


# The Role of Conscious Attention in How Weight Serves as an Embodiment of Importance

Personality and Social  
Psychology Bulletin  
1–12  
© 2017 by the Society for Personality  
and Social Psychology, Inc  
Reprints and permissions:  
sagepub.com/journalsPermissions.nav  
DOI: 10.1177/0146167217727505  
pspb.sagepub.com  


Colin A. Zestcott<sup>1,2</sup>, Jeff Stone<sup>1</sup>, and Mark J. Landau<sup>3</sup>

## Abstract

Inconsistency among findings in the embodied cognition literature suggests a need for theoretical boundary conditions. The current research proposes that conscious attention of a bodily state can moderate its influence on social judgment. Three studies tested this possibility in the case of the demonstrated effect of weight sensations on judgments of an abstract idea's importance. Studies 1 and 2 showed that participants rated a topic as more important when holding a moderately heavy, compared with light, clipboard. However, when the clipboard was very heavy, participants rated the survey topic as less important compared with when the clipboard was moderately heavy. The differences in importance ratings were not caused by derogation of the topic or the activation of a different metaphor. In Study 3, the importance rating difference between light and moderately heavy clipboards was eliminated by explicitly drawing perceiver's attention to the clipboard's weight. Implications and future directions are discussed.

## Keywords

embodied cognition, weight, importance, conscious attention, replication

Received 1 July 2016; revised manuscript accepted 29 July 2017

“Over thinking, over analyzing, separates the body from the mind.”

—Tool, “Lateralus” (2001)

Research suggests that bodily experiences can unconsciously influence social cognition. For example, holding a warm cup of coffee increases perceptions of an individual's friendliness (Williams & Bargh, 2008), exposure to fishy smells increases social suspicion (Lee & Schwarz, 2012), and moving the head up and down leads to greater message agreement than shaking the head from side to side (Wells & Petty, 1980). However, several recent failed replications of embodiment effects (e.g., Ebersole et al., 2016; Johnson et al., 2016; Lynott et al., 2014; Open Science Collaboration, 2015; Wortman, Donnellan, & Lucas, 2014) raise questions about the when and how the body influences thought and behavior. The inability of independent tests to replicate could suggest that embodiment effects are “false positives” or that they emerge from questionable research practices (Bohannon, 2014). The inconsistent evidence has led some investigators to express doubts about the reliability and validity of embodiment processes.

Another way to view the inconsistent findings in the embodiment literature, however, is that the variability across studies reflects theoretically relevant moderators that have

yet to be identified. Building on theories of embodied cognition and automaticity, we propose that one such variable is conscious attention. Specifically, we hypothesized that contextual cues that draw attention to the use of a bodily state as a source of information will attenuate the effect of that bodily state on metaphorically related social judgments.

The current studies provide initial tests of this hypothesis, focusing on the well-known effect of weight sensations on judgments of the importance of abstract stimuli (e.g., social issues) that are not heavy or light in a literal sense. In the first demonstration of this effect, Jostmann, Lakens, and Schubert (2009) showed that participants rated abstract topics as more important when holding a heavy compared with a light clipboard. Subsequent studies, reviewed shortly, have mostly replicated this effect in other judgment contexts. However, as mentioned above, several studies have failed to replicate this effect, setting off a controversy about its validity (Ebersole et al., 2016; Rabelo, Keller, Pilati, & Wicherts, 2015).

<sup>1</sup>University of Arizona, Tucson, USA

<sup>2</sup>State University of New York at Geneseo, USA

<sup>3</sup>University of Kansas, Lawrence, USA

## Corresponding Author:

Colin Zestcott, Department of Psychology, State University of New York at Geneseo, 1 College Circle, Geneseo, NY 14454, USA.  
Email: zestcott@geneseo.edu

Now, as a participant in this type of study, imagine holding a clipboard that is so heavy, you think to yourself, “Wow, this is a heavy clipboard!” It is plausible that consciously processing the clipboard’s heft would prevent that sensation from serving as input into your judgment of the target topic’s importance. As a result, your importance rating would reflect the neutral or low importance that the issue typically brings to mind.

