

Gender Differences in Communicative Abstraction

## **Abstract**

Drawing on Construal Level Theory, which suggests that experiencing a communicative audience as proximal rather than distal leads speakers to frame messages more concretely, we examine gender differences in linguistic abstraction. In a meta-analysis of prior studies examining the effects of distance on communication, we find that women communicate more concretely than men when an audience is described as being psychologically close. These gender differences in linguistic abstraction are eliminated when speakers consider an audience whose distance has been made salient (Study 1). In studies that follow, we examine gender differences in linguistic abstraction in contexts where the nature of the audience is not specified. Across a written experimental context (Study 2), a large corpus of online blog posts (Study 3), and the real-world speech of congressmen and congresswomen (Study 4), we find that men speak more abstractly than women. These gender differences in speech abstraction continue to emerge when subjective feelings of power are experimentally manipulated (Study 5). We believe that gender differences in linguistic abstraction are the result of several interrelated processes – including but not limited to social network size and homogeneity, communication motives involving seeking proximity or distance, perceptions of audience homogeneity and distance, as well as experience of power. In Study 6, we find preliminary support for mediation of gender differences in linguistic abstraction by women's tendency to interact in small social networks. We discuss implication of these gender differences in communicative abstraction for existing theory and provide suggestions for future research.

## **Gender Differences in Communicative Abstraction**

Although women and men are more similar than they are different (Hyde, 2005), small gender differences in behavioral tendencies can have important downstream consequences (Mazei et al., 2015). One gender difference that has been pointed to anecdotally is the tendency of women to speak about specifics and men to speak about the bigger picture. As one female venture capitalist put it regarding the context of entrepreneurs seeking financial backing: “I see men pitch unicorns, and women pitch businesses” (Bellostrom, 2017). In a similar vein, in the 2016 US presidential election, commenters frequently criticized Hillary Clinton’s focus on policy details and specifics, contrasted with her male opponents’ focus on the larger picture and ultimate reason for their candidacy. Despite policy details being a generally good thing, pundits noted that this speaking style made her seem like a policy wonk rather than a leader (Keith, 2016; see Appendix A for sample quotes of various candidates’ opening remarks in the primary presidential debates illustrating these differences).

These gender differences are anecdotal, but striking, especially given recent research on communicative abstraction – the tendency of people to use abstract speech that focuses on the broader picture and ultimate purpose of action rather than concrete speech focusing on details and the means of attaining action. While concrete speech can be perceived by observers as more likely to be true (Hansen and Wanke, 2010) and concrete speakers are seen as having a higher action orientation (Palmeira, 2015), abstract speakers are seen as having more power and leadership potential (Wakslak, Smith, & Han, 2014; Palmeira, 2015) and having greater expertise (Reyt, Weisenfeld, & Trope, 2016). Given the significance of communicative abstraction in shaping person perception, we aim in the current paper to explore whether gender differences in communicative abstraction rise beyond the level of anecdote. We hypothesize that such gender

differences occur widely, across various ways of operationalizing communicative abstraction, and that they are grounded in several interrelated processes. Below, we describe more fully the concept of communicative abstraction, and why we think that women and men differ in their speaking styles. We then describe a series of studies exploring gender differences in communicative abstraction. Our main goal is to establish the existence of these differences, although we also begin to empirically explore their psychological basis.

### **Communicative Abstraction and Its Determinants**

We base our conceptualization of communicative abstraction on Construal Level Theory (CLT), an influential theory that distinguishes between abstract and concrete ways of representing information (Trope & Liberman, 2010). Abstract representations (high-level construals) are relatively decontextualized, focusing on an item or event's gist, or its defining aspects. Concrete representations (low-level construals) are more contextualized and specific, focusing more on incidental features. This distinction has been widely used to characterize people's cognition (see Trope & Liberman, 2010; Liberman & Trope, 2008 for reviews), and can also be used to characterize communication messages (Joshi & Wakslak, 2014; Joshi, Wakslak, Raj, & Trope, 2016).

Based on CLT's broad distinction between high-level and low-level construals, there are a variety of specific ways in which communication can be rendered more abstract versus concrete. For example, a speaker may use concrete nouns that are easy to visualize, or that can be experienced through the senses (e.g., table, pasta), as opposed to abstract nouns that are difficult to visualize and less connected to a specific concrete image (e.g., justice, ethics; Brysbaert, Warriner, & Kuperman, 2014). People can also communicate abstractly by focusing on *why* one might engage in a behavior, rather than *how* one might do so (Vallacher & Wegner, 1989). A

leader, for instance, may emphasize the larger purpose of an organizational endeavor, or describe the specific, granular details that are involved. Furthermore, those who communicate more abstractly tend to employ more adjectives, which are broad and decontextualized, rather than verbs, which are more closely tied to particular actions (Semin & Fiedler, 1988).

A variety of factors have been shown to influence communicative abstraction; intriguingly, several of these – audience proximity, audience size, audience heterogeneity and the communicators' power – may have gender implications. One of CLT's main tenets is that construal-level is associated with distance: people tend to use higher-level construals to represent objects and events that are more psychologically distant. Extending this to the interpersonal domain, Joshi and colleagues (2016) argued that an audience's distance influences the construal-level at which a speaker will communicate with that audience; for example, the more physically farther away an audience, the more likely a speaker is to use abstract speech (Joshi, Wakslak, Trope, & Raj, 2016). Prior research also suggests a similar relationship of concreteness with audience social proximity. For example, individuals speak more concretely with others when they experience closeness (Ijzerman & Semin, 2009), and individuals from interdependent societies (who tend to see others as more socially connected to the self) use more concrete speech than those from independent societies (Semin et al., 2002). Beyond audience distance, people also use more abstract speech when communicating with a large audience rather than a small audience, particularly when a large audience is expected to be heterogeneous (Joshi & Wakslak, 2014). From a conceptual perspective, these patterns may be driven by a similar process: communicating with a distant, large, and heterogeneous audience requires a speaker to be widely relevant and relatable, and the speaker may therefore turn to abstract language which focuses on the gist of an idea, and is therefore more likely to be consistent across contexts than

are specific and concrete details. Finally, a speaker's own power and status can also influence their level of communicative abstraction. People who experience power due to their role in social hierarchies speak more abstractly than those who lack power in their everyday experiences (Magee, Milliken, & Lurie, 2010), as do those who are situationally primed in a given context to feel powerful (Smith & Trope, 2006). Scholars have argued that these patterns emerge because power acts as a form of social distance; those with high power feel more distant from others, and this leads to more abstraction in cognition and communication (Magee & Smith, 2013).

Construal level theory researchers have generally looked at these varied factors – audience distance, audience size, audience heterogeneity, and communicator power – situationally; that is, they have considered how variations in these factors at any one given moment influences communicative abstraction. We note, however, that in a more chronic vein women and men experience differences related to each of these factors throughout childhood and adolescence, as speaking habits are formed, and that these differences often continue into adulthood. As such, these factors may play an important role in leading to generalized tendencies of women and men to speak in a more concrete or abstract fashion (even as they may not be directly relevant in any one given situation).

First, from the time they are children, women and men tend to operate in different size social groups. For example, preschool girls are more likely to play in dyads and small groups, and preschool boys more likely to play in larger, more structured groups (Fabes, Martin & Hanish, 2003; Maccoby, 2002). As they get older, female groups tend to be more close-knit than male groups, consisting of more kinship based relationships (Fischer & Oliner, 1983; Marsden, 1987). Women are more likely to identify with and actively engage in small connected social groups as compared to men who are more likely to identify with larger work related groups

(McPherson & Smith-Lovin, 1982), leading women to have interpersonal contact with fewer individuals and with more similar others in each interpersonal interaction (McPherson & Smith-Lovin, 1986). Even when women's networks are larger than men's, they tend to be more homogeneous than male groups (Ajrouch, Blandon & Antonucci, 2005). This tendency of women to organize in smaller and/or more homogeneous groups may support development of a concrete speaking style in everyday communication.

Second, not only do women relate to others in smaller groups, but they are also more likely to emphasize interpersonal closeness within their group, seeking to build close bonds and supportive relationships (Eagly, 2009; Cross, Gore & Morris, 2003; Wood & Eagly, 2012). These close relationships are an important aspect of women's self-definition (Gabriel & Gardner, 1999) and women's communication is often directed towards relational goals (Brescoll, 2011; Rubin, Perse, & Barbato, 1988). For instance, while men tend to emphasize personal competence and unique strengths in their communication (Tannen, 1991; 1994), women spend more time establishing rapport, engage in self disclosure more, intrude less in conversations, and emphasize similarity between themselves and their conversation partner (e.g. Dindia & Allen, 1992).

Third, women and men may on average experience different levels of power and status, both objectively and subjectively (Carli, 1999; Eagly & Wood, 1999; Ridgeway, 2001). Women's historical roles in the household have traditionally (and to some extent, pervasively) been deemed to be of lower status than the roles that men have traditionally occupied in the workplace. Within the organizational context today, women continue to occupy lower power roles compared to their male counterparts (Catalyst, 2014), and may show resistance to seeking roles defined by high power (Gino, Wilmoth, & Brooks, 2015). Moreover, even when women

and men occupy similar roles, they may experience different subjective amounts of power within those roles (Elliott & Smith, 2004).

Thus, as a whole, women's interpersonal experiences tend to align with factors associated with more concrete speech, compared to men's experiences. Women tend to be socialized in small groups consisting of similar others, rather than larger more diverse groups: small and homogeneous group communication is characterized by more concreteness than large and more heterogeneous group communication (Joshi & Wakslak, 2014). Women tend to see themselves as more interdependent with others, and to nurture relational closeness in communication: audience proximity and feelings of interpersonal interdependence with one's audience is associated with more concrete communication (Semin et al., 2002; Ijzerman & Semin, 2009), and concrete communication may potentially act as way to signal interpersonal closeness (Stephan, Liberman, & Trope, 2010). Women tend to experience lower power and status than men: concrete speech is more common amongst people lower in positions of power and status (Magee et al., 2010). These three factors therefore converge in suggesting that women will tend to speak more concretely than men.

An important point related to the above is worth noting explicitly. As with many gender-difference arguments, it is critical to consider that what is (or may have been) descriptive, can become prescriptive (Heilman, 2001). Historical differences in men and women's roles have continued to create a set of expectations surrounding how men and women *should* speak (Burgoon, Dillard, & Doran, 1983; Lakoff, 1975). That is, although women and men's social roles have changed dramatically over the last several decades, the legacy of these differences is such that women continue to be rewarded for their ability to communicate in a way that expresses that they are thinking of others (Leaper & Smith, 2004; Leaper & Ayres, 2007), and



they can suffer backlash effects (Rudman, 1998; Rudman & Glick, 1999) when their communication style is perceived as explicitly dominant or powerful (Burgoon, et al.; 1991; Carli, 2006; Williams & Tiedens, 2016). While we do not attempt to disentangle the descriptive from the prescriptive in the current work, we believe that together they form an even stronger basis for our core predictions: women and men have historically, and continue to, occupy different roles and experience different socializations, and these can form expectations about the type of communication that is desirable from each gender.

