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Text is gendered: the role of letter case

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Abstract

This research investigates the association between letter case and perception of gender. We propose that referents are judged as more feminine (vs. masculine) when their names are written with lowercase (vs. uppercase) letters. This effect emerges independent of differences in the size in which the letters appear and cannot be fully explained by differences in angularity. We further identify that evaluations of feminine (vs. masculine) objects become more favorable upon presenting their names in lowercase (vs. uppercase) letters. This association between gender and letter case is more pronounced for referents with a clear gender identity (e.g., fragrances and not vacuums). By first identifying and then exploring consequences of the novel link between letter case and gender, the present investigation contributes to research on linguistics, inference, and conceptual associations while also providing insights as to how to construct communication tools most effectively.

Keywords Language · Gender · Letter case · Conceptual metaphor

1 Introduction

Communications via printed words are comprised of alphabetical characters, which can be presented as lowercase or uppercase letters. In marketing contexts, brands often name themselves using only lowercase (e.g., amazon, intel, pepsi, ups, accenture, ebay, adidas, hp., mastercard, salesforce) or uppercase letters (e.g., SAMSUNG, IBM, IKEA, DHL, GUCCI, SONY, VISA, NETFLIX, LEGO; see Interbrand best global brand 2018). Its name is often the very first thing consumers learn about brands, making brand name letter

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case a ubiquitous means by which brands have the chance to make a positive first impression. Further, the subtlety by which letter case can vary makes it a cost-effective means for all brands to manage public perception. But what message do brands send as a function of their name's letter case? Integrating sex-based bodily differences (males tending to be physically larger than females) and conceptual metaphor (Williams, Huang, and Bargh 2009), we propose that people use letter case (lowercase vs. uppercase) to infer the broader concept of gender (femininity vs. masculinity).

2 Conceptual framework

While often printed using a combination of both, words can be printed either in all lowercase or all uppercase. Certain research suggests that people learn and process case-invariant abstract letter representations, which should cause words to convey identical meaning regardless of letter case (Polk et al. 2009). However, the derivation of meanings from words is often influenced by changes in subtle elements of text such as font size, typeface, color, saturation, and the position of letters (Doyle and Bottomley 2004; Grohmann, Giese, and Parkman 2013; Haber and Haber 1981; Henderson and Cote 1998; McMurray 1958). Building on this literature, we posit a role for letter case (specifically, lowercase vs. uppercase letters) and inference of gender.

The tendency to ascribe gender (female vs. male) to both animate and inanimate objects is commonplace (Boroditsky, Schmidt, and Phillips 2003). Gender-related associations are often formed on the basis of conditioning and grounded in experienced gender differences (Bussey and Bandura 1999). For example, the term *sexual dimorphism* refers to differences in appearance between males and females (*di* = two and *morph* = form) in biology (Darwin 1871). Specifically, physical size is one of the most common sexually dimorphic traits (Gangestad and Scheyd 2005); males are usually larger than females (Fairbairn 1997). Hence, in many species, several external body features indeed help judge female from male. Further, once a mental representation of a particular concept is activated, information related to this concept also automatically becomes more accessible (Bargh 2006). Therefore, we propose that the distinct physical aspect of relative size difference that is prominently displayed via the two letter cases (lowercase vs. uppercase) should activate another relevant concept—gender—that also covaries with size (with males tending to be larger than females).

As a result of this activation, we propose that lowercase lettering will cause the referent to seem more feminine, while uppercase lettering will cause it to seem more masculine. Further, because people come to hold more favorable attitudes toward referents when presented with images that are congruent with their separate cognitive representations (Doyle and Bottomley 2006, 2011; Huang, Li, and Zhang 2013), we propose that evaluations of feminine (vs. masculine) objects will be more favorable when the object name is presented in lowercase (vs. uppercase) letters.

The effects of letter case on gender inference and product evaluation received initial consideration from a concurrent investigation. Wen and Lurie (2018) posited a link from letter case to gender on the basis of established associations between letter case and personality. Lowercase lettering had been connected to friendliness and uppercase lettering to authority (Xu, Chen, and Liu 2017). Owing to separate connections between friendliness and femininity (and authority and masculinity), they found that

lowercase lettering led to the inference of femininity, while uppercase lettering led to the inference of masculinity. Our investigation, rooted instead in sex-based differences in relative sizing, capitalizes on this distinct theoretical perspective to test the same basic phenomenon using different paradigms (e.g., within-subjects and forced-choice designs) that attests to its broad practical applications. Wen and Lurie (2018) also posited and found that brands benefit from a congruent fit between the gender seemingly inherent in an object and the gender connoted by letter case. Our investigation, again, conceptually replicates the phenomenon (Study 3) before expanding upon it in the form of moderation (Study 4).

