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Evaluating the Influence of the Presence of a Dog on Bias toward Individuals with Overweight and Obesity

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ABSTRACT Individuals with overweight and obesity are subject to enormous bias and discrimination across domains. This bias constitutes a considerable public health problem beyond the effects of excess weight on health. Unfortunately, the few interventions that have been implemented to reduce this bias have not been successful. Evidence that the presence of an animal makes individuals and settings appear more attractive, desirable, approachable, and relaxed, as well as happier and safer, suggests that dog ownership may be a simple way to reduce weight bias. Accordingly, we tested whether the presence of a dog can reduce weight bias in a sample of 314 online participants. Each participant was presented with a stimulus image representing one of three conditions (person with dog, person with plant, or person alone), and was then asked to rate the human model using three measures. Two sets of stimuli (featuring different models) were used to ensure that findings were not restricted to a particular model. Contrary to our predictions, we found no evidence that the presence of a dog affects endorsement of weight-related stereotypes, general evaluations, or desire for social distance. These findings contrast with a large body of literature showing that dogs enhance perceptions of a range of individuals and settings. The effect of dogs on perceptions may be restricted in the case of weight bias because of the pervasive, explicit, and severe nature of this bias. Dogs may have stronger effects on attitudes that are less openly endorsed. Promising avenues where dogs are very likely to influence attitudes include perceptions of individuals of different racial and ethnic backgrounds, gender identities, and even political parties.

Keywords: attitude, canine, human–animal interaction, perception, stigma, weight bias

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The prevalence of obesity has more than doubled over the past three decades. Today there are over 1.4 billion adults with the conditions of overweight and obesity, representing approximately 35% of the world's population (World Health Organization [WHO], 2014).[1] Overweight receives extensive attention for its role as the "public health challenge of our time" (Bassett & Perl, 2004, p. 1477; Finkelstein, Trogdon, Cohen, & Dietz, 2009). However, bias against those with overweight presents its own public health problem, beyond the effects of excess weight on health (Puhl & Heuer, 2010).

Individuals with overweight are subject to bias and discrimination across domains (Puhl & Brownell, 2001). As students, individuals with overweight are victims of bullying and negative teacher attitudes, and young children prefer individuals with crutches, wheelchairs, amputated limbs, and facial disfigurements to those with overweight (e.g., Janssen, Craig, Boyce, & Pickett, 2004; Puhl & Brownell, 2006; Richardson, Goodman, Hastorf, & Dornbusch, 1961). As adults, individuals with overweight are less likely to be hired and promoted compared to lean individuals, or individuals with arm amputations, poor vision, colon cancer, facial burns, or diabetes (Bordieri, Drehmer, & Taylor, 1997). Even healthcare providers who specialize in obesity demonstrate bias against their patients (Flegal, Kit, Orpana, & Graubard, 2013; Teachman & Brownell, 2001). The pervasive and explicit nature of weight bias highlights the need for methods to reduce this bias.

Although weight bias is a considerable public health problem, there have been few efforts to reduce this bias. Existing interventions have focused on education, providing stereotype-disconfirming information, and raising awareness about the prevalence and impacts of weight bias (e.g., Diedrichs & Barlow, 2011; O'Brien, Puhl, Latner, Mir, & Hunter, 2010). Evaluations of these interventions have focused on measures of knowledge and beliefs about the condition of overweight, with little attention to the impact on bias and discrimination (see Daníelsdóttir, O'Brien, & Ciao, 2010, for a review).

Evaluations of the few interventions that have targeted bias and discrimination have shown that the interventions are not successful in producing changes (e.g., Gapinski, Schwartz, & Brownell, 2006; Teachman, Gapinski, Brownell, Rawlins, & Jeyaram, 2003). Changing perceptions of individuals with overweight is an important avenue that might decrease the deleterious public health consequences of weight bias. A key challenge is to understand how those perceptions might be changed, and particularly whether there are opportunities to change perceptions in everyday settings.