Finally, beyond factors grounded in prior Construal Level Theory research, there are additional reasons that women and men may differ in their communicative abstraction. One important reason is related to competence: women may try to show their competence by displaying a command of details. Women have been found more susceptible to the imposter syndrome (Gibson-Beverly & Schwartz, 2008; Kumar & Jagacinski, 2006), and often underestimate their own performance and skills relative to men (Beyer, 2002; see Hyde & Durik, 2005 for a review). Stereotypes about women are often related to being high on warmth, but low on competence (Fiske, Cuddy, Glick, & Xu, 2002). Thus, women may worry about being seen as incompetent by others, and seek to allay this concern by being detail-oriented. Of note, prior findings have not found a robust link between abstract speech and competence judgments of observers (Wakslak, Smith, & Han, 2014); however, this does not preclude that women will use concrete speech in an attempt to come across as competent.

A related issue is that of conferring judgment. Whereas concrete speech typically concerns objective physical details, abstract speech moves away from these details by making a judgment about the broader implications of the object, action, or event. For example, a goal-based action-identification is more abstract than a means-based one (Vallacher & Wegner, 1989)

in that instead of describing the physical means by which an action occurs it makes an inference about the reason for which those actions were undertaken. Similarly, adjectives are more abstract than verbs (Semin & Fiedler, 1988) in that instead of describing the concrete actions that were completed they make a broader inference about the nature of the actor. Thus, abstract speech connotes greater judgment and tends to be more strongly valenced than concrete speech (Wakslak et al., 2014). Relatedly, concrete speech is often judged as more likely to be true, an effect that occurs because of concrete speech's greater verifiability (Hansen & Wanke, 2010). Women, who harbor more concerns about being doubted due to gender stereotypes associated with low competence (Fiske, Cuddy, Glick, & Xu, 2002), may be less likely to claim the right of conferring judgment, and instead prefer to stay with verifiable concrete language. Furthermore, conferring judgment is associated with power (Anderson & Berdahl, 2002; Goodwin, Gubin, Fiske, & Yzerbyt, 2000), and women may either feel less powerful or be more hesitant about using powerful language even in situations where they have power (cf., Dovidio, Brown, Heltman, Ellyson, & Keating, 1988; Lakoff, 1975).

### **Overview of the Current Studies**

For the converging reasons described above, we hypothesize that women will speak more concretely than men. In Study 1, we present a meta-analysis examining gender differences in speech abstraction within our own previously published studies (Joshi et al., 2016; Joshi & Wakslak, 2014), which had been originally conducted to examine the effects of audience distance/size on speech abstraction. This meta allows us to look at overall gender effects across a range of studies that operationalized speech abstraction using varied methods. Furthermore, because these studies made audience distance/size directly salient, it also allows us to explore if this manipulation moderates any gender effects. Next, we examine gender differences in

communicative abstraction in contexts where the nature of the audience is not specified, utilizing both tightly controlled paradigms (Study 2) and field data consisting of open-ended speech contexts (Studies 3-4). In Study 2, we examine the effects of gender on the use of desirability (high-level) versus feasibility (low-level) arguments (cf., Trope & Liberman, 1998), using a tightly constrained paradigm where participants selected arguments from a provided set that varied in desirability and feasibility focus. In Study 3 and Study 4, we obtained large archival datasets of written and spoken language from publicly available repositories of naturally produced speech and text. Our intention here was to examine whether gender effects seen in highly controlled contexts would replicate in field contexts where there were no constraints on men and women's speech. The nature of these datasets also allowed us to consider factors that may play a role in moderating these effects. In Study 3, we examine whether men and women differ in their use of abstraction in everyday written communication in a large corpus of blog posts. In Study 4, we examine whether these effects are replicated in the context of political speeches by considering a sample of US legislators (Senators and House members). Studies 5 and 6 then begin to address the question of why men and women might differ in their use of communicative abstraction. In Study 5, we focus on the role of power, priming participants with high or low power roles to see if this moderates the focal gender effects. This approach does not adequately address whether power, as part of women's socialized experience, is an underlying cause of these gender effects; instead, it explores whether situationally prompting a feeling of power is enough to nullify these gender differences. We do not find support for moderation of these gender effects by power priming, but we do find mediation by subjective reports of power. We further attempt to consider the psychological processes underlying our effects in Study 6, by measuring women's and men's relational experiences, preferences, and motives in

communication. Critically, because we suspect these gender differences are multiply determined and occur through years of socialization, we do not believe that we can speak definitively about a single process underlying these patterns; rather, Study 6 sheds insight on what factors may be relevant and capturable at the time of communication.

Across studies, we sought to collect data from a fairly diverse sample, including business school students as well as Mechanical Turk workers. We also used two large archival datasets to test our hypothesis in real world settings. For each of our studies, we invited at least 75 participants per experimental condition to participate. For Mechanical Turk studies we invited 100 participants per cell. Across our experimental studies, we predetermined the sample size. Studies 5 and 6 were pre-registered and we followed our pre-registration protocols in conducting the studies and reporting the analyses (see online Supplemental Material for links to pre-registration documents).

### **Study 1: Meta-analysis of Studies Examining the Effect of Distance on Communication**

We conducted a meta-analysis of 9 prior studies that we previously conducted on the impact of psychological distance from an audience (operationalized as either geographic distance or audience size) on linguistic abstraction in communication (Joshi et al., 2016; Joshi & Wakslak, 2014). The studies adopted different measures of communicative abstraction, from coding passages of naturally produced speech to selecting between abstract and concrete arguments to present to an audience. For the current purpose, a notable aspect of these prior studies is that proximity or distance of the audience was made salient to participants, since that was the purpose of this prior work. On the one hand, this suggests that these studies may constrain gender effects, to the degree that natural variation in distance perception and/or motivation is a relevant driver of such effects. At the same time, these studies are a unique

opportunity to explore whether gender and audience distance might interact to predict communicative abstraction. We thus considered both a main effect prediction of gender, as well as whether this effect would be moderated by audience distance/size.

## ***Method***

### *Sample of studies*

Our sample consisted of all studies from two previously published papers (Joshi et al., 2016; Joshi & Wakslak, 2014) that examined the effects of psychological distance on linguistic abstraction. Overall, findings from these studies suggested that people communicate abstractly with distant others (geographically distant others, large audiences) and concretely with near others (geographically near others, small and/or homogeneous audiences). In each study, gender was recorded, and hence we were able to obtain separate means for men and women on measures of communicative abstraction. Some studies included further experimental manipulations beyond distance, such as having a low motivation to communicate (Joshi & Wakslak, 2014, Study 4), communication with a large but homogeneous audience (Joshi & Wakslak, 2014, Study 5), and intention to work together with a distant individual (Joshi et al., 2016, Study 6); we excluded such conditions (which moderated the distance effects in this prior work) in the current analyses. We also excluded studies that did not measure linguistic abstraction as the dependent variable (Joshi et al., 2016, Studies 4-5; Joshi & Wakslak, 2014, Study 6), since these did not allow us to look for the gender effect of interest.

### *Dependent variables: Measures of abstraction*

The studies included in the meta-analysis used different measures of communicative abstraction, allowing us to examine the robustness of any effects of gender. For instance, one of the tasks included in the studies asked participants to describe themselves either in terms of

situationally stable traits and adjectives (e.g., serious–carefree, subjective–analytic, energetic–relaxed, intense–calm) or as determined by the context. This measure has been used previously as a measure of abstraction (Pronin & Ross, 2006). Another task used natural language descriptions, asking students to describe themselves to a prospective student. The descriptions written by the students were hand-coded for speech abstraction using the Linguistic Category Model (Semin & Fiedler, 1988), a method for coding abstraction based on the use of adjectives (considered the most abstract linguistic category) and different classes of verbs which vary in concreteness. Other studies asked participants to select between abstract (focused on the desirability of the objects or events, why-oriented arguments, or using abstract and higher-level descriptions) and concrete arguments (focused on the feasibility of the objects or events, how oriented arguments, or using concrete and lower-level descriptions) in order to persuade their audience to buy a product or engage in a particular activity. We measured the number of times the participants selected an abstract argument. Across studies, measures drew from the varied ways in which abstraction has been measured in the extensive literature on Construal Level Theory (for a conceptual review see Trope & Liberman, 2010; for a “tour guide” of measuring abstraction, see Burgoon, Henderson, & Markman, 2013).

*Moderator variable: Psychological distance*

In each of the studies included in the meta-analysis, we asked participants to communicate with an audience that was either described as being psychologically close or psychologically distant from them. There were two different ways in which the studies in our meta-analysis examined psychological distance from the audience: 1) Geographical distance from the audience, and 2) Size of the audience. Geographical distance was manipulated by telling participants that the audience was located either nearby (e.g., same city) or faraway (e.g.,

city in a different part of the country). Audience size, which prior research (e.g., Sears, 1991) argued is associated with distance such that a single individual is experienced as being psychologically closer than many individuals, was manipulated by asking participants to communicate with either one person or many other persons (e.g., informing them about the number of message recipients or showing pictures of a small or large audience). While conducting our meta-analysis we examined both a main effect of gender, and moderating effects of audience distance on men's and women's tendency to use abstraction in communication.

#### *Computation of effect sizes and data analysis*

The meta-analysis allowed us to examine the magnitude and robustness of the effects of gender on communicative abstraction. We computed effect sizes using Comprehensive Meta-Analysis (Version 2.2.05) software. The studies included in the meta-analysis used a between-participants design to examine how men and women differ in the extent to which they use abstract speech when communicating with a psychologically near and distant audience. We report the computed effect size estimate ( $d$ ) for each of the studies in Figure 1,  $d = (M_{\text{men}} - M_{\text{women}})/SD$ , separately for the psychologically near and psychologically distant context. All effect sizes were converted to  $g$  with the correction for small sample bias (Borenstein, Hedges, Higgins, & Rothstein, 2009). For subgroup analysis comparing psychologically near and psychologically distant audience conditions, a mixed model analysis was used as recommended by Borenstein et al (2009).