Also like Wen and Lurie (2018), our investigation centers upon letter case and not font size. Font size shares a characteristic with letter case (i.e., relative size) that we propose scaffolds onto the construct of gender. However, we propose that the relative prominence of shifts in letter case has caused it to become more strongly associated with gender than the relatively sparse everyday alternation in font size. This is made stronger by the fact that letter case varies as a binary and in one particular direction: lowercase letters are qualitatively different than uppercase letters in always being smaller. In contrast, a font of a given size could be reframed either as yet smaller or yet larger on a continuous scale. Because gender is commonly categorized as a binary female-male distinction as well, we propose that its association with letter case should be stronger than its association with font size.

In addition to conceptually replicating and extending the findings from prior work at the upstream level, the present investigation also identifies unique consequences for the basic effect at the downstream level. The mind can be tuned to draw conceptually related inferences when relevant situational or contextual factors are more accessible (Chartrand and Bargh 1996). Accordingly, we propose that the lowercase-to-female and uppercase-to-male conceptualization will be more pronounced when the target has a clear potential to be gendered because this specification facilitates the evocation of the cognitive association between two concepts (i.e., letter case and gender perception). In contrast, if the target has little or no clear relevance to gender, this effect will be less pronounced.

3 Research overview

In four studies, we identify a relationship linking lowercase lettering with the concept of femininity (and uppercase lettering with masculinity). Studies 1 and 2 demonstrate that brand names are judged as more feminine (vs. masculine) when the names are written in lowercase (vs. uppercase) letters in a manner that operates independent of font size/weight as well as angularity. Study 3 identifies a downstream consequence for evaluations and preferences as they relate to feminine vs. masculine products. Study 4 finds that this association is more pronounced when the referent has a clear potential to be gendered (e.g., fragrance brand names) compared to referents with a less salient relationship to gender (e.g., vacuum brand names).

4 Study 1

The first objective of Study 1 is to examine the potential link between letter case and gender perception for ambiguous brand names. Second, it examines the potential role

of font size and weight (plus, in a posttest, letter angularity). Given that these are critical characteristics in gender perception, they themselves might also influence gender perception.

4.1 Method

This study used a 2 (letter case: lowercase vs. uppercase) × 2 (font size: small vs. large) × 8 (different fictitious brand names: lahm, yhan, dybt, qjir, zera, jyef, hyri, yekg) within-subjects design. One hundred six participants (55% men, $M_{age} = 36.63$, $SD = 11.57$) were recruited from Amazon's Mechanical Turk (MTurk) in exchange for a small monetary compensation. All participants saw the full set of items (32 in total, reflecting our experimental design), presented one at a time and in a random order for each participant. Specifically, participants saw the same 8 brand names presented in four different ways: lower case and small font (20 point), lower case and large font (100 point), upper case and small font (20 point), and upper case and large font (100 point). See the online appendix, for example, stimuli. Participants then reported how masculine or feminine they perceived each of the separate names to be (1 = *Extremely Masculine*, 8 = *Extremely Feminine*). Responses were summed across names to create a composite index for each of the four case-size pairings.

4.2 Results

We performed a repeated-measures ANOVA with letter case and font size as the independent variables and gender perception as the dependent variable. Neither the main effect of font size nor its interaction with letter case obtained, $ps > 0.42$, and a significant main effect emerged for letter case ($F(1, 105) = 11.31$, $p = 0.001$, partial $\eta 2 = 0.097$; see Fig. 1). Across font size and the different items, the lowercase names were evaluated as more feminine compared to the uppercase names ($M_{lower} = 4.60$, $SD = 0.79$ vs. $M_{upper} = 4.38$, $SD = 0.83$). Gender did not interact with the results ($p > 0.34$), and hence we will not discuss this further.

4.3 Discussion

Study 1 provides initial evidence that people perceive ambiguous brand names as more feminine (vs. masculine) when the names are written with lowercase letters (vs. uppercase letters). By documenting an effect that holds across small and large font size, we also address the alternative explanation that the size or weight of letters themselves drives our effect.