Interactions with animals may represent a promising, low-cost, and easy-to-implement method for reducing weight bias. The presence of an animal enhances perceptions and facilitates positive social interactions across a range of settings and populations. Psychotherapists, police officers, and even prospective romantic partners are perceived more positively when they are accompanied by animals (e.g., Giacomantonio, Bradford, Davies, & Martin, 2014; Schneider & Harley, 2006; Tifferet, Kruger, Bar-Lev, & Zeller, 2013). The presence of an animal makes individuals and settings appear more attractive, desirable, approachable, and relaxed, as well as happier and safer (Rossbach & Wilson, 1992; Tifferet et al., 2013).

Multiple species have been used to enhance perceptions and reduce stigma (e.g., Giacomantonio et al., 2014; Rossbach & Wilson, 1992). However, dogs may be particularly well suited to these tasks, because owners are regularly seen with their dogs outside of their homes. In addition, more American households have dogs than any other type of pet, and this prevalence means that any benefits of dogs might be leveraged in large-scale efforts to reduce weight bias (American Pet Products Association, 2015).

Beyond their prevalence, there are three theoretical reasons to believe that dogs may be well-suited to reducing weight bias. First, dogs may reduce weight bias through "destigmatization by association" (Neuberg, Smith, Hoffman, & Russell, 1994, p. 196). Associative stigma, or stigma by association, refers to the phenomenon whereby those who have close relationships with stigmatized individuals become stigmatized as a result of those connections (Mehta & Farina, 1988; see Pryor, Reeder, & Monroe, 2012, for a review). Destigmatization by association is the opposite effect of stigma by association. Just as it is possible for a stigmatized individual to spread his or her stigma to non-stigmatized individuals, it may be possible for positively viewed individuals to enhance the perceptions of stigmatized individuals around them (Neuberg et al., 1994). In other words, dogs may be viewed so positively that they have a halo effect on those around them, including individuals who are victims of weight bias.

The second way in which dogs may reduce stigma is by creating an opportunity for communicating a shared identity or common value. The common ingroup identity model posits that prejudice may be reduced by reframing social categorizations so that individuals with different identities view themselves as members of a shared group (Gaertner, Dovidio, Anastasio, Bachman, & Rust, 1993). For example, lean individuals may come to see themselves as part of the same group of dog-lovers or dog-owners as an individual with overweight when they see that individual in the presence of a dog.

The third rationale comes from the possibility that a dog might communicate information that disconfirms common stereotypes of individuals with overweight. Individuals with overweight are commonly viewed as lazy, lacking in discipline, and incompetent (see Puhl & Brownell, 2001, for a review). The presence of a dog may counter these stereotypes by communicating competence, discipline, industriousness, and a likelihood of regular exercise (Eddy, Hart, & Boltz, 1988).

The purpose of the present study was to test whether the presence of a dog reduces bias toward individuals with overweight. We examined whether the presence of a dog reduces endorsement of weight-related stereotypes, enhances overall evaluations, and increases self-reported willingness to interact with individuals with overweight. Based on the positive impact of dogs on evaluations of other targets and the three theoretical explanations outlined above, we predicted that individuals with overweight would 1) be perceived less stereotypically, 2) be evaluated more positively, and 3) elicit less avoidance when they are in the presence of a dog (e.g., Rossbach & Wilson, 1992; Schneider & Harley, 2006).

In addition to the predictions about the impact of the presence of a dog on perceptions of individuals with overweight, we explored the roles of two theoretically relevant participant characteristics in participant responses to the presence of the dog. First, we explored the role of participants' actual and perceived body composition, based on evidence that these characteristics are related to weight bias (Schwartz, Vartanian, Nosek, & Brownell, 2006). Second, we explored the role of participants' attitudes toward and ownership of animals in their responsiveness to the presence of the dog, because two of our proposed rationales suggest that participants' attitudes toward animals and experiences of having their own animals would be relevant to any bias-reducing effects of dogs.

