

The Influence of Social Power on Weight Perception

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Three studies explored whether social power affects the perception of physical properties of objects, testing the hypothesis that the powerless find objects to be heavier than the powerful do. Correlational findings from Study 1 revealed that people with a low personal sense of power perceived loaded boxes to be heavier than people with a high personal sense of power perceived them to be. In Study 2, experimentally manipulated power indicated that participants in the powerless condition judged the boxes to be heavier than did participants in the powerful condition. Study 3 further indicated that lacking power actively influences weight perception relative to a neutral control condition, whereas having power does not. Although much research on embodied perception has shown that various physiological and psychosocial resources influence visual perception of the physical environment, this is the first demonstration suggesting that power, a psychosocial construct that relates to the control of resources, changes the perception of physical properties of objects.

Keywords: power, perception, economy of action, weight perception

Power tires only those who do not have it.

—Giulio Andreotti

The statement above was made by former Italian prime minister Giulio Andreotti when asked how he managed to survive in power for so long. He might have been right, because there is evidence that powerless people, relative to powerful people, see life as more challenging because of their lack of control over conditions in the world around them. But does power literally change people's perception of their physical environment, thus making it appear more or less challenging? In the current research, we investigated this question by examining the effect of power on the perception of physical weight.

A recent approach originating within ecological psychology (Gibson, 1979) assumes that observers' perceptions of a given environment is affected by their capacity to navigate and act in it (Proffitt, 2006). Power is a key social factor that determines individuals' resource availability: The powerful live in constraint-free environments with access to plentiful rewards such as financial resources, physical comforts, and social recognition, whereas the powerless live in uncertainty, constrained by the powerful who control access to these resources (Emerson, 1962; Fiske, 1993; Keltner, Gruenfeld, & Anderson, 2003). This suggests that social power has the potential to influence the way in which people perceive the physical environment. We propose that a powerless person will find a task at hand more challenging than a powerful person will because of the lack of control over resources, opportunities, and rewards. Thus, powerless people, in comparison to powerful peo-

ple, should see the physical world as a reflection of the difficulties posed by their lack of action possibilities.

Power and Cognitive Processing

Differences in environmental control between the powerful and powerless have been shown to influence a variety of cognitive processes. For example, powerless people are less cognitively flexible than powerful people are, because they attend to both peripheral and central attributes of tasks in an attempt to increase predictability in a given situation (Guinote, 2007). Further, for powerless individuals, the inability to discern goal-relevant information impairs central aspects of executive functioning, including updating or inhibiting information (Smith, Jostmann, Galinsky, & van Dijk, 2008).

However, there are situations in which the vigilant processing style resulting from a lack of power can operate advantageously. For example, powerless individuals' habit of carefully scrutinizing their environment (Keltner et al., 2003) can enhance their performance in psychophysical tasks that require thorough scanning and discrimination of different physical features (Weick, Guinote, & Wilkinson, 2011). Similarly, powerless individuals are better at estimating task completion times compared with powerful individuals, who focus too narrowly on the envisaged goal and ignore information that could make their predictions more accurate (Weick & Guinote, 2010). Thus, power differences can have a significant impact on various cognitive processes. We suggest that in addition, power may also influence the perception of the physical environment, especially aspects of perception that relate to assessing or lacking resources.

Perception and Resources

The economy of action account attributes a central role to the availability of resources when it comes to the perception of the physical environment (Proffitt, 2006). According to this view, visual perception reflects the perceiver's ability to carry out a

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specific action at a given time, in a given space. Previous work indeed has shown that perceivers' physiological resources and potential for action influence the perception of spatial properties, including distance, slant, and size (Proffitt, 2006; Proffitt & Linkenauger, 2013; Witt, 2011). For instance, when a person is wearing a heavy backpack, fatigued, or in declining health, a hill slant is perceived to be steeper (Bhalla & Proffitt, 1999). Similarly, intake of glucose, which directly supplements the body's energetic resources, influences hill slant estimates (Schnall, Zadra, & Proffitt, 2010): Participants who consumed glucose rather than noncaloric sweetener prior to a hill estimation task judged the slant to be less steep.