A separate account might predict that the relative angularity of uppercase letters underlies our effect. To consider it, we conducted a follow-up study using brand names that included letters for which angularity was constant across letter case. We recruited 153 participants (54% men, $M_{age} = 36.29$, $SD = 11.97$) for a study designed using a more conservative approach: 2 (letter case: lowercase vs. uppercase) × 2 (font size: small (20 point) vs. large (100 point)) × 2 (different fictitious brand names: vozcpoc, xokvow) between-subjects design. After viewing one of the two brand names presented in one of four different formats, participants reported how masculine or feminine they perceived each of the separate names to be (using the same scale as Study 1). As

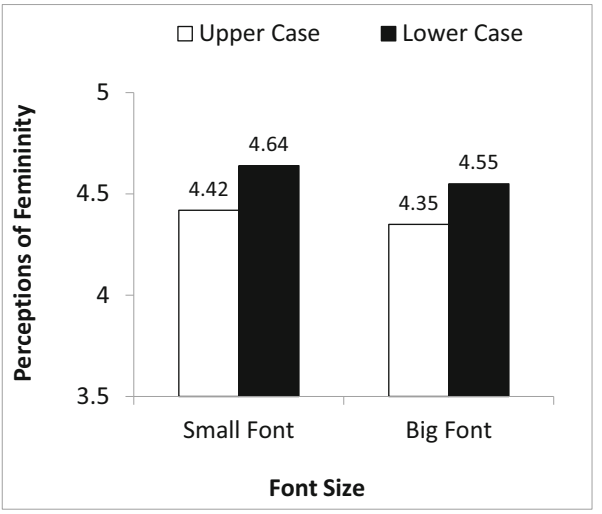

Fig. 1 Gender perception as a function of letter case and font size (Study 1)

expected, there was only a significant main effect of letter case ($F(1, 145) = 6.20$, $p = 0.014$, partial $\eta 2 = 0.041$), such that lowercase names were evaluated as more feminine compared to the uppercase names ($M_{lower} = 3.87$, $SD = 1.80$ vs. $M_{upper} = 3.18$, $SD = 1.54$). No other effects were significant ($ps > 0.17$). Thus, while angularity might contribute to our primary effect, this follow-up suggests it is not the sole driver of it.

5 Study 2

Study 2 seeks to further examine the relative importance of letter case beyond font size. Specifically, in a yet more direct comparison, it asks participants to choose the more masculine brand between two different, simultaneously presented brands in which we vary both letter case and font size in a fully crossed design. This allows us to test the relative contributions of letter case and font size to gender perception.

5.1 Method

This study used a 6 (pairing: upper-large vs. upper-small, upper-large vs. lower-large, upper-large vs. lower-small, upper-small vs. lower-large, upper-small vs. lower-small, lower-large vs. lower-small) × 2 (counterbalance factor: item presentation) between-subjects design. Two hundred four participants (38% men, $M_{age} = 38.82$, $SD = 11.55$) were recruited from MTurk in exchange for a small monetary compensation. Participants were randomly assigned to one of the twelve conditions in which two fictitious brand names (qamyjhrl, ebtdifgn) were presented in accordance with one of the 6 pairings listed above. In a manner similar to Study 1, the font size of the brand names was either small (20 point) or large (100 point). Further, our counterbalance factor presented the brand names in one format or the other for each pairing (e.g., qamyjhrl as upper-large and ebtdifgn as upper-small or the reverse), and the order of presentation

was also randomized. Participants then chose the more masculine brand between the two.

5.2 Results

Because the pattern of results did not vary as a function of the counterbalance factor ($ps > 0.10$) and the presentation order ($ps > 0.15$), we collapsed across it. We performed separate one-sample t tests on choice share for each of the 6 pairings, setting a midpoint at 50% to reflect an even allocation of choices regarding the more masculine brand. We highlight selected comparisons here; see Table 1 of the online appendix for details. In seeking to determine which factor—letter case or font size—has a more powerful role in gender perception, we only focus on the two pairs composed of different types of letter case and font size (i.e., upper-large vs. lower-small and upper-small vs. lower-large). We created two separate variables, letter case (lower letter = −1, upper letter = 1) and font size (small font = −1, large font = 1), and conducted a paired-samples t test on choice share. There was a significant difference in the impact of letter case and font size ($t = 2.73$, $p < 0.01$, $r = 0.31$). Specifically, 80% of participants chose an uppercase brand name as more masculine than a lowercase brand name (higher than the midpoint at 50%; $t = -6.09$, $p < 0.001$, $r = 0.59$), while 58% of participants chose a large-size brand name as more masculine than a small-size brand name (no difference from the midpoint at 50%; $t = -1.33$, $p > 0.18$).