#### ***Results***

Results revealed that there was no main effect of gender on linguistic abstraction, although directionally men spoke more abstractly than women,  $g = .13$ ,  $k = 9$ , 95% CI = [-0.03, .28],  $p = .10$ ; See Table 1. We conducted subgroup analysis to examine whether this effect varied by

distance condition. The gender effect was moderate when participants were communicating with a psychologically close other,  $g=.35$ ; 95%  $CI=[.13, .57]$ , but disappeared when the audience was psychologically distant,  $g=-.08$ ; 95%  $CI=[-.29, .13]$ , indicating that the context moderates the effects of gender on speech abstraction,  $Q_B(1) = 7.52$ ,  $p=.006$ , Table 2. The results of the meta-analysis indicate that gender differences in communicative abstraction are reliable when audience distance is small, occurring across different measures of speech abstraction, and these differences are moderate in size. However, when an audience's distance is made salient, women's communicative abstraction scores are similar to those of men. An intriguing implication of this moderation finding is that gender differences in linguistic abstractness are not fixed or inevitable, as might be the case if such gender differences related to some essential quality of men and women. In other words, it isn't that women are not capable of speaking abstractly or that men are not capable of speaking concretely; rather, situational characteristics and interpersonal motives may dictate how men and women chose to communicate in everyday contexts.

Having shown initial evidence for gender effects in communicative abstraction using prior studies that specified audience proximity/distance, we sought to examine such gender differences when the context of communication was not experimentally specified. As mentioned earlier, providing specific information about audience distance in the studies included in the meta-analysis may have constrained the effects obtained in those studies. Indeed, prior work suggests that gender differences tend to be larger when fewer constraints are posed on language use (Newman, Groom, Handelman, & Pennebaker, 2008). In the studies that follow, we examine gender differences in linguistic abstraction in experimental and non-experimental contexts. In our experimental studies, we do not specify the nature of the audience, allowing for gender



differences in communication motives and audience perceptions to more freely influence communication patterns.

*Table 1: Studies that assessed the effects of audience distance on speech abstraction*

Audience distance	Study	Effect size: Gender difference in speech abstraction (positive $d$ values indicate that men speak more abstractly than women)	Speech abstraction task
Spatially near audience	Paper 1, Study 1	$d=.66$	Trait self ascription task: The extent to which people describe themselves in terms of traits versus situationally variable characteristics
Spatially distant audience		$d=.16$	
Spatially near audience	Paper 1, Study 2	$d=.42$	Natural speech production task: Describe a day at the University to a prospective student
Spatially distant audience		$d=.22$	
Spatially near audience	Paper 1, Study 3	$d=-.18$	Persuasion task: Select arguments to persuade another person to recycle
Spatially distant audience		$d=.57$	
Spatially near audience	Paper 1, Study 6	$d=-.08$	Persuasion task: Select arguments in order to persuade another individual to use a newly launched computer program
Spatially distant audience		$d=-.53†$	

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Small size audience	Paper 2, Study 1	$d=.13$	Natural speech production task: Describe a day at the University to a prospective student
Large size audience		$d=-.38$	
Small size audience	Paper 2, Study 2	$d=.86†$	Trait self ascription task: The extent to which people describe themselves in terms of traits versus situationally variable characteristics
Large size audience		$d=.11$	
Small size audience	Paper 2, Study 3	$d=.61†$	Persuasion task: Select arguments to persuade another person to recycle
Large size audience		$d=.13$	
Small size audience	Paper 2, Study 4	$d=.47$	Persuasion task: Select arguments to persuade another person to buy a newly launched juice product
Large size audience		$d=-.26$	
Small size audience	Paper 2, Study 5	$d=.58*$	Persuasion task: Select arguments to persuade another person to recycle
Large size audience		$d=-.05$	

\* $P<.05$ ; † $p<.10$

*Table 2: Gender differences in speech abstraction for psychologically close and distant audience*

Audience distance	$K$	Effect size ( $g$ )	$SE$	95% CI
Psychologically close audience	9	0.35	0.11	LL=0.13/UL=0.57
Psychologically distant audience	9	-0.08	0.11	LL=-.29/UL=0.13

## Study 2: Gender Differences in Communicative Abstraction in a Persuasion Context

Using a constrained experimental task, university undergraduate students were asked to persuade another student to recycle by selecting arguments from a set of concrete and abstract arguments that were presented to them.

### Method

**Participants.** One hundred and fifty native English speaking students from a West Coast University signed up to participate in a study on communication. One hundred and thirty nine students (55 Male, 84 Female;  $M_{age}=20.40$ ,  $SD_{age}=1.45$ ) completed and submitted the study.

**Material and Procedure.** Participants were asked to persuade another student from their university to recycle by selecting arguments from a list that we provided. The list included both desirability oriented arguments (e.g., “recycling helps sustain the environment for future generations”), as well as feasibility oriented arguments (e.g., “on average, organizing one’s recycling takes less than five minutes each day”). This allowed us to observe communicative abstraction preferences, as desirability oriented arguments are oriented towards the end goals or more abstract purpose of engaging in action, while feasibility oriented arguments relate to the concrete means by which a person engages in action (cf., Liberman & Trope, 1998). Participants saw a total of 14 arguments (7 desirability, 7 feasibility) supporting recycling and were asked to select 6 of these arguments to persuade the audience to recycle. All arguments were previously pilot tested to ensure that they did not differ in their persuasiveness ( $M_{why}=4.44$ ,  $SD=1.60$ ,  $M_{how}=4.58$ ,  $SD=1.31$ ;  $t(19)=-.63$ ,  $p=.53$ ), and only differed in terms of whether they related to feasibility (i.e., how recycling is done,  $M_{how}=4.76$ ,  $M_{why}=2.8$ ,  $p<.001$ ) or desirability (i.e., why one should recycle,  $M_{why}=6.29$ ,  $M_{how}=2.41$ ,  $p<.001$ ; 1 to 7 Likert scale; see Joshi & Wakslak, 2014, for more details about this pilot testing). Our dependent measure was the number of

desirability oriented or abstract arguments selected. Participants also reported the extent to which they supported recycling by stating their agreement with the statements “*I always recycle*” and “*Recycling is very important*” using a 5 point Likert scale ranging from *1=Strongly disagree* to *5=Strongly agree*.

## Results and Discussion

Eight participants who did not follow the instructions for the communication task (i.e., they selected less than 6 items) were excluded from our analysis. An independent samples t-test found that men ( $M=3.94$ ,  $SD=1.33$ ) used more abstract arguments to persuade another student as compared to women ( $M=3.27$ ,  $SD=1.44$ ),  $t(129) = 2.65$ ,  $p=.009$ ,  $d=.46$ , in support of our primary hypothesis.

We also conducted exploratory analyses to see if participants’ attitudes toward recycling might differ by gender, and whether recycling attitude might impact communicative abstraction. Women showed more positive attitudes towards recycling ( $M=3.99$ ,  $SD=.73$ ) than did men ( $M=3.68$ ,  $SD=.77$ ),  $t(128) = 2.33$ ,  $p=.02$ ,  $d=.41$ , but attitudes towards recycling did not predict communicative abstraction,  $B=.17$ ,  $SEB=.16$ ,  $t=-1.06$ ,  $p=.29$ . Interestingly, however, results showed a gender x recycling support interaction,  $B=.38$ ,  $SEB=.16$ ,  $t=2.33$ ,  $p=.02$ . Follow-up analyses probing this interaction suggested that being vested in (i.e., caring more about) the issue of recycling had opposite directional effects on communicative abstraction for men and women: men who supported recycling showed a preference for using abstract arguments to persuade another student ( $B=.38$ ,  $SEB=.26$ ,  $t=1.42$ ,  $p=.16$ ), whereas women who supported recycling were more likely to use concrete arguments to persuade another student ( $B=.40$ ,  $SEB=.24$ ,  $t=1.65$ ,  $p=.10$ ), although neither of these simple effects reached significance. The gender differences in communicative abstraction were significant among participants who cared about recycling (1 SD

above the mean),  $B=.61$ ,  $SEB=.18$ ,  $t=3.29$ ,  $p=.001$ , but not among those who did not feel strong support for recycling (1 SD below the mean),  $B=.05$ ,  $SEB=.17$ ,  $t=.27$ ,  $p=.79$ .

Overall, consistent with our expectations, men used more abstract arguments to persuade others as compared to women. While this was a fairly low-stakes, non-anxiety provoking context, we intriguingly found divergence between men and women to be strongest amongst those who cared most about the issue, suggesting that men and women may turn to different communication styles particularly when they are motivated to communicate well. Next, we sought to examine whether these gender differences in linguistic abstraction persist in naturally occurring speech.

### **Study 3: Evidence from an Online Blogging Platform**

Using a large corpus of online blog posts, we investigated in Study 3 whether male and female bloggers differ in communicative abstraction. On the one hand, given that Study 1 did not find an effect of gender on communicative abstraction when participants were asked to communicate with a large audience, it is plausible that we would see no gender effect in the blogging context. At the same time, unlike the experimental studies on audience size which made salient the size and/or heterogeneity of the audience and likely reduced variation in perceptions of it, the blogging context preserves the opportunity for variation in perception of one's audience. In fact, research on the imagined audiences of individuals who post information online shows that posters sometimes think about their audience quite broadly and abstractly (e.g., "the public"), without having a specific user in mind, and other times more specifically and narrowly (e.g., "my coworkers"; "people with poodles"), with imagined audiences fluctuating in poster's minds even as their actual audience did not change (Litt & Hargittai, 2016). Thus, we suspect that there is intra-individual as well as inter-individual variability in how bloggers perceive their

audience. It is likely that female bloggers may differ from male bloggers in terms of their perception of their audience's homogeneity, size, and similarity to themselves; although speculative, such variation may support the emergence of gender differences in communicative abstraction within the blogging context. We thus predicted that female bloggers will use more concrete speech than male bloggers.

In addition to examining this main effect of gender, the unique nature of the dataset – which comprises bloggers in their teens, twenties, and thirties-forties – allowed us to explore an additional potential moderator of gender effects in communicative abstraction: age of the respondent. We did not make any a priori predictions about age, but given that many of the processes we think might underlie a gender effect on communicative abstraction arguably are socialized and develop over time, we wondered if such effects would manifest or fail to manifest in younger populations.

## **Method**

The data used in this study was taken from the Blog Authorship Corpus, collected by Schler, Koppel, Argamon, and Pennebaker (2006). There are 681,288 blog posts in the data, written by 19,320 bloggers. Schler et al. (2006) scraped the data from the blogging platform blogger.com on August 2004, with the earliest posts in the dataset going back to January 1999. The data includes information on the gender, age, blog topic, and astrological sign of each blogger<sup>1</sup>. The data consists of three varied age groups (at 2004, the time of data collection): 13-17, 23-27, and 33-47, with an equal share of bloggers from each gender in the different age groups.

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<sup>1</sup> The horoscopic sign didn't have any significant association with concreteness, and was excluded from the analysis. Including the horoscopic sign in the analysis does not substantially change any of the results.