Further, psychosocial resources have been shown to moderate perception of the physical world. Participants accompanied by a friend, a form of social support, estimated a hill to be more shallow than participants who were alone did (Schnall, Harber, Stefanucci, & Proffitt, 2008). Similarly, participants expecting to lift a box with another participant, as opposed to participants expecting to lift a box alone, judged its weight to be lighter prior to lifting (Doerrfeld, Sebanz, & Shiffrar, 2012). Further, participants who listened to sad music or wrote about a negative personal experience judged a hill to be steeper than did participants who listened to happy music or wrote about a positive personal experience (Riener, Stefanucci, Proffitt, & Clore, 2011). As a self-relevant resource, self-worth has been found to make disturbing baby cries less unpleasant (Harber, Einav-Cohen, & Lang, 2007) and make threatening objects such as a live tarantula appear to be less close to one's face (Harber, Yeung, & Iacovelli, 2011). As shown, the resources and perception model put forward by Harber et al. (2011) suggests that self-relevant resources change perception. Indeed, by definition, power implies the presence or absence of resources as a result of an imbalance in social control and therefore has the potential to shape people's view of the physical environment.

Present Research

Because the powerful have control over their own and others' resources, whereas the powerless depend on the control of the powerful, the powerless compared with the powerful should experience a lower potential for future actions, which should result in a task at hand being perceived as more challenging. Thus, powerless people should perceive objects they lift to be heavier than powerful people perceive them to be. The investigation began by observing the relationship between individuals' personal sense of power and their weight estimates of heavy boxes (Study 1). Then we experimentally manipulated power and tested the effect on weight estimates (Study 2). Last, we investigated whether the effect was due to the powerful or the powerless condition relative to a neutral control condition (Study 3).

Study 1

As a first step, we tested the link between individual differences in people's experience of social power, self-reported on the personal sense of power (PSP) questionnaire (Anderson, John, & Keltner, 2012) and weight estimates of boxes filled with books. We predicted that people with a high sense of power should perceive boxes as lighter than people with a low sense of power do.

Method

Participants. We recruited 145 participants (67 men; $M_{\text{age}} = 32.08$ years, $SD = 12.02$) through opportunity sampling on the campus of the University of Cambridge; they participated in exchange for a chocolate bar.¹ One participant was excluded from analysis because her weight estimate was an outlier, with a standardized residual of more than 3 and Cook's distance of more than 1.

Weight estimation. The stimuli were two beige cardboard boxes (length = 38.5 cm, width = 27 cm, height = 15 cm) loaded with 2.0 lb or 8.2 lb of books. Weight estimates were reported on a rating scale ranging from 0 lb to 15 lb, with 1-lb increments.

PSP. The PSP index developed by Anderson et al. (2012) measures individuals' generalized beliefs about their power in social relationships with others. Participants rated their agreement with eight items (e.g., "In my relationships with others, I can get people to listen to what I say") on a scale from 1 (*strongly disagree*) to 7 (*strongly agree*).

Mood measure. For a subset of participants ($n = 93$), we also included a mood questionnaire (as previously used by Schnall et al., 2008), wherein they rated their mood (*happy*, *anxious*, *stressed*, *depressed*, *angry*, and *sad*) from 1 (*not at all*) to 5 (*a great degree*).

Procedure. Participants for a study on perceptual estimates were recruited from passersby on the campus of the University of Cambridge. For the weight estimation, participants were standing and put out their hands in front of them. They were first given a cardboard box weighing 1 lb as reference weight. Then the experimental weights or the PSP were given, in a counterbalanced order. After the experimenter placed the box on a participant's hands, he or she gave a nod when ready to give the weight estimate. Then the experimenter took away the box and provided the participant the weight estimate rating scale. The mood scale was completed at the end. Before debriefing, participants were orally probed for suspicion regarding the study purpose by having the experimenter ask open-ended questions; nobody discerned the hypothesis.

Results and Discussion

Weight estimates across the two different weights were averaged, and this composite was correlated with participants' PSP questionnaire composite ($\alpha = .77$). There was a significant negative correlation between weight estimates and PSP, $r(142) = -.24$, $p = .004$ (two-tailed), suggesting that the lower a person's general feelings of power, the higher the weight estimates (see Figure 1).

To check whether gender or task order moderated the relationship, gender, order, and their interaction terms with mean-centered PSP were added to a regression predicting the relationship between PSP and weight estimates. There was no effect of either variable, $ps < .26$, nor were there interactions for Gender \times Power, $\beta = -.14$, $p = .10$ or Order \times Power, $\beta = -.10$, $p = .25$, but the effect of PSP remained significant, $\beta = -.24$, $p = .004$. Mood was added for participants who completed this measure, but there was

¹ In a pilot study ($n = 53$), we observed $r = -.23$ between weight estimates and PSP. Using the R software, we calculated the sample size for the main study given this effect size with power = .8 and $\alpha = .05$.