Although anecdotal, this scenario points to consciousness of a bodily state as one factor moderating when that state serves as the input to metaphorically related social judgments versus when a bodily state is just a bodily state. Evidence that drawing conscious attention to the body reduces the embodiment effect would not only answer the call of many scholars to identify theoretical boundary conditions of embodiment effects (e.g., Meier, Schnall, Schwarz, & Bargh, 2012), but by documenting boundary conditions, the present research may contribute to our understanding of failures to replicate embodiment findings.

## The Role of the Physical Body in Cognition

The conceptualization of a link between the body and the mind is not in its infancy. James (1884) postulated that the physical body is connected to emotional experiences. However, cognitive psychology in the mid-20th century argued for an amodal processing system in which semantic knowledge and higher level cognitions operate sovereignly of physical body states (e.g., Fodor, 1983; Newell & Simon, 1972). Amodal models assume that memory stores information in an abstract form that is largely unrepresentative of the physical body and perceptual states that produce it. However, these amodal models have, in turn, given way to new theories that reflect James’ original notions about the body–mind connection.

Recent theories postulate that knowledge may be embodied in physical states and in the brain’s modality-specific systems (Niedenthal, Barsalou, Winkielman, Krauth-Gruber, & Ric, 2005; Smith & Semin, 2004). One account of this relation is Barsalou’s perceptual symbols system (PSS; Barsalou, 1999, 2003, 2008). Concepts contain representations of bodily states, such as sensations, that occur during interactions with relevant stimuli and contexts. These inputs are not translated into abstract symbols but retain their modality-specific character (e.g., the concept *bowling* contains tactile sensations of a bowling ball’s smoothness). Thinking about those concepts involves the simulation, or reactivation, of those bodily states, even when the individual is not currently interacting with relevant stimuli. Damasio (2001) similarly proposed that reactivated bodily states, experienced as emotions, serve as a marker or cue that informs the person’s interpretation of the current situation. In this way, bodily states can inform representations of abstractions, with consequences for perception, judgment, and behavior.

Although the PSS explains how an individual may gain knowledge from concrete perceptual states, one potential limitation of the PSS concerns how knowledge is accrued for abstract domains, such as the concept of importance, in which a physical body referent is absent (see Borghi et al., 2016). Indeed, while we can feel a cup of coffee and experience physical warmth, how does one *touch* an abstract concept like importance? To bridge this gap, scholars have suggested that metaphor plays a central role in embodiment processes (Boroditsky & Prinz, 2008). According to conceptual metaphor theory (Lakoff & Johnson, 1980, 1999; Landau, Meier, & Keefer, 2010), the use of metaphor (e.g., “importance = weight”) can facilitate understanding of an abstract concept (perceptions of importance) when couched in a concrete physical experience (holding heavy weight) due to repeated co-occurrences. For example, as speculated by Jostmann et al. (2009), we may learn that working with heavy objects requires greater effort than light objects, which in turn, links concrete experience of weight to abstract concepts such as perceptions of importance. Hence, when an individual refers to an important issue as “heavy,” he or she is not saying that the issue is *literally* heavy in the haptic sense; the individual is referring to the physical bodily state of holding a heavy object to communicate that the topic possesses a high degree of importance. Consequently, metaphor may not serve merely to embellish language but rather function as a tool that shapes how individuals see and interpret the world.

## Weight as an Embodiment of Importance

The metaphorical expression of importance as weight permeates daily discourse. For example, important issues are often referred to as “heavy,” an influential individual’s opinions may “hold more weight” than a less influential person, some issues “weigh more” on our minds than others, and people “weigh” the value of different opinions before making a decision. Consistent with everyday vernacular, several studies indicate that holding a heavy weight can transfer over to increase the perceived importance of an abstract social stimulus. After Jostmann et al. (2009) reported that participants rated foreign currency and a campus issue to be more important when they rated the topics while holding a heavy clipboard compared with a light clipboard, Ackerman, Nocera, and Bargh (2010) reported that holding a heavy clipboard increased perceptions of a job applicant’s seriousness, and Kaspar (2013) reported that holding a heavy clipboard increased the perceived seriousness of a disease and drug side effects. In the food and hospitality domain, food presented in a heavy (compared with light) container is expected to be more satiating and expensive (Piqueras-Fiszman, Harrar, Alcaide, & Spence, 2011; Piqueras-Fiszman & Spence, 2012) and perceivers who hold heavier restaurant menus compared with lighter menus rate restaurants as being more upscale and providing better service quality (Magnini