We examined the communication abstractness of the text of each post using the Brysbaert Concreteness Index (BCI). The Brysbaert Concreteness Index is a coding scheme that relies on abstraction norms that have been created by asking human raters to provide concreteness ratings for 40,000 commonly used words in the English dictionary (Brysbaert et al., 2014). The Brysbaert score for a word can range from 1 (most abstract) to 5 (most concrete). Words that can be easily visualized (e.g., table, chair) are rated as more concrete, and those that are difficult to easily visualize (e.g., justice, morality) as more abstract. This method has been used previously to explore Construal Level Theory predictions within large datasets of natural language (Twitter, newspaper articles; e.g., Bhatia & Walasek, 2016; Johnson et al. 2019). To calculate BCI scores for each post, we used Johnson et al. (2019)’s R code at [https://osf.io/hsnmq/?view\\_only=8e33ec6a2c6644f58a0437bc95d4d2e5](https://osf.io/hsnmq/?view_only=8e33ec6a2c6644f58a0437bc95d4d2e5)<sup>2</sup>. Furthermore, we filtered out brief posts that had less than 20 words, keeping 85% of the blog posts (578,422 posts)<sup>3</sup>. Brief posts were filtered out, as they didn’t have a many words with a Brysbaert score, having on average 6 words with Brysbaert score, compared to the overall average of 157.4 (median=87, SD=326.9) for the entire corpus.

On average, each blogger wrote 30 posts with a large variance across bloggers (SD=83.11). To control for this, we included the blogger ID as a random effect in our main model. We also observed several other covariates in the dataset that we wanted to incorporate in our analysis as controls: The blog’s topic, the blogger’s age at time of a given post, and the

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<sup>2</sup> Johnson et al. (2019) also provide an alternative method to calculate abstractness levels, Syntax-LCM, which calculates abstractness levels as indicated by syntax use. This represents a different approach to measuring abstractness that is highly dependent on syntax, rather than words. Syntax-LCM also differs from BCI in the index values. While in BCI *higher* values mean *more concrete* words, in Syntax-LCM, *higher* values means *less concrete* syntax. We replicate our findings using both methods, and include the Syntax-LCM estimation results in the supplementary materials.

<sup>3</sup> We also examined keeping only longer posts with 50 word or more and results were consistent with those reported here. For completeness, we include the results for the 50 words or more analysis in the supplementary materials.

length of the text (log transformed). Finally, to be able to control for other aspects of communication that have been shown to vary by gender, such as tentativeness, certainty, and emotionality (Carli 1990; Newman et al., 2008), we analyzed the text using Linguistic Inventory and Word Count (LIWC; Pennebaker et al. 2015). We saved LIWC's measures for Certainty, Tentativeness, Positive Emotion, and Negative Emotion so that we could use these as control covariates in the analysis. In Table 3 we report the descriptive statistics of the blog data.

Table 3: Descriptive statistics for blog data (Study 3)

	<u>Overall</u>		<u>Female</u>		<u>Male</u>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
<b>User's Age (at posting)</b>	23.66	7.77	23.64	7.91	23.67	7.63
<b>BCI score</b>	2.50	.18	2.51	.18	2.50	.18
<b>Share of BCI words</b>	.74	.10	.74	.10	.74	.10
<b>Certainty (LIWC)</b>	1.49	1.44	1.52	1.44	1.45	1.44
<b>Tentativeness (LIWC)</b>	2.79	2.13	2.73	2.07	2.84	2.20
<b>Positive Emotions (LIWC)</b>	3.80	2.72	3.95	2.76	3.66	2.67
<b>Negative Emotions (LIWC)</b>	2.10	2.17	2.18	2.21	2.03	2.12
<b>Observations per blogger</b>	29.94	83.11	29.79	81.79	30.09	84.42
<b>Word count</b>	245.22	460.51	250.61	481.39	239.88	438.80
<b>Number of bloggers</b>	19,318		9,659		9,659	
<b>Number of observations</b>	578,422		287,778		290,644	

## Results and Discussion

Before considering our more elaborate model, we considered the simplest possible test of the predicted gender effect: a t-test examining gender differences in communicative abstraction. We calculated the mean BCI for all posts of each blogger as an index of each blogger's average concreteness, and ran a t-test to examine the difference in this across gender: as expected, men ( $M=2.48$ ,  $SD=.10$ ) used more abstract language than women ( $M=2.49$ ,  $SD=.09$ ),  $t(19,261) = -$



5.78,  $p < .001$ ,  $d = .08^4$ . Of note, while significant given the large sample size, the mean difference here is extremely small. One reason for this is the nature of how the BCI is calculated: because the BCI relies on concreteness norms for many words used by the speaker, large amount of text is likely to result in overall scores near the center of the 1-5 scale used to establish concreteness scores. In the current data, the range for the BCI score was 1.92-3.82 and the interquartile range was 2.43-2.54. Given this tight interquartile range, showing that men and women differ as expected is notable.

Continuing this simplistic approach, we next conducted exploratory analysis with age cohort (categorically defined as 33-47 vs. 23-27 vs. 13-17) as a moderator. Findings revealed a gender \* age cohort interaction,  $F(2, 577743)=149.7$ ,  $p<.001$ . The effects were stronger with age. For bloggers in the age range of 33-47 years, men ( $M = 2.485$ ,  $SD = .10$ ) used more abstract language than women ( $M = 2.503$ ,  $SD = .097$ ),  $t(2990.9) = -5.1$ ,  $p < .001$ ,  $d = .19$ . Likewise, for bloggers ranging in age from 23-27 years, we found that men ( $M = 2.481$ ,  $SD = .10$ ) used more abstract language than women ( $M = 2.493$ ,  $SD = .094$ ),  $t(8028.7) = -5.251$ ,  $p < .001$ ,  $d = .12$ . However, for older adolescent bloggers in the age group of 13-17 years, we did not find any significant difference between male ( $M = 2.499$ ,  $SD = .10$ ) and female bloggers ( $M = 2.5$ ,  $SD = .097$ ) in their use of speech abstraction,  $t(8228.4) = -.592$ ,  $p = .5536$ ,  $d = .013$ .

Next, we sought to test a more elaborate model that better accounted for the nature of the data that included repeated observations from the bloggers, included the various controls identified earlier, and more precisely considered the age\*gender interaction.

Thus, for every blogger  $i$  and blog post  $j$ , we analyzed the following regression<sup>5</sup>:

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<sup>4</sup> We take the mean BCI of all posts per blogger rather than all posts together, to try and control for repeated measures. However, even when running a t-test on all individual posts, the results are significant. We find that men ( $M=2.50$ ,  $SD=.18$ ) used more abstract language than women ( $M=2.51$ ,  $SD=.18$ ),  $t(577,100)=-32.90$ ,  $p < .001$ ,  $d=.09$ .

<sup>5</sup> We use the *lmer* function in the R package lmerTest (Kuznetsova et al. 2017) to run the linear mixed model

$$\begin{aligned}
y_{ij} = & \alpha + \beta_1 \cdot Gender\_D_i + \beta_2 \cdot Age_{ij} + \beta_3 \cdot Gender\_D_i \cdot Age_{ij} + \beta_4 \cdot Cert_{ij} \\
& + \beta_5 \cdot Tent_{ij} + \beta_6 \cdot PosEmo_{ij} + \beta_7 \cdot NegEmo_{ij} + \beta_8 \cdot ShareBCI_{ij} + \beta_9 \cdot LogWC_{ij} \\
& + \beta_{10} \cdot Date_{ij} + Topic_i + u_i + \varepsilon_{ij}
\end{aligned} \tag{1}$$

Where the dependent variable  $y_{ij}$  is the post's BCI;  $Gender\_D_i$  is a gender dummy (0=Female, 1=Male);  $Age_{ij}$  is the mean centered age of the blogger<sup>6</sup>;  $Cert_{ij}$ ,  $Tent_{ij}$ ,  $PosEmo_{ij}$ , and  $NegEmo_{ij}$ , are all mean centered LIWC measures taken as control for Certainty, Tentativeness, Positive Emotion, and Negative Emotion, respectively;  $ShareBCI_{ij}$  is the mean centered share of BCI words in the text, and  $LogWC_{ij}$  is the mean centered total word count in the text (log transformed);  $Date_{ij}$  is the mean centered date of the post;  $Topic_i$  are the fixed effects for the various blog topics, having only an  $i$  subscript as each blog belongs to a single topic;  $u_i$  is the random effects term for the bloggers, and  $\varepsilon_{ij}$  is the error term.

The parameter  $\beta_1$  captures the difference between genders across all blog posts (negative values mean women write more concretely than men, whereas positive values mean the opposite). The parameter  $\beta_2$  captures the effect of the blogger's age on the BCI, the  $\beta_3$  parameter captures any interaction between age and gender, and the  $\beta_4 - \beta_{10}$  parameters capture the various controls in our analysis. According to our hypothesis,  $\beta_1$  should be negative, indicating that women write more concretely than men.

Mirroring the simple t-test results, we find that even when we control for common linguistic styles that usually differ between genders (i.e., tentativeness, certainty and emotions), other factors associated with the blogger (i.e., number of posts, date of each post, blog topic, post length), and factors associated with the coding mechanism (i.e., share of BCI words identified in

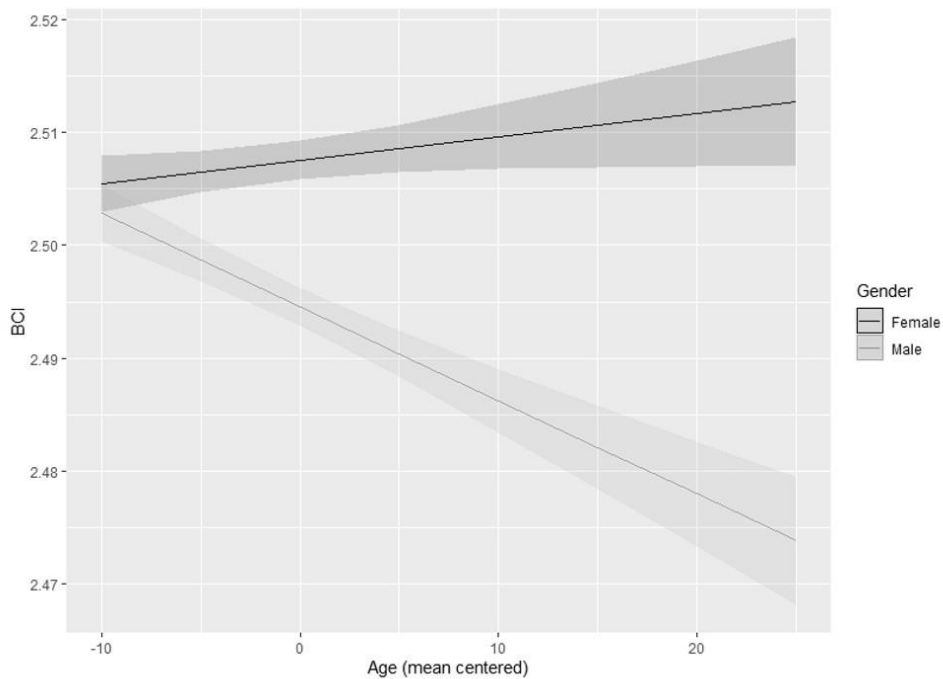
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regression described above, and provide p-values for the coefficient estimates. The *r.squaredGLMM* function in the R package MuMIn (Barton 2019) was used to calculate the Conditional Pseudo  $R^2$  for the regressions.