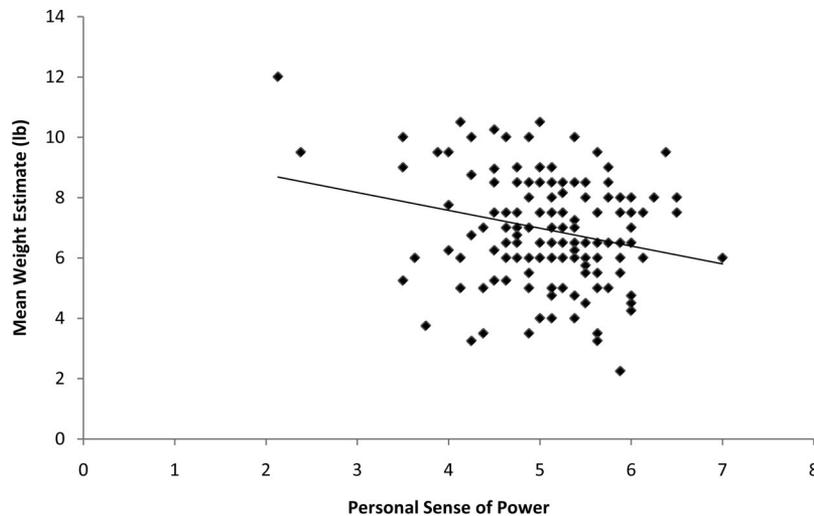


Figure 1. Scatter plot (with best fitting regression line) showing the association between personal sense of power, with higher numbers indicating a greater sense of power, and mean weight estimates across two weights.

no effect, $\beta = -.03$, $p = .81$, and PSP remained significant, $\beta = -.28$, $p = .03$.² Thus, people with a low PSP perceived loaded boxes to be heavier than people with a high PSP did. However, other coexistent traits could have played a role. The next study, therefore, tested the link between power and weight perception experimentally.

Study 2

Power was directly manipulated to observe its causal effect on weight perception. Because adopting either an expansive (i.e., high-power) or a constricted (i.e., low-power) posture is highly effective in manipulating power (Carney, Cuddy, & Yap, 2010; Huang, Galinsky, Gruenfeld, & Guillory, 2011), we used this method. The same set of experimental weights was lifted twice, with powerful or powerless postures administered in between. To ensure that a possible change in weight perception could be attributed only to the power manipulation, we assessed the perceived comfort and difficulty of these postures.

Method

Participants. We recruited 41 participants (24 men; $M_{\text{age}} = 28.24$ years, $SD = 8.76$) on the campus of the University of Cambridge, who participated in exchange for a chocolate bar.

Weight estimation. Three beige cardboard boxes (length = 41 cm, width = 34 cm, height = 25.5 cm) weighing 3.9 lb, 6.5 lb, and 9.2 lb were given to participants for weight estimates in different orders before and after the power manipulation. The same rating scale as in Study 1 assessed weight estimates.

Power manipulation. Following Carney et al. (2010) and Huang et al. (2011), participants were seated on an ergonomic office chair. Participants in the high-power condition held an expansive posture, placing one arm on the armrest of the chair and the other arm on the desk nearby while crossing their legs such that the ankle of one leg rested on the thigh of the other leg (i.e., stretching beyond the edge of the chair). Participants in the low-

power condition held a constricted posture, placing hands under their thighs, with shoulders dropped and legs placed together. Postures were maintained for 3 min.

Comfort and difficulty of posture. Three items asked about chair comfort and difficulty and discomfort of the posture on a 7-point scale (1 = *not at all* to 7 = *very strongly*).

Procedure. Participants were led to believe that the study examined ergonomics of work environments, with a task involving lifting boxes and another testing an ergonomic chair, which was actually the power manipulation. Participants were given the reference weight of the 1-lb box and then estimated the weights of the three experimental boxes in a fixed random order. To conceal that participants would lift the same weights again, they were told that there would be a short break in the middle of the box-lifting task involving the “ergonomic chair task,” the power manipulation, to prevent any physical stress from having lifted several boxes. After the manipulation and the questionnaire on perceived comfort and difficulty of the postures, participants gave weight estimates of a different set of boxes in a different fixed random order. Before debriefing, participants were probed for suspicion as in Study 1; nobody discerned the hypothesis.