Methods

Participants

Participants were 314 individuals recruited through Amazon's Mechanical Turk (MTurk) (www.mturk.com/mturk/welcome). MTurk is an online workforce where "requesters" can post

tasks, including surveys, for people to complete in exchange for small sums of money (see Buhrmester, Kwang, & Gosling, 2011 and Horton, Rand, & Zeckhauser, 2011, for more on the use of MTurk in social science research). In exchange for their participation, each participant received 65 cents, in accordance with standard pay rates for social science surveys on MTurk. Participants provided informed consent by completing a consent form at the beginning of the study.

Participants ranged in age from 18 to 70 years (M = 33.98, SD = 10.34). Of the 314 participants, 184 (59%) identified as male, 128 (41%) as female, and two (1%) as "other" /declined to report gender.[2] The racial/ethnic breakdown of the sample was as follows: 255 participants (81%) identified as White, 20 (6%) as Hispanic/Latino, 16 (5%) as Asian, 15 (5%) as African American, 6 (2%) as "other," and two participants (1%) declined to report ethnicity. Participant self-reported body mass index (BMI) ranged from 11.16 to 51.49 (M = 26.73, SD = 6.26), with 52.9% of participants meeting the CDC criteria for overweight/obesity. The majority of participants (221, 70%) had pets at the time of the study, and 149 (48%) had dogs specifically.

Stimuli and Study Conditions

Two sets of original photographs were developed for the present study. The photographs were produced using procedures approved by the Institutional Review Board and Institutional Animal Care and Use Committee of Yale University. The photographs featured human models who were hired through Craigslist, and dog models who were volunteered to participate by their human guardians. Each set of stimulus photographs included one human model and one dog model. Both human models were Caucasian females with overweight (BMI ≥ 25). The human models were photographed with relaxed expressions. Pilot testing was conducted with images of the human models standing alone to confirm that both models were perceived as overweight by naïve observers. The dog models were Labrador mixes of similar size and coloring.

Each set of stimulus photographs included three images corresponding to the three conditions. The first (experimental) condition featured the human model standing with the dog model on her right side. The second condition featured the human model standing with a plant on her right side. The plant was included to rule out the possibility that the presence of any novel and attractive object might reduce weight bias (Lohr, 2010). The third condition featured the human model standing alone. This condition was included to establish a baseline against which the dog and plant conditions could be compared, and to control for the effects of merely participating in the experiment. Each participant was presented with one image of one of the two human models standing either 1) with a dog, 2) with a plant, or 3) alone. All study images are available from the first author.

Measures

Fat Phobia Scale (Short Form):[3] A primary goal of this study was to determine whether the presence of a dog reduces endorsement of weight-related stereotypes. The Fat Phobia Scale (Short Form) was used to assess stereotypes associated with individuals who have overweight. Participants are asked to make evaluations using pairs of bipolar adjectives (e.g., lazy vs. industrious), with each adjective pair querying components of weight-related stereotypes (Bacon, Scheltema, & Robinson, 2001). Ratings are made on a 5-point scale, and there are a total of 14 items, which yield a single sum score. The short form shows high correlation with the original 50-item scale, and has established construct

validity (e.g., Bacon et al., 2001; Durso et al., 2012; Robinson, Bacon, & O'Reilly, 1993). Internal consistency (Cronbach's alpha) for the Fat Phobia Scale in the present investigation was 0.92.

Semantic Differential: The Evaluative dimension of the Semantic Differential (henceforth: Semantic Differential) was used to evaluate whether the presence of a dog enhances overall evaluations of individuals with overweight (Osgood, Suci, & Tannenbaum, 1957). Like the Fat Phobia Scale, the Semantic Differential consists of pairs of bipolar adjectives (e.g., pleasant vs. unpleasant). Participants are asked to indicate where on a 7-point scale (with each adjective representing one of the two polar options) best reflects their impressions of the person in the image. The Evaluative dimension includes five items and yields a single sum score. The Semantic Differential is commonly used to measure overall attitudes toward stigmatized individuals, and there are extensive reliability and validity data available for it (e.g., Kroska & Harkness, 2006; Osgood et al., 1957; Panek & Jungers, 2008). Cronbach's alpha for the Semantic Differential was 0.91.