<sup>6</sup> We extrapolate the age of the blogger at time of each post by taking their age at the time the data was scraped (2004) and deducting the difference between that age and the time the post was published.

the text), blog posts written by men use more abstract language than posts written by women ( $\beta_1 = -.01$ ,  $SE=.00$ ,  $p < .001$ ). We further find a significant interaction between gender and age ( $\beta_3 = -.001$ ,  $SE=.00$ ,  $p < .001$ )<sup>7</sup>. We collapse all topics (by removing the topic variable from the regression) to further probe this interaction<sup>8</sup>. Exploring this interaction (Figure 1), we find that gender differences in communicative abstraction were stronger among older bloggers (1 SD above the mean),  $B = -.02$ ,  $SEB = .00$ ,  $t = -12.01$ ,  $p < .001$ , than among younger bloggers (1 SD below the mean),  $B = -.005$ ,  $SEB = .00$ ,  $t = -3.15$ ,  $p < .001$ .

**Figure 1:** Age (mean centered) and gender interaction plot (Study 3)



*Note.* Age of bloggers at time of posting ranged from 7 until 48, only 4 observations were from ages 7-10 and were censored from the plot for clarity. Age was mean centered in the analysis, such that zero represents a blogger who was 23.66 years old at time of posting.

<sup>7</sup> Gender main effects are still significant when we run the model without the gender and age interaction ( $\beta_1 = -.01$ ,  $SE=.00$ ,  $p < .001$ ), and still holds when we remove all LIWC measures from the regression ( $\beta_1 = -.01$ ,  $SE=.00$ ,  $p < .001$ ).

<sup>8</sup> Gender, age and their interaction do not change when we run the model without the blog topics ( $\beta_1 = -.01$ ,  $SE=.00$ ,  $p < .001$ ;  $\beta_2 = .0002$ ,  $SE=.00$ ,  $p = .051$ ;  $\beta_3 = -.001$ ,  $SE=.00$ ,  $p < .001$ ). The benefit of running the model this way is that we collapse all topics and do not have to calculate separate slopes for each of the 40 topics.

This interaction broadly suggests that differences in communicative abstraction may develop over time. However, because the corpus was scraped at a given time point we cannot empirically distinguish between age effects and generational effects, and hence cannot definitively argue that the teenagers in our sample would show larger gender differences in communicative abstraction as they get older.

The blogger corpus allowed us to replicate the lab findings in a large dataset consisting of naturally occurring speech. We see that gender differences in communicative abstraction reliably occur when the speaker controlled the topic, form, and length of the communication, rather than engaging in communication at the behest of an experimenter. Effects were small to moderate (See Bosco et al, 2014 and Nye et al., 2019 for more information on interpreting correlational effects from archival datasets) and were moderated by age of the communicator. Next, we leverage another large dataset of communication by men and women, which allows us to consider: a) differences in communicative abstraction in spoken, rather than written discussion, and b) differences in communicative abstraction amongst individuals with a relatively high amount of power.

### **Study 4: Gender Differences in Communicative Abstraction in US Congressional Transcripts**

Drawing on a large corpus of data from the U.S. Congress, we examined whether congressmen and congresswomen differed in their communicative abstraction. We included all congressmen and women from the 107<sup>th</sup> to 114<sup>th</sup> Congress session (2001-2017) and examined their language use. To be able to identify gender, and add congress-member level controls (e.g., age, party, state), we retained in the corpus only the speech of named members of Congress,

removing all speech made by other individuals (e.g., Speaker, clerks, visitors). We predicted that even in this very different context, women would use more concrete speech than men.

## Method

Our corpus consisted of all text spoken on the U.S. Congress (Senate and House) floor from 2001-2017 (specifically, everything said by members of the House from the 107<sup>th</sup> to the 114<sup>th</sup> Congress). These congressional discussions play a crucial role in the legislative process and can be critical for converting a proposed bill into a law, and thus represent a unique opportunity to examine gender differences in professional communication.

The corpus of Congressional records was parsed and compiled by Gentzkow et al. (2018), and also includes information on the speaker's gender, party, state, and chamber membership (Senate or House). Since the data also includes the date of the transcript, for each transcript we also calculated the age of the speaker<sup>9</sup>. We excluded Aníbal Acevedo Vilá who, as Resident Commissioner of Puerto Rico was a member of the Popular Democratic Party, keeping only members of the Democratic, Independent, and Republican parties. Similar to Study 3, we filtered out brief transcripts that consisted of less than 20 words, resulting in 575,989 transcripts of spoken text<sup>10</sup>, delivered by 1,088 congress members.

We examined the communicative abstractness of the text of each transcript using the BCI measure. On average, each congress member spoke 529 times with a large variance across speakers (SD=1,026). Similar to Study 3, we used LIWC (Pennebaker et al. 2015) to create measures for Certainty, Tentativeness, Positive Emotion, and Negative Emotion, to run as

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<sup>9</sup> We used data from GitHub's congress-legislators repository to add the congress members' date of birth (GitHub 2019).

<sup>10</sup> We also examined whether the effects persisted when we included speech with 50 word or more. For completeness, we include the results for the 50 words or more analysis in the supplementary materials.

control covariates in the analysis. In Table 4 we report the descriptive statistics of the Congressional corpus.

Table 4: Descriptive statistics for congressional transcript observations

	<u>Overall</u>		<u>Female</u>		<u>Male</u>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
<b>Congress member Age (at time of speech)</b>	60.32	10.14	60.30	9.46	60.32	10.36
<b>BCI score</b>	2.42	.13	2.43	.12	2.42	.13
<b>Share of BCI words</b>	.82	.07	.82	.07	.82	.07
<b>Certainty (LIWC)</b>	1.08	1.12	1.12	1.06	1.07	1.13
<b>Tentativeness (LIWC)</b>	1.56	1.59	1.33	1.35	1.60	1.63
<b>Positive Emotions (LIWC)</b>	2.93	2.28	3.26	2.26	2.87	2.27
<b>Negative Emotions (LIWC)</b>	1.08	1.36	1.24	1.42	1.05	1.35
<b>Observations per Congress member</b>	530	1,026	500	700	535	1,078
<b>Word count</b>	369.09	579.34	382.11	496.34	366.72	593.15
<b>Number of Congress members</b>	1,088		177		911	
<b>Number of observations</b>	575,989		88,567		487,422	

## Results and Discussion

As in Study 3, we consider first a simplistic t-test analysis. For each Congress member, we calculated the mean BCI for all speeches as an index of that Congressperson's average concreteness, and ran a simple t-test to examine the difference between genders: as predicted, Congressmen ( $M=2.432$ ,  $SD=.033$ ) used more abstract language than Congresswomen ( $M=2.439$ ,  $SD=.028$ ),  $t(275.49) = -2.76$ ,  $p = .006$ ,  $d = .21$ <sup>11</sup>. Even more than in Study 3, the BCI range was small (2.319 to 2.622) with a very tight interquartile range (2.413-2.454).

<sup>11</sup> Running a t-test on all transcripts, we find that men ( $M=2.42$ ,  $SD=.13$ ) used more abstract language than women ( $M=2.43$ ,  $SD=.12$ ),  $t(125,160) = -21.32$ ,  $p < .001$ ,  $d = .08$ . Running a t-test on speeches with more than 50 words, we find that men ( $M=2.418$ ,  $SD=.034$ ) used more abstract language than Congresswomen ( $M=2.427$ ,  $SD=.028$ ),  $t(290.16) = -3.69$ ,  $p = .0002$ ,  $d = .26$

Next, we sought to test a more elaborate model that better accounted for the repeated observations from the Congresspersons, and included a variety of controls. For every speaker  $i$  and speech  $j$ , we analyze the following regression:

$$\begin{aligned}
 y_{ij} = & \alpha + \beta_1 \cdot \text{Gender\_}D_i + \beta_2 \cdot \text{Age}_{ij} + \beta_3 \cdot \text{Gender\_}D_i \cdot \text{Age}_{ij} + \beta_4 \cdot \text{Cert}_{ij} \\
 & + \beta_5 \cdot \text{Tent}_{ij} + \beta_6 \cdot \text{PosEmo}_{ij} + \beta_7 \cdot \text{NegEmo}_{ij} + \beta_8 \cdot \text{ShareBCI}_{ij} + \beta_9 \cdot \text{LogWC}_{ij} \\
 & + \beta_{10} \cdot \text{Date}_{ij} + \beta_{11} \cdot \text{Party}_{ij} + \beta_{12} \cdot \text{Chamber}_{ij} + \beta_{13} \cdot \text{State}_{ij} + \beta_{14} \cdot \text{Congress}_{ij} + u_i + \varepsilon_{ij}
 \end{aligned} \tag{2}$$

Where the dependent variable  $y_{ij}$  is the post's BCI;  $\text{Gender\_}D_i$  is a gender dummy (0=Female, 1=Male);  $\text{Age}_{ij}$  is the mean centered age of the speaker;  $\text{Cert}_{ij}$ ,  $\text{Tent}_{ij}$ ,  $\text{PosEmo}_{ij}$ , and  $\text{NegEmo}_{ij}$ , are the mean centered LIWC measures taken as control for Certainty, Tentativeness, Positive Emotion, and Negative Emotion, respectively;  $\text{ShareBCI}_{ij}$  is the mean centered share of BCI words in the text,  $\text{LogWC}_{ij}$  is the mean centered total word count in the text (log transformed), and  $\text{Date}_{ij}$  is the mean centered date of the post;  $\text{Party}_{ij}$ ,  $\text{State}_{ij}$ ,  $\text{Chamber}_{ij}$ , and  $\text{Congress}_{ij}$  are fixed effects for the speaker's party, state, chamber, and the Congressional meeting they were elected to;  $u_i$  is the random effects term for the speakers, and  $\varepsilon_{ij}$  is the error term.

The parameter  $\beta_1$  captures the difference between genders across all speeches (negative values mean women speak more concretely than men, whereas positive values mean the opposite). The parameter  $\beta_2$  captures the effect of the speaker's age on the BCI, the  $\beta_3$  parameter captures any interaction between age and gender, and the  $\beta_4 - \beta_{14}$  parameters capture the various controls in our analysis. We include the age\*gender interaction for consistency with Study 3, although we note that the sample here is considerably older than in the Blogger dataset. According to our hypothesis,  $\beta_1$  should be negative, indicating that women speak more concretely than men.