5.3 Discussion

The results of Study 2 replicated those of Study 1 using a different approach. Though font size appears to have some impact on gender perception, these studies preclude the alternative explanation that the size of letters alone accounts for the effect of letter case on gender perception.

6 Study 3: feminine versus masculine scarves

Expanding to downstream consequences of our proposition, Study 3 observes attitudes as a function of the (mis)match between letter case and referent type. In so doing, it uses a new product that similarly carries a gender identity (a scarf, which can be feminine or masculine). Consistent with prior work attesting to the importance of congruity in brand characteristics to foster positive evaluations (Doyle and Bottomley 2004, 2006), we predict that attitudes will be more favorable when the presented letter case matches the femininity or masculinity of the product.

6.1 Method

This study used a 2 (letter case: lowercase vs. uppercase) × 2 (product type: masculine vs. feminine) between-subjects design. One hundred seventy-eight undergraduates (55% men, $M_{age} = 20.60$, $SD = 2.54$) were recruited in exchange for course credit. Participants were told that the brand name was being considered for a scarf. Participants were presented with a brand name that was either written in all lowercase letters

(atanas) or all uppercase letters (ATANAS) alongside a picture of a scarf designed to appear either feminine or masculine, as verified by a pretest ($N = 62$, $1 = Extremely\ Masculine$, $5 = Extremely\ Feminine$; $M_{feminine} = 4.60$, $SD = 1.07$ vs. $M_{masculine} = 3.53$, $SD = 0.98$; $p < 0.001$). They then reported how much they liked the brand name for the scarf ($1 = Not\ At\ All$, $5 = Very\ Much$).

6.2 Results

We performed an ANOVA with letter case and product type as the independent variables and brand attitude as the dependent variable. Neither main effect obtained, $ps > 0.44$, and a significant interaction emerged between letter case and product type ($F(1, 174) = 8.21$, $p < 0.005$, partial $\eta 2 = 0.045$; see Fig. 3). Participants in the lowercase condition indicated more positive brand attitudes for the feminine scarf than the masculine scarf ($M_{feminine} = 2.80$, $SD = 1.09$ vs. $M_{masculine} = 2.27$, $SD = 1.10$; $F(1, 174) = 4.21$, $p = 0.042$, partial $\eta 2 = 0.024$). In contrast, participants in the uppercase condition indicated more positive brand attitudes for the masculine scarf than the feminine scarf ($M_{feminine} = 2.16$, $SD = 1.35$ vs. $M_{masculine} = 2.64$, $SD = 1.13$; $F(1, 174) = 4.00$, $p = 0.047$, partial $\eta 2 = 0.022$).

6.3 Discussion

The results of Study 3 highlight the downstream relevance of our effect in marketing communication: people have more positive attitudes toward referents when the letter case of the name and the gender inherent to the referent exhibit a match or fit with one another.

7 Study 4

Study 4 seeks to examine a boundary condition of our effect, showing that all brands may not equally be perceived as feminine or masculine as a result of letter case. Given that gender asymmetries appear to be more pronounced when the product category has gender-related attributes (Klink 2009), we propose that shifting gender perception using letter case will be more pronounced when the target has a clear potential to be gendered. Specifically, we test whether this proposed effect is more pronounced for brands referring to targets with a clear potential to be gendered (e.g., a fragrance) compared to brands with a weaker such potential (e.g., a vacuum cleaner).

7.1 Method

This study used a 2 (letter case: lowercase vs. uppercase) × 2 (product type: fragrance vs. vacuum) between-subjects design. One hundred twenty-six undergraduates (84% men, $M_{age} = 22.28$, $SD = 4.43$) were recruited in exchange for course credit. Given that an object's gender is often determined by the gender of individuals that typically use it (Allison et al. 1980), we selected a fragrance as an object that reflected a gender identity (e.g., cologne for men or perfume for women) and a vacuum cleaner as a neutral object with relatively weak gender identity. Participants were randomly assigned to a

condition in which five fictitious brand names (iryx, joik, quih, heya, iyef) were either written in all lowercase or all uppercase letters. Separately, participants were randomly assigned to a condition in which the text of the instructions indicated that those brand names were said to be for a fragrance or a vacuum cleaner. Participants then reported how masculine or feminine they perceived each referent to be (using the same scale as Study 1). Responses were summed to create a composite index.