Social Distance Scale: The Social Distance Scale was included to evaluate the prediction that participants would show less desire for avoidance from individuals with overweight when these individuals were accompanied by dogs. The Social Distance Scale in the present study was adapted from measures of social distance used in studies of mental illness stigma, and has been used in prior studies to evaluate the desire for social distance from individuals with overweight (e.g., Pearl, Puhl, & Brownell, 2012). Participants are asked to rate their agreement with statements intended to query their willingness to interact (e.g., "I wouldn't mind being friends with the person in this photo"), using a 5-point Likert scale. The Social Distance Scale includes six items and yields a single sum score. Cronbach's Alpha for the Social Distance Scale was 0.93.

Participant Body Composition and Perceived Weight: The actual BMI and perceived weight of participants are related to weight bias, and were included to explore the possibility that the influence of the dog on weight bias might vary based on participants' own actual or perceived body composition (Schwartz et al., 2006). BMI was assessed using self-reported height and weight, and computed using the procedures described by the U.S. Centers for Disease Control (CDC) (Centers for Disease Control and Prevention, 2015).[4] Perceived weight was assessed with the following item: "Do you consider yourself to be overweight, underweight, or about the right weight?" (Chang & Christakis, 2003).

Pet Attitude Scale-Modified: Two of the three proposed rationales for the predicted influence of dogs on weight bias might be contingent on participants' attitudes toward animals. To explore this possibility, we included The Pet Attitude Scale-Modified (PAS-M). The PAS-M is an 18-item measure of attitudes toward companion animals. Participants are asked to rate their agreement with each item (e.g., "I love pets") using a 7-point Likert scale, ranging from "Strongly Disagree" to "Strongly Agree" (Munsell, Canfield, Templer, Tangan, & Arikawa, 2004; Templer, Salter, Dickey, Baldwin, & Veleber, 1981). The PAS-M has high test-retest reliability and demonstrated construct validity (e.g., Brown, 1999; Schenck, Templer, Peters, & Schmidt, 1994; Templer et al., 1981; see Munsell et al., 2004, for further details of the psychometric properties of the PAS-M). Cronbach's alpha for the PAS-M was 0.90.

Results

Preliminary Analysis

We conducted preliminary analyses to check that participants in the three conditions did not differ on demographic or background variables. Chi-square tests of independence confirmed that the three groups did not differ in terms of gender, ethnicity, religious affiliation, perceived weight, or current or past pet ownership. A one-way Analysis of Variance (ANOVA) showed that participants also did not differ in terms of age, BMI, or attitudes toward animals.

We additionally examined the correlations among our outcome measures in order to test for the predicted associations among these measures and to rule out the possibility of redundancy of measures. We expected that responses on the three outcome measures would be associated with each other, but not redundant. We used Pearson Product-Moment Correlations with a threshold of 0.71 (indicating a shared variance of 50%) to check for redundancy of measures. The Fat Phobia Scale was significantly related to both the Semantic Differential ($r_{(290)} = 0.43$, $p < 0.001$) and the Social Distance Scale ($r_{(290)} = 0.41$, $p < 0.001$). The Semantic Differential and the Social Distance Scale were also significantly related ($r_{(303)} = 0.57$, $p < 0.001$). These correlations show that, as expected, all three measures were significantly related, but not redundant.

We then checked for differences on the three outcome measures based on which of the two models participants viewed. Independent samples t-tests revealed that scores on the Fat Phobia Scale ($t_{(312)} = 3.04$, $p = 0.003$, Cohen's $d = 0.34$), and the Social Distance Scale ($t_{(312)} = 2.01$, $p = 0.046$, $d = 0.23$), differed significantly depending on which human model participants saw. Participants showed greater fat phobia scores in response to Model A ($M = 54.24$, $SD = 8.50$), compared with Model B ($M = 51.27$, $SD = 8.85$), and greater desire for social distance from Model A ($M = 13.26$, $SD = 5.02$), compared with Model B ($M = 12.11$, $SD = 5.07$).[5] As a result, model was included as a factor for the analyses involving the Fat Phobia Scale and the Social Distance Scale. Scores on the Semantic Differential did not differ significantly between the two models ($t_{(310)} = 0.23$, $p = 0.82$).