The regression analysis was consistent with the simple t test, suggesting that congressmen speak in a more abstract language than congresswomen ( $\beta_1 = -.01$ ,  $SE=.00$ ,  $p = .001$ )<sup>12</sup>. Unlike Study 3, we find that the interaction between gender and age is not significant ( $\beta_3 = -.00$ ,  $SE=.00$ ,  $p = .117$ )<sup>13</sup>.

We also further explored the data by considering whether gender differences in speech abstraction would persist across both the House of Representatives and the Senate. A non-significant gender\*chamber interaction ( $\beta_{gender*chamber} = .00$ ,  $SE=.00$ ,  $p = .685$ ; see supplementary material for full model results) suggested that female members of both the higher power Senate and the (comparatively) lower power House of Representatives spoke similarly more concretely than male members of those respective bodies. It is interesting to note in addition that, overall, members of the Senate speak more abstractly than members of the House of Representatives ( $\beta_{chamber} = -.01$ ,  $SE=.00$ ,  $p < .001$ ; House = 0, Senate = 1), providing support for previous work that shows a relationship between power and speech abstraction (Smith & Trope, 2006). However, gender differences in speech abstraction persist in both the higher and lower power groups and having high levels of power does not eliminate gender differences in speech abstraction.

The Congressional speech dataset allowed us to examine another replication of the lab findings in a large, naturally occurring spoken dataset. Congress members discuss issues that are vital to the ongoing existence of the US. Even in these high stakes contexts where speech style

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<sup>12</sup> In the Syntax-LCM regression, the difference in gender is not significant ( $\beta_1 = -.005$ ,  $SE=.004$ ,  $p = .209$ ). This might be related to the underlying approach of the Syntax-LCM analysis, which looks at syntax, rather than specific words. Perhaps the more formal speech of congress reduces syntax based gender difference; we leave this for future research to explore. See supplementary materials for full regression results.

<sup>13</sup> Gender main effects are still significant when we run the model without the gender and age interaction ( $\beta_1 = -.01$ ,  $SE=.00$ ,  $p = .002$ ), and still holds when we remove all LIWC measures from the regression ( $\beta_1 = -.01$ ,  $SE=.00$ ,  $p = .009$ ). For further exploratory analyses surrounding this issue, see supplementary materials.



may involve much deliberation and practice, we find that women use more concrete speech than men.

In the studies that follow, we sought to explore why these gender differences in speech abstraction persist across different contexts. One explanation for why men and women differ in linguistic abstraction is that men and women may experience different levels of power. Because women may occupy lower status roles and positions, they may experience lower power than men (Ridgeway & Smith-Loving, 1999). While our findings in the Congressional dataset suggest power may not be enough to alleviate gender communicative abstraction differences, it is also possible that men and women in Congress have different (real or subjective) levels of power. In order to further examine the role of power in explaining gender differences in communicative abstraction, we experimentally manipulated feelings of power in the following study.

### **Study 5: Situationally Induced Subjective Power**

In Studies 1-4 we find that women speak more concretely than men. While we have argued that this effect is most likely multidetermined, with a number of factors shaping women's and men's experiences as they develop linguistic styles, a different possibility is that the entire difference is explained by women and men's current experience of power. That is, if women and men experience different amounts of subjective power in a given context, and power is linked to abstraction (Smith & Trope, 2006), then this might explain gender differences in communicative abstraction. To more directly consider the role of momentary experiences of power, we conducted Study 5 to see if gender differences in communicative abstraction would persist when women are experimentally primed to experience higher levels of subjective power. This allows us to more clearly isolate whether gender differences in communicative abstraction are the result of more ingrained gender differences arising from socio-historical differences that men and

women have experienced as a group (irrespective of current feelings of power) or whether women who are primed to experience power might, in fact, be found to speak as abstractly as men.

## **Method**

***Participants:*** Three hundred students (122 Male, 175 Female, 3 unreported) from a West Coast University participated in a study on communication styles. Participation in the study was restricted to students who reported being native English speakers in an earlier prescreening battery session.

***Power priming:*** Participants engaged in a visualization task (Moon & Chen, 2014) in which they were assigned to the role of either an interviewee (the lower power role) or an interviewer interviewing candidates (the high power role). Participants in all conditions were shown a picture of an office scene, and asked to visualize themselves sitting in the chair with the red arrow pointing at it (see Supplemental Material for stimuli). In the low power condition, participants were asked to visualize being seated in a subordinate's chair (one of two chairs facing the boss's seat) for an interview, and to imagine that they were being evaluated by a potential boss for a position within the organization. In the high power condition, participants were asked to visualize being seated in the boss's chair (the chair behind the desk), and to imagine that they were interviewing a candidate, evaluating them, and making a hiring decision about the candidate. After the visualization task, participants completed a communication task.

***Communication task:*** Participants were asked to continue visualizing themselves in the role they had been assigned to, and to communicate about everyday work behaviors to another person. Participants read, "This task focuses on your communication preferences for how a number of different work related behaviors should be described. Any behavior can be described

in many ways. For example, one person might describe a behavior as "writing a paper," while another person might describe the same behavior as "pushing keys on the keyboard." Yet another person might describe it as "expressing thoughts." Below you will find several behaviors listed. After each behavior will be two different ways in which the behavior might be described to another person. Your task is to choose the option that best describes the behavior to someone else. Simply mark the option you prefer. Be sure to respond to every item." Participants were provided with a series of eighteen work related actions. For each action (e.g., preparing a report, using a computer) they were provided with two choices to identify/communicate each action, one choice being abstract (e.g., showing progress, processing information) and the other concrete (e.g., compiling information, typing on a keyboard). Items were adapted from a measure of work-based action identification (Reyt & Wiesenfeld, 2015), which has been used in prior research to measure degree of abstract or concrete thinking. The number of times participants chose to communicate the abstract option was used as a measure of abstraction.

Participants also completed two manipulation check items that asked them to indicate "*How much control they experienced in the moment*" and "*How powerful they felt*" using a 7 point scale ranging from 1(*not at all*) to 7 (*very much*).

## Results

Data of 28 participants who failed the attention check, 3 participants who did not report gender and 2 participants who did not complete the communication task was excluded from analysis as per preregistered criteria. An examination of the manipulation check items indicated that participants in the high power condition reported feeling more powerful ( $M=5.19$ ,  $SD=1.10$ ) than participants in the low power condition ( $M=4.32$ ,  $SD=1.18$ ),  $F(1,265)=37.15$ ,  $p<.001$ ,  $\eta^2_p=.12$ . We also obtained a main effect of gender on feelings of power, such that women ( $M=4.63$ ,

$SD=1.22$ ) reported experiencing lower feelings of power than men ( $M=4.98$ ,  $SD=1.20$ ),  $F=6.40$ ,  $p=.01$ ,  $\eta^2_p=.02$ . There was no power prime x gender interaction,  $p=.71$ .

A 2 (Gender: Male, Female) x 2 (Power: High, Low) ANOVA on communicative abstraction yielded a main effect of gender,  $F(1, 265)=4.93$ ,  $p=.03$ ,  $\eta^2_p=.02$ , and a main effect of power,  $F(1, 265)=8.35$ ,  $p=.004$ ,  $\eta^2_p=.02$  – however, the interaction effect was not significant,  $F(1, 265)=.50$ ,  $p=.48$ ,  $\eta^2_p=.002$ . In line with prior research (Smith & Trope, 2006; Magee et al., 2011), we found that high power primed participants communicated more abstractly ( $M=10.67$ ,  $SD=3.20$ ) than low power primed participants ( $M=9.40$ ,  $SD=3.60$ ). More central to the current investigation, we found that once again women communicated less abstractly ( $M=9.68$ ,  $SD=3.62$ ) than did men ( $M=10.60$ ,  $SD=3.12$ ).

On the one hand, the lack of interaction between gender and power-prime condition suggests that directly impacting sense of power does not alleviate gender communicative abstraction effects. At the same time, because our manipulation check of subjective power showed gender differences (i.e., despite our power priming, men felt more powerful than women as a main effect), it is feasible that subjective power plays a mediational role. To explore this possibility, we further examined whether gender differences in subjective experience of power mediated the main effect of gender on communicative abstraction. Feelings of power predicted speech abstraction,  $B(SEB)=.89 (.16)$ ,  $t=5.43$ ,  $p<.001$ . We used PROCESS (Hayes, 2013) to examine whether gender differences in subjective experience of power mediated the effects of gender on communicative abstraction, and found support for this possibility (Indirect effect  $B=-.31$ ,  $SEB=.15$ ,  $LLCI=-.64$ ,  $ULCI=-.04$ ). The remaining direct effect of gender on speech abstraction was not significant;  $B=-.61$ ,  $SEB=.41$ ,  $t=-1.47$ ,  $p=.14$ ;  $LLCI=-1.42$ ,  $ULCI=.20$ .

Our results thus indicate that gender differences in the experience of power may contribute to why men and women differ in their use of speech abstraction. Indeed, we suspect that gender differences in communicative abstraction are likely due to an interrelated set of factors that shape men and women as they grow and develop. Such factors include but are not limited to: experience of power, perception of audience distance, preference for seeking closeness and connection or expressing uniqueness, preference for and experiences with networks of similar and relatively few others or dissimilar and many others, and concerns about expressing competence and sounding judgmental. To further explore these possibilities, we consider the potential role of each of these in mediating the gender-communicative abstraction link.

### **Study 6: The Mediating Role of Interaction Patterns, Preferences, and Motives**

We suspect that multiple mechanisms operate simultaneously to explain why men and women differ in their use of communicative abstraction. In Study 6, we test the role of several of these mechanisms in explaining gender differences in communicative abstraction, measuring the following: perceived distance from the audience, communication motives, preference for interaction in small versus large groups, childhood social interaction patterns, concerns about competence and judgmentalness, as well as subjective feelings of power. However, we note that while we conducted Study 6 to begin to explore these processes, we readily admit to its inherent limitations: given that we believe the effects we are interested in occur through years of socialization, it may not be possible to measure them in the context of a single study. Rather than speaking definitively to what drives gender differences in communicative abstraction, our findings may help shed light specifically on factors that are especially relevant and able to be captured through self-report measures in the context of an experimental study.

## Method

**Participants:** Three hundred Amazon Mechanical Turk Workers were invited to participate in a study titled “Communication task.” Two hundred and seventy eight (149 Male, 129 Female) participants submitted the questionnaire.

**Materials and Procedure:** Participants completed the same communication task as in Study 5. They then completed the additional measures listed below:

***Perceived audience distance:*** Participants indicated the extent to which they perceived their audience as being psychologically close or distant by responding to three items: “*When completing the task, I thought about this audience as being: near me(1)/far away from me(7), very similar to me(1)/very different from me(7), and small(1)/large(7),*”  $\alpha=.63$ .