& Kim, 2016). In an academic setting, Schneider, Rutjens, Jostmann, and Lakens, (2011) reported that individuals told that a textbook contains important information rated the textbook as weighing heavier than those who are not told about the textbook's importance. In a follow-up, Schneider, Parzuchowski, Wojciszke, Schwarz, and Koole (2014) reported that individuals who hold a USB stick presumably containing important tax information estimate the storage device to be heavier than those who are not told about information on the USB stick and those who are told the USB stick contains expired tax information.

Previous research has also documented moderators and boundary conditions for embodiment processes. Research by Ackerman and colleagues (2010) and Chandler, Reinhard, and Schwarz (2012), for example, reported that the weight of a clipboard only affected ratings of importance if participants had knowledge about the issue or topic being evaluated; the clipboard's weight did not influence judgments for participants unfamiliar with the topic. In a conceptual extension, Hauser and Schwarz (2015) reported that perceivers high in need for cognition rated a book as more important than those low in need for cognition when holding a heavy book and reading a brief plot synopsis, presumably because individuals highly motivated to elaborate sought information to confirm their metaphor-consistent hypothesis.

Despite the large number of findings suggesting the embodied relationship between weight and importance, as well as identifying moderating variables, several failed replications question the robustness of the basic weight as an embodiment of importance effect (e.g., Ebersole et al., 2016; Rabelo et al., 2015). These mixed results may be the result of unexamined moderators, one of which may be the degree to which observers are consciously aware of the bodily states they are experiencing in contexts of judgment and decision making. Previous research finds that individuals who are high in bodily awareness show increased embodied effects (Häfner, 2013; Schnall, Haidt, Clore, & Jordan, 2008). However, individuals may differ in their introspection without awareness reaching consciousness (Craig, 2004). Thus, experimentally manipulating conscious awareness may lend further insight into when embodiment effects on social judgments are attenuated.

Indeed, it is possible that conscious awareness of the use of the body as a source of information contributes to null findings in the literature. For example, one large project examining the replicability of a number of social psychological findings observed no effect of clipboard weight on ratings of importance (Ebersole et al., 2016). However, Ebersole et al. randomly embedded the clipboard study within the presentation of eight distinct computerized tasks. As such, it is possible that the novelty of the clipboard in the computer context drew participants' attention to the use of their body when completing the measure via paper-pencil. Another recent set of studies by Rabelo and colleagues (2015) failed to find increased clipboard weight influencing importance

judgments. Although Rabelo et al. in Study 1 used similar weights to those used in the studies by Ackerman et al. (2010), the heavy clipboard weights used by Rabelo et al. in Studies 2 and 3 were slightly heavier.

The mixed findings in the nonpublished online Psych File Drawer research archive may also provide some evidence that conscious awareness plays a role in replicating the weight-as-importance effect. For example, in one null finding, the manipulation of the light clipboard condition was a piece of paper on a clipboard whereas the heavy clipboard condition was manipulated by placing a notebook on the clipboard with the piece of paper (Hadley, Ring, Gold, & Daubman, 2013; also see Stewart, McVeigh, Stojkov, & Daubman, 2012). It is possible that perceivers were aware that the clipboard would be heavier than a nonmanipulated clipboard due to the addition of the notebook. Furthermore, an unsuccessful replication by Jostmann (2013) failed to find weight served as an embodiment of importance under conditions in which participants could visibly see the additional weight in the heavy clipboard and in another condition where the heft was heavier than the heavy clipboard manipulation in the original studies reported by Jostmann et al. (2009).

In sum, studies show mixed support for the weight-as-importance effect. Analysis of the procedures used across studies suggests that if something in the context draws conscious attention to the weight of an object, people will no longer use the weight sensation as a source of information when rating the importance of a target stimulus. This hypothesis coincides with theoretical perspectives proposing that consciously attending to a stimulus can prevent it from automatically informing information processing.