Results and Discussion

Comfort and difficulty of posture. Participants’ reported comfort of the chair, $t(39) = 1.17$, $p = .25$; posture difficulty, $t(39) = -0.11$, $p = .91$; and discomfort, $t(39) = -0.47$, $p = .64$, did not differ between the high-power and low-power conditions.

Weight estimation. As predicted, a 2 (Condition: high power, low power) \times 2 (Order: before, after) \times 3 (Weight: 3.9 lb, 6.5 lb, 9.2 lb) mixed analysis of variance (ANOVA) revealed a significant interaction of Condition \times Order on the weight estimates, $F(1, 39) = 5.08$, $p = .03$, $\eta_p^2 = .12$. This showed that the weight

² Happiness was reverse coded and a composite was formed with all mood items ($\alpha = .81$)

estimates in the high-power condition were reduced from before the manipulation ($M = 6.98$ lb, $SD = 2.40$) to after the manipulation ($M = 6.24$ lb, $SD = 2.10$), whereas no such reduction occurred for the low-power condition (before: $M = 7.29$ lb, $SD = 2.25$, vs. after: $M = 7.51$ lb, $SD = 2.08$).³ The Condition \times Order \times Weight interaction was not significant, $F(2, 78) = 0.71$, $p = .50$, indicating no moderation by weight. To explore the extent to which judgment accuracy was influenced by the power manipulation, we subtracted the actual weights of the boxes from participants' weight estimates. As illustrated in Figure 2, on the baseline block, judgments generally overestimated the true weight of the boxes. However, after the manipulation, participants in the powerful condition provided relatively more accurate estimates, whereas participants in the powerless condition continued to provide inflated estimates.

Study 3

Having established the effect of a power manipulation on weight perception, we explored in Study 3 whether having power makes an object feel lighter or whether lacking power makes an object feel heavier, relative to a default state. Thus, a neutral control condition was added. In addition, to generalize the effect of social power beyond posture, we used a different type of power induction. Power was manipulated by asking participants to recall an experience involving either high power, low power, or an unrelated event (Galinsky, Gruenfeld, & Magee, 2003). As in Study 2, the same set of weights was given before and after the manipulation.

Method

Participants. Sixty-eight participants (32 men; $M_{\text{age}} = 25.09$ years, $SD = 6.14$), recruited on the campus of the University of Cambridge, participated in exchange for a chocolate bar. Participants were randomly assigned to one of the three power conditions. Five participants were excluded from the main analysis because one participant guessed the purpose of the experiment and the other four participants did not follow instructions.

Weight estimation. The same materials as in Study 2 were used.

Power manipulation. Following Galinsky et al. (2003), participants were asked to describe an event from their past in which they had power over someone (high-power condition), someone else had power over them (low-power condition), or write down details of a typical journey from home to their work place, as used previously by Schnall and Roper (2012) (control condition).

Procedure. As a cover story, the experiment was introduced as a study on the effect of everyday physical exercise on autobiographical memory. Instructions specified that there would be several short blocks of lifting boxes followed by a memory task after each block. Participants were again first given the reference weight of 1 lb. After the first block of weight estimates, participants received the recall task for the power manipulation, which was untimed. Then participants proceeded to the second block of weight estimates. At the end, participants were probed for suspicion regarding the study purpose and debriefed as in Studies 1 and 2.

Results and Discussion

As expected, a 3 (condition: high power, low power, control) \times 2 (order: before, after) \times 3 (weight: 3.9 lb, 6.5 lb, 9.2 lb) mixed ANOVA showed a significant Condition \times Order interaction, $F(2, 60) = 3.38$, $p = .04$, $\eta_p^2 = .10$, suggesting that the change of weight estimates differed as a function of power (see Figure 3).⁴ Follow-up planned contrasts confirmed that the change of estimates in the low-power condition (before: $M = 7.37$ lb, $SD = 2.43$, vs. after: $M = 7.53$ lb, $SD = 2.40$) differed significantly from the high-power condition (before: $M = 7.32$ lb, $SD = 2.16$, vs. after: $M = 6.42$ lb, $SD = 1.72$), $p = .03$, $d = 0.40$, and the control condition (before: $M = 7.62$ lb, $SD = 2.36$, vs. after: $M = 6.62$ lb, $SD = 2.13$), $p = .02$, $d = 0.45$, showing reduced weight estimates for the high-power and control conditions relative to the low-power condition. However, the high-power condition did not differ from the control condition, $p = .83$, $d = 0.04$. The Condition \times Order \times Weight interaction, corrected with the Greenhouse-Geisser index because of a violation of the sphericity assumption, was not significant, $F(3.59, 107.82) = 0.49$, $p = .72$, indicating no moderation by weight.