***Motive to connect to audience:*** Participants indicated the extent to which they agreed with two items: “*When I communicate with others, I care deeply about building relationships*” and “*When I communicate with others, I seek to establish a personal connection with the other person*” (1=strongly disagree to 7=strongly agree,  $\alpha=.81$ ).

***Current social network size:*** Participants indicated the extent to which they agreed with the two statements: “*I would describe my social network as being small*” and “*I would describe my social network as being large (reverse scored)*” (1=strongly disagree to 7=strongly agree,  $\alpha=.81$ ).

***Current social network heterogeneity:*** Participants indicated the extent to which they agreed with the two statements: “*The people I relate to on an everyday basis are usually very different from me*” and “*The people I interact with are usually very similar to me (reverse scored)*” (1=strongly disagree to 7=strongly agree,  $\alpha=.81$ ).

**Childhood social network:** Participants indicated the extent to which they agreed with the two statements: “*During my childhood, I tended to hang out with a small tight-knit group of friends*” and “*During my childhood, I preferred to interact in large social groups (reverse scored)*” (1=strongly disagree to 7=strongly agree,  $\alpha=.64$ ).

**Concerns about competence:** Participants indicated the extent to which they agreed with the two statements: “*When I communicate with others, I worry about people doubting my competence*” and “*When I communicate with others, I feel like I have to prove my competence to them*” (1=strongly disagree to 7=strongly agree,  $\alpha=.78$ ).

**Concerns about judgmentalness:** Participants indicated the extent to which they agreed with the two statements: “*When I communicate with others, it feels safer to stick to the facts rather than communicate my own judgments*” and “*When I communicate with others, I am careful to let them draw their own conclusions from what I am saying, rather than draw conclusions for them*” (1=strongly disagree to 7=strongly agree,  $\alpha=.47$ ).

**Feelings of subjective power:** Participants indicated the extent to which they felt powerful using two items “*How powerful do you feel at the moment?*” and “*How much do you feel you are in control at the moment?*” (1=strongly disagree to 7=strongly agree,  $\alpha=.72$ ).

After completing the communication task and the measures listed above, participants completed a demographics measure.

## Results

Data of 4 participants who were non-native English speakers and 6 participants who did not complete the communication task was excluded from analysis based on our pre-registration criteria.

Replicating our earlier effects, men ( $M=9.97$ ,  $SD=4.34$ ) communicated more abstractly than women ( $M=8.10$ ,  $SD=4.69$ ),  $t(267)=3.40$ ,  $p=.001$ ,  $d=.42$ . Men and women also differed on several proposed mediators (see Table 8 for means, standard deviations, and relevant statistical tests for each measure). Women were more motivated to connect to their audience than men. Women described their current social network as relatively smaller compared to men, and also indicated that their networks were smaller in childhood. Women also described their social network as being more homogeneous than did men. Women were also more likely to indicate concerns about having to prove their competence, although only at a marginal level. There were no significant differences in perceived proximity of audience, concerns about judgmentalness, and subjective experience of power.

Next, we conducted regression analyses to examine whether any of our potential mediators predicted abstraction scores. Each of the mediators were separately regressed on the outcome measure of communicative abstraction (controlling for gender). Current social network size,  $B=-.52$   $SEB=.19$ ,  $t(267)=-2.78$ ,  $p=.006$ , and concerns about proving competence,  $B=-.40$ ,  $SEB=.18$ ,  $t(267)=-2.27$ ,  $p=.02$ , each resulted in the use of more concrete speech. (For correlations between variables see Table 9.) Next, we explored whether each of the potential mediators explained the effects of gender on communicative abstraction in separate mediation analyses<sup>14</sup>. For each of the potential mediators, we conducted bootstrapping analyses (Hayes, 2013) with 5,000 resamples with 95% CIs for the indirect effects. Current social network size mediated the effects of gender on communicative abstraction (Bootstrapping  $CI = -.55/-.03$ ). Women's social networks tended to be smaller than male social networks, which in turn explained their tendency to speak concretely. However, even after controlling for the effects of current social network,

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<sup>14</sup> See Table S12 in the supplement materials for mediation results.



there was a significant direct effect of gender on communicative abstraction  $B=-1.63$ ,  $SEB=.13$ , Bootstrapping  $CI=-2.7/-.56$ , suggesting partial mediation. None of the other variables statistically mediated the effects of gender on communicative abstraction.

The results suggest that women and men in this sample differed in several expected ways. Women reported being more motivated to connect with others in communication contexts, having relatively smaller social networks (currently and in childhood), and more homogeneous interactions, and being more concerned about demonstrating competence than did men. Further, gender differences in social network characteristics emerged as a significant mediator of gender differences in communicative abstraction. If women tend to interact with a small group of similar others, a concrete style of communication may be more suitable to meet the demands of their network. On the other hand, if men are more accustomed to interacting with a larger group of individuals, their messages may benefit from being framed to meet the demands of interacting with different and dissimilar others, leading them to turn to more abstract forms of speech.

Our goal in this study was to empirically explore several ideas about why women might speak less concretely than men. This statistical mediation approach is certainly not definitive, and therefore we view these results as a starting point rather than the final word on process. Undoubtedly, other mediating variables exist for the relationship between gender and communicative abstraction; moreover, some of the interrelated processes we discussed earlier relate to women's sociocultural roles and may be hard to test definitively, especially through a measurement approach. Thus, constructs we attempted to measure here may contribute to the overall process in a way that we were unable to capture in the current study (indeed, simple measurement error may have muted some of our potential findings), and other additional variables that we have not considered may contribute to the process as well.

**Table 8:** Gender Differences in relational goals and communicative abstraction (Study 6)

	Male Mean ( <i>SD</i> ) N=140	Female Mean ( <i>SD</i> ) N=122	<i>t</i>	<i>p</i>	<i>d</i>
Communicative abstraction	9.97 (4.34)	8.10(4.69)	3.40	0.001	0.42
Perceived distance	3.41 (1.22)	3.17 (1.12)	1.633	0.104	0.20
Motive to connect	4.83 (1.28)	5.20 (1.10)	2.457	0.015	0.30
Social network size	4.96 (1.54)	5.57 (1.34)	3.41	0.001	0.42
Social network heterogeneity	3.65 (1.32)	3.27 (1.22)	2.48	0.013	0.30
Childhood network	5.16 (1.31)	5.61 (1.09)	3.04	0.003	0.37
Competence concerns	3.66 (1.57)	3.97 (1.59)	1.62	0.10	0.20
Judgmentalness concerns	4.49 (1.07)	4.59 (1.19)	0.71	0.47	0.09
Subjective power	4.43 (1.33)	4.27 (1.38)	0.987	0.324	0.12

	1	2	3	4	5	6	7	8	9
Communicative abstraction (1)	--	.03	-.17**	.03	.12	-.09	-.14*	-.01	.04
Perceived distance(2)	.03	--	-.24**	.24**	-.15*	-.24**	.15*	.08	.003
Current network size(3)	-.17**	-.24**	--	-.21**	-.20**	.55**	.13*	.06	-.34**
Network heterogeneity	.03	.24**	-.21**	--	-.17*	-.13	.04	-.11	-.02
Motive to connect (5)	.12	-.15*	-.20**	-.17*	--	-.13*	.014	.09	.23**
Childhood network(6)	-.09	-.24**	.55**	-.13*	-.13*	--	-.01	.06	-.23**
Competence concerns (7)	-.14*	.15*	.13*	.04	.01	-.01	--	.26**	-.17**

judgment concerns (8)	-.01	.08	.06	-.11	.09	.06	.26**	--	.09
Subjective power (9)	.04	.003	-.34**	-.02	.23**	-.23**	-.17**	.09	--

**Table 9:** Correlations between variables (Study 6)

\*significant at  $p < .05$ ; \*\*significant at  $p < .01$

### General Discussion

Across a series of six studies, we find that men communicate more abstractly than women. We find that gender differences in communicative abstraction persist across experimental (Studies 1, 2, 5, and 6) and field (Studies 3 and 4) contexts. The effects conceptually replicate across various measures of abstraction, including emphasizing desirability vs. feasibility (Study 2), using more concrete words (Studies 3 and 4), and adopting higher levels of action identification (Studies 5 and 6).

Effects ranged from small to moderate across studies, with larger effect sizes in our controlled laboratory-style studies than our archival data ones. The former studies allowed for greater control, constraining the topic of communication and potential ways in which a participant was able to communicate. They largely also used paradigms that have been specifically designed in prior work to capture variation in communicative abstraction. On the other hand, our archival data studies gave us an opportunity to examine gender differences in contexts that were much less constrained in terms of numerous factors such as the topic of conversation, number of words, intended audience, length of speech, and overall purpose of conversation. Given the size of the corpora involved, they also relied on an automated method for coding abstraction, which gives up some amount of precision compared to hand coding (see Johnson et al., 2019, for a related discussion). Thus, it is not especially surprising to find smaller effects in these contexts.

*What Drives these Effects?*

We suspect that the gender difference in communicative abstraction we identify emerges from a set of converging reasons, including women's social interactions in closely knit small groups, their historical occupation of lower status roles compared to men, their desire to establish close interpersonal relationships, their caution in signaling power and judgmentalness, and their desire to establish their competence. While we do not argue for any one particular process, several of our specific findings across studies may speak to the various (potentially interrelated) processes that might underlie this effect.

For example, in Study 1, we find that when an audience's distance is made salient, gender differences in linguistic abstraction are eliminated. The moderating role of distance is consistent with this factor playing a role in explaining gender differences in communicative abstraction. That is, women may be relatively more inclined to create proximity with others (indeed, we found this gender pattern in Study 6, although it did not negatively correlate with the use of abstraction) or to conceptualize others as proximal; emphasizing that an audience is distant may block the proximating tendency of women and minimize gender effects in communication. Also important to consider in the context of Study 1's findings are our findings in Study 3, which showed differences in the communicative abstraction of male and female bloggers. On the one hand, this may be surprising given Study 1's findings (given that bloggers communicate with a sizeable audience). At the same time, unlike the experimental studies on audience size which made salient the size and/or heterogeneity of the audience and likely reduced variation in perceptions of it, the blogging context preserves the opportunity for variation in perception of one's audience. For example, female bloggers may differ from male bloggers in terms of their perception of their audience's homogeneity, size, and similarity to themselves; although

speculative, such variation may support the emergence of gender differences in communicative abstraction within the blogging context.

We also considered the role of power in explaining gender effects on communicative abstraction. Across samples, we find effects both when respondents have relatively low levels of power (e.g., students, Mturk respondents) and when they have higher levels of power (members of Congress). Indeed, even within our Congress dataset (Study 4) we find no variation in the gender effect based on relative amount of power (House of Representative members vs. Senators). This is consistent as well with results of Study 5, which experimentally manipulated power and found that this did not interact with gender. These findings, however, do not preclude a role of the *subjective experience* of power. That is, even when in similar positions, men and women may differ in how powerful they feel. Study 5, which found that women reported lower subjective experience of power than men when power was experimentally primed, and that this subjective experience of power mediated the effects of gender on communicative abstraction, is consistent with a role of subjective power in explaining gender differences in speech. In Study 6, however, we did not find any evidence for gender differences in subjective experience of power, and subjective experience of power did not mediate the effects of gender on communicative abstraction. This suggests at a broad level that while subjective power may play a role in some contexts (e.g., most likely ones in which subjective power is salient, as in Study 5), the routine experience of power is unlikely to be the main driver of these gender effects across variable contexts.