## Conscious Awareness in Embodied Cognition

Dual-process theories of social cognition assert that information processing falls along a continuum, from processing that is relatively automatic, effortless, and experiential to processing that is relatively deliberate, controlled, and rational (Chaiken & Trope, 1999; Stanovich & West, 2000). For example, it is well established that a persuasive message can be processed in a more heuristic fashion or in a more elaborative way that requires greater cognitive effort (Chaiken, 1980; Petty & Cacioppo, 1986); attitudes guide behavior automatically unless sufficient motivation and opportunity to act deliberately on an attitude exists (Fazio, 1990); people use salient category cues to form an impression of a target individual unless goals draw attention to that individual's attributes (Fiske & Neuberg, 1990); and evaluative responses are a product of the interplay between the activation of associations in memory and the validation of these associations (Gawronski & Bodenhausen, 2006).

The current research tests the idea that the body can automatically provide information in an implicit manner, but if something in the social context draws conscious attention to

what the body is sensing, conscious or explicit processing attenuates or eliminates the use of the body as information. The literature appears to assume that embodied effects are necessarily implicit; indeed, the PSS suggests that the default of the body when processing a concept is to simulate previous multimodal experiences pertaining to the concept (Niedenthal et al., 2005). This implies that body states influence metaphorically related cognition and behavior outside of conscious awareness, and they may operate primarily through experiential processes that encapsulate nonverbal information (Epstein & Pacini, 1999). People can literally think what they feel, smell, or hear.

However, as people consciously attend to the sensory information and become more analytical and deliberate in their thinking, attention shifts to the cognitive attributes of the stimulus and/or the judgment task. Drawing deliberate attention to the bodily state will increase the salience and relevance of other features in the environment, such as the content of a message presented on the clipboard. Consequently, rather than rely on the automatic or experiential processing that uses the body as a source of information, perceivers switch to controlled processing of other cues in the environment.

## The Current Research

The current set of three studies test the prediction that drawing a perceiver's conscious attention to their bodily states reduces embodied cognition effects. All three studies test the predictions made by the model using the weight-as-importance paradigm first established by Jostmann and colleagues (2009). The studies were designed to replicate the original effect when participants rated the importance of a neutral survey topic (funding for road infrastructure in Arizona) and modulate the effect by drawing conscious attention toward the heft of the clipboard.

In Study 1, participants rate the importance of funding for road infrastructure holding either a light, moderately heavy, or very heavy clipboard. Study 2 further examines the impact of conscious attention by including additional weight conditions and testing for the activation of a different metaphor (i.e., burden) as an alternate explanation. Study 3 examines weight as an embodiment of importance when participants' conscious attention is explicitly drawn to the heft of a moderately heavy clipboard. The reliability of the findings across the three studies (and a study included in the Supplemental Material) is addressed in a final combined analysis of all the data.

## Study 1

The purpose of the first study was to test the prediction that weight would operate as an embodiment of importance unless something in the context draws attention to the bodily state itself, such as through the weight of a very heavy clipboard. The prediction was that participants would rate the

topic of road infrastructure as more important when holding a moderately heavy compared with a light clipboard (replicating previous research), but when holding a very heavy clipboard, participants would rate the survey topic as less important compared with the moderately heavy clipboard condition. Another aim of Study 1 was to show that the predicted lower importance rating in the very heavy clipboard condition was not due to derogation of the topic itself. Thus, an additional prediction was that participants' attitude toward funding for road infrastructure would not differ by clipboard weight condition.

## Method

**Participants.** Overall, 96 participants completed the study. Two participants were eliminated from data analysis due to leaning against a wall while completing the survey because this may offset the influence of the weight (see Jostmann et al., 2009). Data from a total of 94 participants (female = 53, male = 41) were included in the final data analysis. The mean age was 27.25 years ( $SD = 13.91$ ).