Effects of the Presence of a Dog

We predicted that the presence of a dog would reduce endorsement of weight-related stereotypes. We used a two-way (Condition x Model) ANOVA to examine the influence of the presence of a dog on scores on the Fat Phobia Scale. Contrary to our hypothesis, the results of this two-way ANOVA showed no significant effect of condition ($F_{(2, 308)} = 0.45$, $p = 0.64$, $\eta_p^2 = 0.003$) and no Condition x Model interaction ($F_{(2, 308)} = 1.06$, $p = 0.35$, $\eta_p^2 = 0.007$). The results of the analysis for Fat Phobia did not show an effect of the dog on weight bias compared with either of the control images.

The second hypothesis was that the presence of a dog would improve overall evaluations of individuals with overweight. We used a one-way ANOVA to evaluate the influence of condition on Semantic Differential scores. Again, contrary to our hypothesis, this one-way ANOVA revealed no significant effect of condition ($F_{(2, 309)} = 0.47$, $p = 0.63$, $\eta_p^2 = 0.003$). As with Fat Phobia, our analysis did not show an effect of the dog on general evaluations of the models in our investigation.

The final hypothesis was that the presence of a dog would reduce the desire for social distance from individuals with overweight. We evaluated the influence of condition on scores on the Social Distance Scale using a two-way (Condition x Model) ANOVA. This ANOVA also revealed no significant effect of condition ($F_{(2, 308)} = 1.85$, $p = 0.16$, $\eta_p^2 = 0.01$). The Condition

x Model interaction also was not significant ($F_{(2, 308)} = 0.17$, $p = 0.85$, $\eta_p^2 = 0.001$). This analysis indicates that when the models were accompanied by the dogs, participants were no more willing to interact with the models than they were in either of the two control conditions.

To address possible concerns about our ability to detect the effects of the presence of the dogs, we conducted a power analysis using G* Power 3.1 Statistical Power Analysis Software (Faul, Erdfelder, Lang, & Buchner, 2007). This analysis indicated that given our sample size and study design, we had a 95% chance of detecting a small effect of the dogs. In combination with the sizes of the effects observed in our investigation, this power analysis suggests that it is unlikely that our failure to detect an effect of the dogs is due to issues of statistical power or sample size.

Supplementary Analysis

We explored the role of participants' self-reported BMI and perceived weight status in their evaluations of the models in our investigation. BMI was positively correlated with the perception of oneself as overweight ($r_{(311)} = 0.67$, $p < 0.001$) and negatively correlated with the perception of oneself as underweight ($r_{(311)} = –0.21$, $p < 0.001$). BMI was negatively correlated with scores on the Social Distance Scale ($r_{(311)} = –0.14$, $p = 0.01$) such that higher BMI was associated with less desire for social distance. BMI was not significantly correlated with scores on the Fat Phobia Scale ($r_{(311)} = –0.04$, $p = 0.46$) or Semantic Differential ($r_{(310)} = 0.01$, $p = 0.84$). As with BMI, perceiving oneself as overweight was negatively correlated with scores on the Social Distance Scale ($r_{(312)} = –0.11$, $p = 0.04$), but was not significantly correlated with scores on the Fat Phobia Scale ($r_{(312)} = –0.07$, $p = 0.24$) or the Semantic Differential ($r_{(310)} = 0.02$, $p = 0.69$). Perceiving oneself as underweight was not significantly correlated with any of the three outcome measures. In light of the fact that both BMI and the perception of being overweight were associated with the Social Distance Scale, we conducted an additional two-way (Condition x Model) ANOVA, with BMI and the perception of being overweight entered as covariates. However, even after adjusting for participants' actual and perceived weight status, there was no significant effect of condition ($F_{(2, 305)} = 1.96$, $p = 0.14$, $\eta_p^2 = 0.01$) and no significant Condition x Model interaction ($F_{(2, 305)} = 0.25$, $p = 0.78$, $\eta_p^2 = 0.002$). Accounting for the effects of participants' own weight status did not alter the pattern of results.