Figure 3 illustrates the extent to which estimates were accurate. As in Study 2, at baseline, all conditions overestimated the weights somewhat, whereas after the power and control manipulations, estimates were closer to the true weights. In contrast, participants in the powerless condition continued to overestimate the weights. The reduction of weight estimates observed in the neutral condition suggests that repeatedly lifting the same weights decreased the feeling of weight. In other words, both the high-power and the neutral conditions showed adaptation, with the same weights being perceived as less heavy over time, whereas the low-power condition did not. Thus, lacking power actively affected weight perception, whereas having power did not.

General Discussion

In three studies, we showed a link between social power and weight perception. The first study investigated the correlation between individual differences in subjective social power and weight estimates. We then examined the direct effect of different power manipulations on weight perception. Powerless people consistently perceived the weight of boxes as heavier than powerful people. Moreover, as demonstrated in Study 3, which compared the change in perceptual estimates of control participants to high-power and low-power participants, it was the lack of power that drove the effect.

Existing research shows that individuals' resources, whether physiological (Bhalla & Proffitt, 1999; Schnall et al., 2010) or psychosocial (Harber et al., 2011; Riener et al., 2011; Schnall et al., 2008) can influence visual perception (Proffitt & Linkenauger, 2013). Our studies further demonstrate that power, which drives

³ Another ANOVA was conducted with gender as additional independent variable. Although women generally gave higher weight estimates than men did, $F(1, 37) = 5.76$, $p = .02$, there was no Condition \times Order \times Gender interaction, $F(1, 37) = 0.12$, $p = .74$, but Condition \times Order remained significant, $F(1, 37) = 4.36$, $p = .04$.

⁴ Adding gender did not change the effect, $F(2, 57) = 3.86$, $p = .03$, nor did it involve an interaction of Condition \times Order \times Gender, $F(2, 57) = 0.61$, $p = .55$.

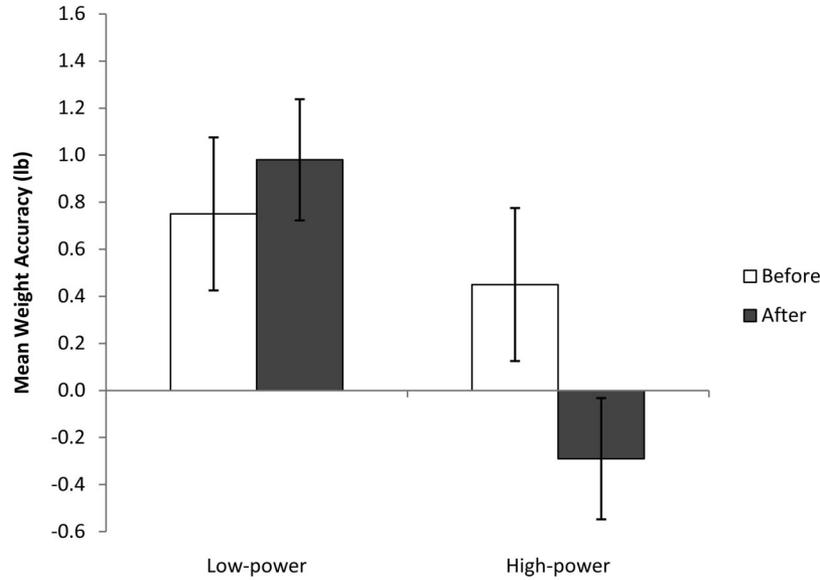


Figure 2. Accuracy of mean weight estimates (estimated weight minus actual weight) in Experiment 2 before and after power manipulation. Error bars represent within-subjects 95% confidence intervals.

potential strategies for gaining resources (Fiske, 1993), can affect the perception of physical properties of objects. Thus, these findings extend previously observed effects in visual perception to another important perceptual modality.

Our findings suggest that differences along the power continuum do not influence weight perception in a linear fashion. Rather, it was only the deficiency of power that impacted weight perception relative to a neutral state. This may be adaptive because people deprived of power will likely be unable to attain enough resources for difficult actions ahead. Consequently, it would be advantageous for powerless individuals to experience perceptual attributes of the world around them in an exaggerated fashion, so further activities would be discouraged with the ultimate goal of

preserving one's existing resources. This nonlinear effect also suggests that the effect was not simply due to cognitive priming of physical strength. If so, then participants in the powerful condition should have perceived weights as lightest and participants in the powerless condition should have perceived weights as heaviest with intermediate estimates for participants in the control condition. However, there was no difference between the powerful and control conditions in Study 3.