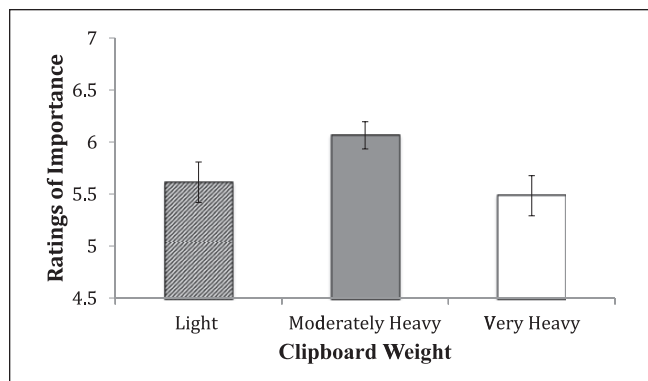
**Procedure.** Individual passersby on and near the University of Arizona campus were recruited to complete a survey on funding for road infrastructure. A first experimenter, blind to the weight of the clipboard, approached participants and asked them whether they would like to participate in a university-approved survey. If participants agreed to participate, a second experimenter handed participants a randomly assigned clipboard with a piece of paper on top that contained information about funding for road infrastructure and a brief questionnaire.<sup>1</sup> The first experimenter gave verbal instructions to the participants on how to complete the survey<sup>2</sup>; after handing them the clipboard, the second experimenter walked away and did not interact with participants again. After completing the questionnaire, participants gave the clipboard to the first experimenter, who thanked and debriefed them.

## Materials

**Clipboard weights.** The clipboard ( $9.5'' \times 13.5'' \times 0.875''$ ) contained a compartment that stored ceramic tile weights and paper to manipulate the weight of the clipboard. In the *light* condition, the clipboard weighed 1.45 lbs (657 g,  $n = 31$ ); in the *moderately heavy* condition, the clipboard weighed 2.29 lbs (1,039 g,  $n = 31$ ); and in the *very heavy* condition, the clipboard weighed 3.65 lbs (1,655 g,  $n = 32$ ). The light and moderately heavy clipboard weights were identical to Jostmann et al. (2009). The moderately heavy clipboard in Jostmann and colleagues was about 1.58 times heavier than the light clipboard, thus the very heavy clipboard weight was calculated to be 1.58 times heavier than the moderately heavy clipboard.

**Questionnaire.** Participants answered two questions about funding for road infrastructure. The first question assessed





**Figure 1.** Ratings of importance by clipboard condition in Study 1. Note. The error bars represent standard errors of the mean.

participants' attitude toward funding for road infrastructure (*How do you feel about funding for road infrastructure?*) on a scale of 1 (*extremely negative*) to 7 (*extremely positive*). The second question asked about participants' perceived importance of funding for road infrastructure (*How important is funding for road infrastructure in Arizona?*) on a scale of 1 (*not at all*) to 7 (*extremely*). Participants also completed a brief demographics questionnaire asking their gender and age.

## Results

**Importance ratings.** A one-way analysis of variance (ANOVA) revealed a significant difference between the clipboard conditions,  $F(2, 91) = 3.16, p = .047, \eta_p^2 = .07$  (see Figure 1). Planned contrasts showed that participants in the moderately heavy clipboard condition ( $M = 6.06, SD = 0.73, 95\%$  confidence interval [CI] = [5.80, 6.32]) rated funding for road infrastructure as more important than participants in the light clipboard condition ( $M = 5.61, SD = 1.09, 95\%$  CI = [5.21, 6.01]),  $F(1, 91) = 3.30, p = .073, \eta_p^2 = .04, d = 0.45$ . Although not statistically significant, this finding is in predicted direction as previous research by Jostmann and colleagues (2009). However, consistent with the hypothesis, participants in the very heavy clipboard condition rated funding for road infrastructure as significantly less important ( $M = 5.47, SD = 1.08, 95\%$  CI = [5.09, 5.86]) than participants in the moderately heavy clipboard condition,  $F(1, 91) = 5.83, p = .018, \eta_p^2 = .06, d = 0.59$ . There were no significant differences between the light and very heavy clipboard condition,  $F < 0.34, p > .56$ . There were no main effects or interactions with age or gender on ratings of importance ( $ps > .33$ ).