7.2 Results

We performed an ANOVA with letter case and product type as the independent variables and gender perception as the dependent variable. Neither main effect obtained, $ps > 0.38$, and a significant interaction emerged between letter case and product type ($F(1, 122) = 3.96$, $p = 0.049$, partial $\eta 2 = 0.031$; see Fig. 2). The specific brand did not interact with the results ($p > 0.13$). For a fragrance, participants in the lowercase condition indicated that the names were perceived to be more feminine compared to those in the uppercase condition ($M_{lower} = 4.85$, $SD = 1.20$ vs. $M_{upper} = 4.32$, $SD = 0.69$; $F(1, 122) = 4.01$, $p = 0.047$, partial $\eta 2 = 0.032$), whereas this difference disappeared among participants evaluating vacuum cleaners ($M_{lower} = 4.33$, $SD = 0.86$ vs. $M_{upper} = 4.54$, $SD = 1.27$; $F < 1$).

7.3 Discussion

The results of Study 4 support our proposed relationship in a broader realm of application: people perceive the same names as more feminine (vs. masculine) when the names are written using lowercase (vs. uppercase) letters, but only when the referent carries a relatively strong gender identity (e.g., a fragrance) through which the dissociation between the two letter cases—and, in turn, gender perception—can emerge.

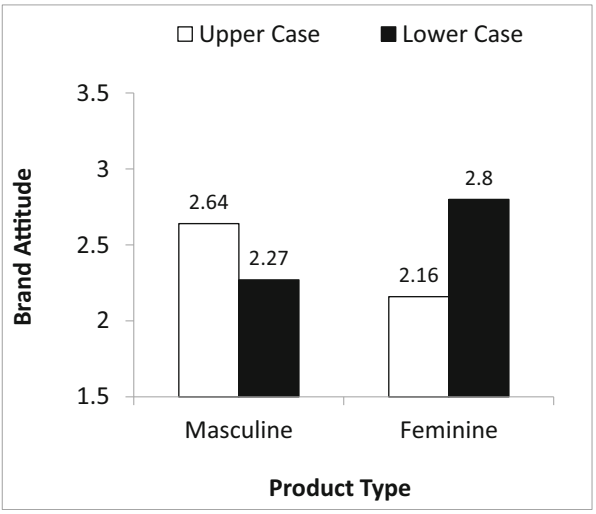

Fig. 2 Brand attitude as a function of letter case and product type (Study 3)

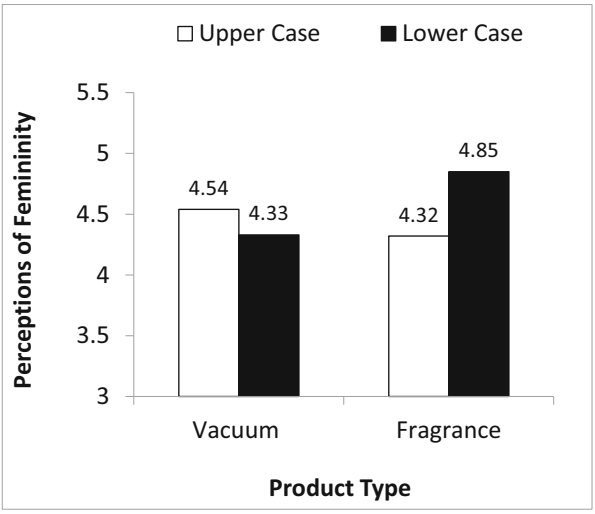

Fig. 3 Gender perception as a function of letter case and product type (Study 4)

8 General discussion

Compared to uppercase letters, lowercase letters make named referents seem more feminine, which influences evaluations of those referents. This effect is robust across orthogonal manipulation of font size and not fully explained by angularity. Further, the relationship linking lowercase letters with femininity and uppercase letters with masculinity is more salient when the target is gendered but becomes weakened when the target has a weak gender identity.

