, since it has no attendant category structure, conceptual spread will not occur. This raises the question of whether other syntactic categories can also lead to conceptual spread.⁴ If category structure by itself is driving conceptual spread, then we should expect to see it wherever linguistic categories exist. If, however, a particular type of conceptual structure is required, then we might only expect it is some linguistic structures, and not others. A remaining possibility is that grammatical gender is just special, and conceptual spread is a quirky by-product of this specific category. We think the latter is unlikely, and are exploring these questions in ongoing work.

⁴ To this point we have been using the term conceptual spread only in discussions of gender. However, we intend the term to be more general, referring to instances of semantic features spreading more generally.

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Appendix

List of Stimuli Used

| Radical Type | Language Group | | |
|--------------|----------------|----------------|------------------|
| | Chinese | English | German |
| Feminine | 安瓿 (anbu) | ampoule | Ampulle (f) |
| | 案板 (anban) | chopping board | Schneidbrett (n) |
| | 按语 (anyu) | note | Notiz (f) |
| | 奸细 (jianxi) | spy | Spion (m) |
| | 奶酪 (nailao) | cheese | Käse (m) |
| | 奶油 (naiyou) | cream | Crème(f) |
| Masuline | 别墅 (bieshu) | villa | Villa (f) |
| | 动物 (dongwu) | animal | Tier (n) |
| | 功课 (gongke) | homework | Hausaufgabe (f) |
| | 幼苗 (youniao) | seedling | Keimling (m) |
| | 茄子 (qiezi) | eggplant | Aubergine (f) |
| | 剪刀 (jiandao) | scissors | Schere (f) |
| Neutral | 小山 (xiaoshan) | hill | Hügel (m) |
| | 毛刷 (maoshua) | paintbrush | Pinsel (m) |
| | 窗口 (chuangkou) | window | Fenster (n) |
| | 绷带 (bengdai) | bandaid | Pflaster (n) |
| | 钱包 (qianbao) | wallet | Geldbeutel (m) |
| | 词典 (cidian) | dictionary | Wörterbuch (n) |
| | 画像 (huaxiang) | picture | Bild (n) |
| | 眼镜 (yanjing) | eyeglasses | Brille (f) |
| | 饼干 (bing'gan) | cookie | Keks (m) |
| | 钥匙 (yaoshi) | key | Schlüssel (m) |
| | 帐篷 (zhangpeng) | tent | Zelt (n) |
| | 地毯 (ditan) | carpet | Teppich (m) |