**Attitude ratings.** A one-way ANOVA of clipboard condition on attitude ratings revealed no significant differences between the light clipboard condition ( $M = 4.90, SD = 1.85$ ), moderately heavy clipboard condition ( $M = 5.23, SD = 1.38$ ), and very heavy clipboard condition ( $M = 4.91, SD = 1.35$ ),  $p > .60$ . There were no main effects or interactions with age or gender on attitudes ( $ps > .40$ ).

## Discussion

The results support the hypothesis that weight can influence judgments of importance unless something in the context draws attention to the bodily state. First, Study 1 found directionally consistent results with those of Jostmann et al. (2009) and others who have reported that increasing the weight of a clipboard from light to moderately heavy could increase the ratings of the importance of a survey topic. However, when the clipboard was very heavy, participants rated the survey topic as significantly less important compared with when the clipboard was moderately heavy. Thus, it is possible that drawing participant's attention to their bodily state via a very heavy clipboard moderates weight as an embodiment of importance. Finally, the decrease in ratings of importance for the very heavy clipboard was not due to a more negative evaluation of the topic.

Of note, the results replicating the research of Jostmann and colleagues (2009) were not statistically significant. Yet establishing directional consistency can be one way to provide overall support for an effect (e.g., Fabrigar & Wegener, 2016). In that light, the results reflect a similar pattern shown in much of the previous research, albeit with a smaller effect size.

## Study 2

The results of Study 1 are in line with the idea that drawing conscious attention to the bodily state can reduce metaphorically related social judgments. Nevertheless, another explanation for the null effect of the very heavy clipboard on ratings of importance in Study 1 is that very heavy weights may activate a different metaphor rather than importance. Indeed, people can think about an issue using multiple metaphors, for example, love is often described using metaphors of war, a journey, or as passion (Gibbs., 2015; Lakoff & Johnson, 1999). Similarly, weight can serve as a metaphor of importance, but it also serves as a metaphor of *burden*, as in the effort required to carry a heavy load. Previous research shows that experiencing a burden (e.g., keeping a secret) makes physical tasks appear more effortful (Slepian, Masicampo, Toosi, & Ambady, 2012). Thus, if a very heavy clipboard serves as the embodiment of burden, it may cause people to reduce their ratings of importance. We examine this alternative explanation in Study 2.

In addition, Study 2 sought to further test the prediction that weight as an embodiment of importance is attenuated by very heavy clipboard weights that draw conscious attention to the body. Indeed, as weight increases, embodiment effects increase, but at some point, the increased weight becomes noticeable, is consciously processed and diminishes the influence of the body on cognition. Thus, Study 2 included two additional clipboard weight conditions in addition to those used in Study 1 to test the curvilinear relationship between increasingly heavy clipboard weight and the perceived importance of the survey topic.

**Table 1.** Ratings of Importance and Burden by Clipboard Condition in Study 2.

	Clipboard weight				
	Light	Moderately heavy	Heavy	Very heavy	Extremely heavy
Importance mean ( <i>SD</i> )	5.57 (1.01)	6.13 (0.84)	6.03 (0.77)	5.51 (1.27)	5.46 (1.02)
Burden mean ( <i>SD</i> )	3.11 (1.53)	3.45 (1.94)	3.17 (1.54)	3.17 (1.79)	3.35 (1.67)

## Method

**Participants.** A total of 187 participants completed the survey. Six were eliminated for sitting on a bench or leaning against a wall during the study. Thus, data from 181 participants (female = 97, male = 84) were included in the final data analysis. The mean age was 22.60 years ( $SD = 8.35$ ).

**Procedure and materials.** The procedure was identical to Study 1. The clipboard weights were identical to Study 1 along with the addition of two clipboard weights. Thus, there were a total of five clipboard conditions: light (1.45 lbs,  $n = 35$ ), moderately heavy (2.29 lbs,  $n = 38$ ), heavy (2.97 lbs,  $n = 36$ ), very heavy (3.65 lbs,  $n = 35$ ), and extremely heavy (4.08 lbs,  $n = 37$ ). Participants also reported their perceptions of the burdensome nature of funding for road infrastructure (*Funding for road infrastructure is a burden*) on a scale of 1 (*strongly disagree*) to 7 (*strongly agree*). The question assessing perceived importance of funding for road infrastructure and the demographic questions was identical to Study 1.