8.1 Theoretical implications

Our findings add to a growing body of research exploring when and why the same verbal information might convey a different meaning (Luangrath, Peck, and Barger 2017; Perea et al. 2015; Song and Luximon 2019; Xu et al. 2017; van der Lans et al., 2009). By demonstrating that gender perception is linked to letter case, this investigation adds to the discussion on attributes that carry gender associations (Debevec and Iyer 1986; Yorkston and De Mello 2005). Although gender is a fundamental concept in human society, only recently have researchers begun to examine factors that can influence gender perception and how those perceptions color behavior. While prior work has found that gender perception can be altered by colors or hues (Jablonski and Chaplin 2000), vowels or consonants (Spence 2012), and logo shapes or font type (Lieven et al. 2014), this research establishes an important, unexamined connection to letter case.

We also contribute to an emerging research stream that examines how phenomena established by the natural sciences can inform a better understanding of the social sciences (Saad 2013). A growing body of research has begun to draw on research and theory from animal behavior to gain insight into dynamic psychological processes that influence individual preferences and behaviors (Griskevicius and Kenrick 2013). We

add to this line of research by identifying the psychological link between two constructs: biological traits (gender) and linguistic information (letter case).

8.2 Practical implications

Verbal information—including the written word—is ubiquitous. Words flow everyday through newspapers, traffic signs, televisions, computer monitors, and smartphones. The present investigation suggests that letter case might be far from trivial in shaping how people respond to this written information. Our findings suggest that communicators can control the perceived femininity or masculinity of their offerings through a simple change in letter case, which can boost evaluation. These managerial takeaways echo those from a concurrent investigation (Wen and Lurie 2018). It, much like our independent set of experiments, provides evidence for a unique effect of letter case independent of letter size or letter shape/angularity. While these similarities attest to the reliability of the general effect, noteworthy differences between that investigation and ours point to how practitioners might best take advantage of it. Table 2 of the online appendix compares and contrasts the two investigations.

First, whereas Wen and Lurie (2018) tested their personality-based account using between-subjects designs, our relative-sizing account informed the within-subjects design of Study 1. There, the relationship between letter case and gender inference held when participants evaluated multiple names in a sequence rather than just one in isolation. Going further, Study 2 presented participants with pairs of brand names and had them select the more masculine item. Taken together, these results suggest that letter case informs gender inference when the potential influence of language more explicitly comes to the fore. From an applied lens, our findings attest to the relevance of the basic phenomenon in a wider set of branding contexts, like encountering different brands (and their corresponding names) in comparative advertising campaigns and on retail shelves.

Second, our methodology offers unique opportunities for practical translation of the effect. For instance, Wen and Lurie (2018) provided evidence for their congruent-fit-based account of brand enhancement in the realm of personal care products (i.e., vitamins and shampoos). Study 3, asking participants to evaluate a scarf, is extended to the apparel domain. Though Study 3 provided evidence for generality, Study 4 cautions against unilateral generalization. Instead, by showcasing the effect for fragrances but not vacuums, it provided evidence that the basic effect holds more strongly for product domains with the potential to be gendered (for the broader issue of relevance in linking linguistic cues with consumer judgment, see also Maglio et al. 2014). Thus, certain industries appear better poised to take advantage of this relationship than others.

8.3 Limitations and future directions

Across all of our studies, the materials were always presented in English; thus, our conclusions remain limited to English-language applications. Future research might test for a similar pattern in other languages and multi-language contexts. In one example, some languages assign genders to common nouns (e.g., Germans refer to “the moon” as male, while the French refer to it as female). These nouns, in turn, might have a

strong gender association in French and German, amplifying and not attuning our effect among their speakers. In another example, the Greek language uses some letters altogether different than English characters while still allowing them to vary between lowercase and uppercase. In a manner similar to the present investigation, Greek speakers should appraise a word written with lowercase letters (ω, π, and σ) as more feminine than the same word written with uppercase letters (Ω, Π, and Σ). We hope that our investigation inspires future research into other associations beyond gender that might be evoked as a function of letter case.

Future research may also examine other important boundary conditions that can weaken or strengthen our established effect. Because people tend to rely on contextual cues to understand novel information but form opinions about familiar stimuli based on preexisting knowledge (Cacioppo and Petty 1979), our effect might be pronounced for new or unfamiliar brands (Maglio and Feder 2017; Rabaglia et al. 2016), which minimize any impact of preexisting knowledge. In contrast, our effect should be tempered when gender-relevant concepts are strongly pre-established (e.g., well-known male names such as John or well-known female brands such as Victoria's Secret). We await these and other possibilities at the intersection of language and inference in the marketplace.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s11002-021-09556-w.

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