We additionally explored the role of participants' attitudes toward animals and experience of having pets among participants in the dog (experimental) condition. Among participants who viewed images of the models with the dogs, scores on the PAS-M were negatively correlated with scores on both the Semantic Differential ($r_{(103)} = –0.27$, $p = 0.006$) and the Social Distance Scale ($r_{(103)} = –0.24$, $p = 0.02$), but were not significantly correlated with the Fat Phobia Scale ($r_{(103)} = –0.16$, $p = 0.11$). Across all conditions, PAS-M scores were positively correlated with having animals at the time of the survey ($r_{(312)} = 0.47$, $p < 0.001$) as well as having animals in the past ($r_{(312)} = 0.43$, $p < 0.001$). In addition, PAS-M scores were significantly correlated with having dogs specifically, at the time of the survey ($r_{(312)} = 0.33$, $p < 0.001$) and in the past ($r_{(312)} = 0.22$, $p < 0.001$).

Having a dog in the present or past, and having any kind of pet in the present or past were not significantly correlated with any of the three outcome variables. However, because of the significant correlation between PAS-M scores and scores on the Semantic Differential and Social Distance Scale among those in the dog condition, we conducted an additional one-way ANCOVA for Semantic Differential scores, and an additional two-way (Condition x Model) ANCOVA for Social Distance Scale scores, with PAS-M scores entered as a covariate in each

case. In both cases the pattern of results persisted: for Semantic Differential scores, there was no significant main effect of Condition, and for Social Distance Scale scores, there was no significant main effect of Condition and no significant Condition x Model interaction. To further explore the possibility that the effect of dogs on weight bias might be limited to individuals with positive attitudes toward animals, we additionally evaluated the effects of condition on Semantic Differential and Social Distance among only those participants who demonstrated positive attitudes toward animals (which we determined by taking a median split of PAS-M scores and including only those participants in the top half). Even among participants who showed positive attitudes toward animals, the effect of condition was not significant. These findings show that among participants who saw the model standing with the dog, those who had more positive attitudes toward animals viewed the model more positively, and were more willing to interact with them than participants who had less positive views of animals. However, accounting for these effects did not change the pattern of results.

Discussion

We found that individuals with overweight were perceived similarly, regardless of whether or not they were accompanied by a dog. We found no evidence that the presence of a dog influences perceptions of individuals with overweight. Participants did perceive the models in our investigation differently depending on their own weight status and attitudes toward animals. However, even accounting for those factors, we found no differences based on whether or not there was a dog present. Our findings contrast with those of previous studies showing that animals enhance perceptions of psychotherapists, police officers, individuals with physical disabilities, prospective romantic partners, and even products and newspaper headlines (e.g., Giacomantonio et al., 2014; Schneider & Harley, 2006; Tifferet et al., 2013).

Although we found no effect of dog presence, we did find that endorsement of weight-related stereotypes and desire for social distance differed based on which model participants viewed. Participants endorsed more weight-related stereotypes and were less willing to interact with the model who had a higher BMI. This is important because it conveys that our failure to detect an effect was not simply due to issues with the sensitivity of our measures or our design. Participants did differentially endorse weight bias in response to differences in model weight, but not in response to dog presence.

Our findings convey that the influence of animals on attitudes and perceptions may be more circumscribed than prior work suggests. It may be that the effect of animals on attitudes and perceptions is not strong enough to extend to especially pervasive or explicit forms of bias, such as weight bias (Puhl & Brownell, 2003). Similarly, the fact that weight-related stereotypes are widely and openly endorsed might make this form of bias resistant to the positive effects of dogs (Tomiyama & Mann, 2013). Some support for this possibility comes from the fact that in the dog condition, attitudes toward animals were correlated with general evaluations and desire for social distance, but not weight-related stereotypes. However, we cannot conclude based on this single investigation that there is not an effect of dogs on weight bias. In particular, our study bears two important limitations that may have prevented us from detecting the effect of dogs on weight bias, if such an effect exists.