An important question concerns the potential mechanism that may be responsible for our observed effects. Recent research suggests that powerful people can more efficiently mobilize action-relevant bodily resources through an adaptive cardiovascular response consistent with experiencing a challenge, whereas

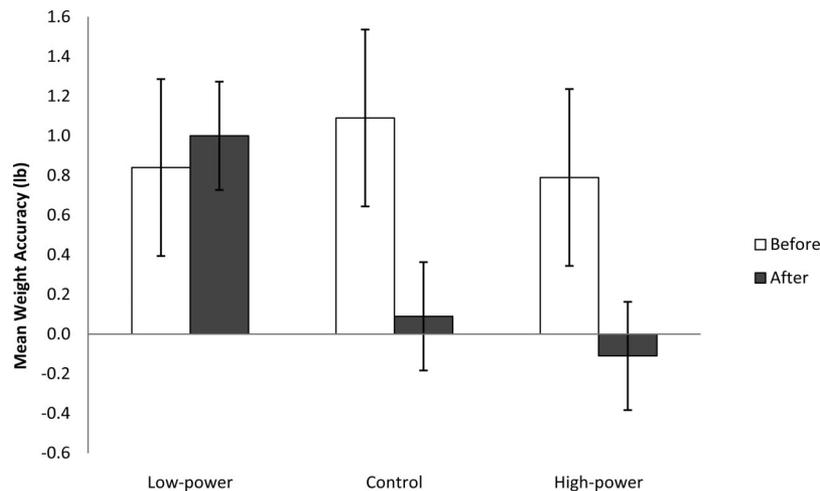


Figure 3. Accuracy of mean weight estimates (estimated weight minus actual weight) in Experiment 3 before and after power manipulation. Error bars represent within-subjects 95% confidence intervals.

powerless people show an inefficient cardiovascular pattern consistent with experiencing a threat (Scheepers, de Wit, Ellemers, & Sassenberg, 2012). This work is in line with the biosocial model of threat and challenge (e.g., Blascovich, 2008), which suggests that people interpret situational demands according to the resources available to deal with that situation. Thus, whereas participants in the powerful condition in Studies 2 and 3 gave lower estimates when lifting the weights for the second time, it is possible that the suboptimal cardiac pattern exhibited by powerless people prevented them from adapting to the weights over time.

In previous research, individual differences in physiological potential had been studied as singular factors that influence the visual perception by which elderly participants, as opposed to younger ones, overestimated the steepness of a hill slant (Bhalla & Proffitt, 1999). In addition, the present work for the first time demonstrates that differences in individuals' beliefs regarding their social role in relationships with others are also related to perception: Study 1 showed that people who reported a lower sense of power gave higher weight estimates. Our work thus expands existing findings on inherent physical characteristics such as age or fitness to other, personality-based individual differences, namely, those that are linked to aspects of power and social control, and we find that they equally shape the perception of the physical world.

Furthermore, such a role of individual differences on perception challenges the recent claim that demand characteristics might underlie previously reported effects of physical ability on perception (Durgin et al., 2009; Durgin, Klein, Spiegel, Strawser, & Williams, 2012). Such demand characteristics cannot account for the findings reported in the current article. For the correlational design of Study 1, it is unlikely that participants inferred how they should respond. Further, both Studies 2 and 3 provided sophisticated cover stories that concealed the purpose of the experiment. In particular, the posture manipulation used in Study 2 proved to be a potent method of inducing power while keeping participants unaware of this goal, which, according to postexperimental questioning, was achieved successfully both in our and in previous research using this method (Huang et al., 2011). Thus, results cannot be explained by demand characteristics but instead are consistent with the theoretical account of the economy of action and considerations that link individuals' bodily capabilities and their perception (Proffitt, 2006).

To conclude, the present work suggests that feeling powerless—whether because of inherent personality characteristic in dealing with others or because of having been conferred a disadvantageous social role—leads people to perceive objects differently, presumably because they are faced with challenges they lack the resources to overcome. The comment made by the former Italian prime minister Giulio Andreotti, that power only tires those who do not possess it, therefore is no longer an unsubstantiated conjecture: Our data suggest that the world of the powerless is indeed full of heavy burdens.

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