Indeed, in Study 6 we considered a broader set of mediators of a gender effect on abstraction. Gender differences on the measures we collected supported many of our earlier arguments based on the gender literature: women reported greater motivation than men to seek

closeness in communication contexts, greater likelihood of interacting in small and homogeneous networks, and greater concerns about establishing their competence. Further, we found that the tendency of women to establish and interact in small groups mediated their tendency to use concrete speech. As mentioned earlier, we certainly don't see these results as ruling out alternative explanations, but they do suggest the plausibility of communication audience size playing an important role.

Also thought-provoking are the findings from Study 3. In a dataset that allowed us to capture writings of adolescents as well as adults, we found that gender differences were larger for older adults than for teenagers, suggesting that gender differences in communicative abstraction may be reinforced by one's experiences. This is broadly consistent with our argument that women and men are acculturated in a variety of ways over time that are consistent with the development of different communicative abstraction tendencies. We call for future work to continue to explore this divergence in women and men's speech, and how these are shaped through one's interpersonal experiences.

### *Theoretical Implications*

Our findings contribute to several lines of theoretical inquiry, including research on Construal Level Theory and on linguistic abstraction, as well as research on gender and communication. First, our findings offer novel contributions to the growing body of research on abstraction in cognition and communication. Research on Construal Level Theory (Trope & Liberman, 2010) has primarily explored the impact of psychological distance on mental construal – the degree to which people cognitively represent an object more abstractly or concretely. Recent work has extended this research to an interpersonal domain, exploring how audience characteristics such as audience distance (Joshi, Wakslak, Raj & Trope, 2016) and size

and heterogeneity (Joshi & Waksalak, 2014) impact communicative abstraction. We further advance this research by showing how *speaker characteristics*, rather than audience ones, can impact communicative abstraction. That is, individuals communicating with the same audience may adopt different levels of abstraction based on characteristics such as their gender. To our knowledge, our research is among the first to demonstrate how individual difference characteristics such as gender can influence abstraction use in communication contexts. Because different people may experience a social situation in different ways, and have different motivations in the same social context, it is likely that there are further individual differences that will systematically predict differences in cognitive and linguistic abstraction.

Second, our findings both build upon and expand prior research in communication showing that men and women differentially adopt different speaking styles (Carli, 1989; Lakoff, 1975; Tannen, 1991, 1994). We link these important prior findings to a subtle, and yet widely relevant, difference in how men and women speak that has not been previously identified. Much of previous research on gender differences in communication has looked at differences in the content of men and women's speech (Carli, 1999; Herring, 1996; Holmes, 1990; Tannen, 1994). In contrast, we identify a gender difference in how men and women may approach similar content, finding that men are more likely to emphasize the end goals of action and the big picture compared to women.

#### *Limitations and Future Research*

There are several key limitations of our research that would benefit from further investigation. As mentioned earlier, a major question revolves around more precisely identifying why these gender differences in linguistic abstraction exist. We provide evidence to show the role of audience distance, subjective power, and perceived social network size in explaining

these gender differences in communicative abstraction. However, we believe that the effects of gender on communicative abstraction are determined by the interrelationship of multiple co-occurring factors including, but not limited to, communication motives, perceived audience distance and homogeneity, objective and subjective power, desire to demonstrate competence, and prescriptive and descriptive gender role expectations. We do not believe that the lack of statistical mediation for some of these mediators conclusively implies that they do not play a role in explaining this gender effect. Experimental studies that manipulate levels of the proposed mediators and test for moderation of the effects can more convincingly demonstrate the potency of some mediators over others in predicting our effects.

Second, it would be advantageous to gain a deeper understanding of the moderators of this general effect. Our meta-analysis shows that gender differences in communicative abstraction are moderated by perceptions of audience distance, and our blogging data suggests that they are moderated by age. Other moderators that might further provide theoretical insights about the causes of these gender effects include cultural factors, personality variables, actual network size and heterogeneity, as well as situationally experienced feelings of competence. We believe that future research would benefit from more carefully examining such moderators, in order to more fully understand boundary condition of this effect.

Third, an important question arising from our findings – which focus specifically on communicative abstraction – is whether a similar divergence would occur for cognitive abstraction more generally. Communication is one important window into cognition, but it also is distinct from cognition and may be used more strategically. Indeed, some of our proposed mechanisms (e.g., subjective power) are consistent with a broader effect on cognition, while others (e.g., proximity and size of audience, prescriptive norms surrounding speech, etc.) might



be more uniquely relevant to communication contexts. Moreover, within the general category of cognition, one can meaningfully distinguish between cognitive *preference*, and cognitive *ability*. That is, it is feasible that women prefer to think about things more concretely than do men, but if a goal necessitates abstract thinking they would be perfectly able to think more abstractly (and vice versa for men, if a goal necessitates concrete thinking). Indeed, our current findings of moderation of gender effects in communication by various factors (audience distance, age, etc.) suggests that both men and women are able to speak abstractly or concretely depending on the context, but may choose not to. Human cognition as well as communication are context dependent. Future research would benefit from examining gender differences in cognitive and communicative abstraction and their relationship to each other. It would also be interesting to examine the ways in which these gender differences are shaped by the contextually induced communication goals or motives. To the extent that communication goals are made salient in specific contexts, thoughts may align with these communication goals, and we might obtain gender differences in abstraction on certain cognitive tasks.

Finally, future research would benefit from examining the implications of these gender differences in communicative abstraction. One potential area of future research is examining the effects of communicative abstraction on communication effectiveness. Concrete speech is associated with greater action orientation (Palmiera, 2015), higher perceptions of truthfulness (Hansen and Wanke, 2010), more effective feedback (Kernan & Lord, 1989; Liden & Mitchell, 1985), and stronger following through on goals (Gollwitzer & Sheeran, 2006). Women's concrete speech may thus have positive implications in contexts where such outcomes are desirable (e.g., managerial or educator effectiveness).

Effects of gender and speech style may also relate to important gender imbalances in leadership conferral and emergence (Eagly & Karau, 1991; 2002; Ridgeway, 2001).

Communicative abstraction has been associated with status conferral and power judgments, such that people who speak more abstractly are given more status (Reyt, Weisenfeld, & Trope, 2015) and are perceived as having more power (Berson & Halevy, 2014; Palmiera, 2015; Wakslak, Smith, & Han, 2014) than those who speak concretely. Women's tendency to use more concrete speech may therefore be implicated in their lower likelihood of emerging as high-level leaders. Researchers have found that similar heuristics for power and status influence decisions across an employee's life cycle: from who gains opportunity before formal entry (Milkman, Akinola, & Chugh, 2015), to interview procurement (Bertrand & Mullainathan, 2004), hiring decisions (Huang, Frideger, & Pearce, 2013), investment decisions (Brooks, Huang, Kearney & Murray 2014), and leadership assessment (Antonakis & Dalgas, 2009; Ridgeway, 2001; Taggar et al., 1999). Future research should therefore explore the impact of gender differences in communicative abstraction for leadership outcomes, and potential strategies for counteracting any such effects.

### *Conclusion*

Across a number of varied contexts we find that men tend to communicate more abstractly than women. We also identify several moderators for this effect, suggesting that it does not reflect a fixed tendency of men or women but rather emerges within specific contexts. We look forward to future research that continues to explore this effect, its basis, and its consequences.

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**Appendix A**  
**Introductory quotes from Presidential debates**

Below is an excerpt from Hillary Clinton's self-introduction in the first democratic presidential candidate debate held in Las Vegas, NV during the primaries:

*"I have spent a very long time — my entire adult life — looking for ways to even the odds to help people have a chance to get ahead, and, in particular, to find the ways for each child to live up to his or her God-given potential. I've traveled across our country over the last months listening and learning, and I've put forward specific plans about how we're going to create more good-paying jobs: by investing in infrastructure and clean energy, by making it possible once again to invest in science and research, and taking the opportunity posed by climate change to grow our economy. At the center of my campaign is how we're going to raise wages. Yes, of course, raise the minimum wage, but we have to do so much more, including finding ways so that companies share profits with the workers who helped to make them. And then we have to figure out how we're going to make the tax system a fairer one. Right now, the wealthy pay too little and the middle class pays too much. So I have specific recommendations about how we're going to close those loopholes, make it clear that the wealthy will have to pay their fair share, and have a series of tax cuts for middle-class families. And I want to do more to help us balance family and work. I believe in equal pay for equal work for women, but I also believe it's about time we had paid family leave for American families and join the rest of the world. During the course of the evening tonight, I'll have a chance to lay out all of my plans and the work that I've done behind them."*

Below is an excerpt from Bernie Sanders self-introduction in the first democratic presidential candidate debate held in Las Vegas, NV during the primaries:

*“Anderson, thank you very much. I think most Americans understand that our country today faces a series of unprecedented crises. The middle class of this country for the last 40 years has been disappearing. Millions of Americans are working longer hours for lower wages, and yet almost all of the new income and wealth being created is going to the top one percent. As a result of this disastrous Citizens United Supreme Court decision, our campaign finance system is corrupt and is undermining American democracy. Millionaires and billionaires are pouring unbelievable sums of money into the political process in order to fund super PACs and to elect candidates who represent their interests, not the interests of working people. Today, the scientific community is virtually unanimous: climate change is real, it is caused by human activity, and we have a moral responsibility to transform our energy system away from fossil fuel to energy efficiency and sustainable energy and leave this planet a habitable planet for our children and our grandchildren. Today in America, we have more people in jail than any other country on Earth. African-American youth unemployment is 51 percent. Hispanic youth unemployment is 36 percent. It seems to me that instead of building more jails and providing more incarceration, maybe — just maybe — we should be putting money into education and jobs for our kids.”*

Below is an excerpt from Donald Trump’s self-introduction in the tenth republican presidential candidate debate held in Houston, TX during the primaries:

*“Thank you. My whole theme is make America great again. We don't win anymore as a country. We don't win with trade, we don't win with the military. ISIS, we can't even*

*knock out ISIS, and we will, believe me. We will. We don't win in any capacity with healthcare. We have terrible health care, Obamacare is going to be repealed and replaced. We just don't win. You look at our borders, they're like Swiss cheese, everybody pours in. We're going to make a great country again. We're going to start winning again. We're going to win a lot, it's going to be a big difference, believe me. It's going to be a big difference."*