First, it is possible that that our stimuli did not optimally represent the predicted effects of dogs on weight bias. Our stimuli depicted the human models with the dog models standing at their sides. It may be that a stronger display of the human–animal bond (e.g., the person petting, holding, or otherwise actively engaged with the dog) would have an effect on

perceptions of the person. However, we elected to have the dogs standing with the human models based on prior findings that models standing and/or sitting with a dog are perceived more positively than models standing or sitting with flowers, or standing or sitting alone (Rossbach & Wilson, 1992).

The second limitation is that all three of our outcome measures were self-report measures, and these measures were relatively obtrusive (i.e., it was evident from the questions that we were interested in participants' attitudes toward the models, and in weight bias in particular). This is an important limitation in light of theories of cognitive processing (Kazdin, 2016). These theories suggest that environmental stimuli can influence individuals' judgments and behaviors without the person being consciously aware of the influence (Bargh, 2002). This type of automatic processing is more likely when participants have to make relatively fast judgments of ambiguous situations, without being aware of the automatic influence of environmental stimuli (Bargh, Chen, & Burrows, 1996). Our investigation likely evoked deliberate (rather than automatic) processing of the presence of human and dog models. If dogs influence weight bias through an automatic process, our study, with its relatively obtrusive measures and stimuli, would have been unlikely to elicit that effect. However, it is unlikely that the influence of dogs on attitudes and perceptions operates through exclusively automatic processes. Numerous investigations have documented influences of dogs on attitudes and perceptions across a range of populations using paradigms similar to ours (e.g., Rossbach & Wilson, 1992; Schneider & Harley, 2006; Tifferet et al., 2013).

In addition to addressing the two limitations noted above, future research should attempt to identify the populations and circumstances for which the effects of animals on attitudes and perceptions are most potent. Specifically, studies that identify moderators of these effects will be useful in increasing our understanding of the effects and in guiding further research in this area. Examples of possible moderators include the species of the animal present, the identity of the human model, and the gender of the viewer or model. Promising avenues where dogs may be more likely to influence attitudes include perceptions of individuals of different cultural backgrounds, gender identities, and even political parties.

We tested the influence of the presence of a dog on general evaluations, endorsement of weight-related stereotypes, and desire for social distance in response to images of models with overweight. We did not find evidence for an effect of dog presence on any of the three outcome measures. This pattern of results persisted even when we adjusted for participants' attitudes toward animals and their own actual and perceived weight status. Our findings conflict with the existing literature supporting the influence of animals on attitudes and perceptions, and provide an important caution against assuming that previously observed effects of animals on attitudes will generalize across settings, stimuli, and populations (Greenwald, 1975). We hope that these findings will stimulate discussion and further investigation into the circumstances under which animals do influence attitudes, perceptions, and related outcomes. Animals are already used widely to influence and enhance perceptions, and information on the conditions under which that influence operates may be leveraged to improve attitudes toward individuals with stigmatized identities, reduce discrimination, increase intergroup cooperation, and achieve a range of other desirable outcomes.

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Conflict of Interest

The authors report that they have no affiliations or involvement with any organization or entity with any financial or non-financial interest in the material discussed in this manuscript.

Notes

1. Overweight refers to the condition of having excess body fat beyond what is healthy (WHO, 2014). Overweight and obesity are commonly evaluated based on body mass index (BMI), with overweight referring to BMI's of 25 through 29.9, and obesity referring to those of 30 and above (National Institutes of Health, 2012). For the purpose of clarity and brevity, we use the term "overweight" to refer to individuals who have a BMI of 25 or above. In addition, we refer to people who "have" overweight and obesity, rather than people who "are" overweight or obese, in accordance with current guidelines on the use of person-first language for obesity (Obesity Action Coalition, 2017).
2. Due to standard rounding, percentages for participant demographics may not add up to 100.
3. We prefer the term "weight bias" to "fat phobia," but use the proper noun "Fat Phobia" to refer to the measure for consistency with other uses of this same scale.
4. The CDC formula for BMI is as follows: weight(kg) / height(m)^2.
5. We additionally conducted the analyses for the Fat Phobia Scale and Social Distance Scale collapsing across Model, and found the same pattern of results as when Model was included as a factor.

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