## Results

**Importance ratings.** A one-way ANOVA revealed significant differences between the clipboard condition on the ratings of importance of funding for road infrastructure,  $F(4, 176) = 3.67, p = .007, \eta_p^2 = .08$  (see Table 1). Planned contrasts replicated the original finding by Jostmann et al. (2009) in that the moderately heavy clipboard ( $M = 6.13, SD = 0.84, 95\% CI = [5.85, 6.41]$ ) caused significantly greater ratings in importance than the light clipboard ( $M = 5.57, SD = 1.01, 95\% CI = [5.22, 5.92]$ ),  $F(1, 176) = 5.79, p = .017, \eta_p^2 = .03, d = 0.55$ . In addition, consistent with predictions, the moderately heavy clipboard caused higher ratings of importance than the very heavy clipboard ( $M = 5.51, SD = 1.27, 95\% CI = [5.07, 5.95]$ ),  $F(1, 176) = 7.03, p = .009, \eta_p^2 = .04, d = 0.61$ , and the extremely heavy clipboard ( $M = 5.46, SD = 1.02, 95\% CI = [5.12, 5.80]$ ),  $F(1, 176) = 8.57, p = .004, \eta_p^2 = .05, d = 0.65$ . Moreover, as predicted, the heavy clipboard ( $M = 6.03, SD = 0.77, 95\% CI = [5.77, 6.29]$ ) caused significantly higher ratings of importance compared with the light clipboard,  $F(1, 176) = 3.74, p = .055, \eta_p^2 = .02, d = 0.45$ , the very heavy clipboard,  $F(1, 176) = 4.74, p = .031, \eta_p^2 = .03, d = 0.51$ , and the extremely heavy clipboard,  $F(1, 176) = 5.96, p = .016, \eta_p^2 = .03, d = 0.56$ . These results support the prediction that subtle sensations of physical weight influence judgments in a

metaphor-consistent fashion, whereas weight sensations that are more conspicuous do not. There was no difference between the moderately heavy clipboard and heavy clipboard and no differences between the light clipboard, very heavy clipboard, and extremely heavy clipboard condition (all  $F$ s < .23, all  $p$ s > .63). As in Study 1, there were no main effects or interactions with gender and age ( $p$ s > .15).

**Burden ratings.** There were no significant differences between the burden ratings for the light clipboard ( $M = 3.11, SD = 1.53$ ), moderately heavy clipboard ( $M = 3.45, SD = 1.94$ ), heavy clipboard ( $M = 3.17, SD = 1.54$ ), very heavy clipboard ( $M = 3.17, SD = 1.79$ ), and extremely heavy clipboard condition ( $M = 3.35, SD = 1.67$ ),  $p > .90$ . There were no main effects or interactions with gender and age ( $p$ s > .43).<sup>3</sup> These results show that the curvilinear relationship of increased weights and perceptions of importance was not due to the activation of another relevant metaphor such as burden.

## Discussion

The results of Study 2 are consistent with the prediction that embodied effects diminish when contextual cues cause conscious processing of the bodily state. As seen in Study 1, the weight of the clipboard increased ratings of importance of the survey topic up to a point where it was very heavy and ratings of importance significantly decreased. According to the present conceptual framework, participants reduced their ratings of importance when the clipboard was very and extremely heavy because as the weight grew, they began to consciously perceive the heft of the object in their hands. The conscious attention to the weight appears to have caused participants to judge the importance of the survey topic on the neutral merits of the issue, rather than on the heft of the clipboard. In addition, the results of Study 2 suggest that the heaviest clipboards did not reduce the ratings of importance because the metaphor switched to the concept of burden.

Although the curvilinear relationship between weight and importance observed in Studies 1 and 2 is consistent with the conscious attention hypothesis, it is possible that increasing the weight could activate processes other than conscious attention. According to previous research, any cue that draws attention to the weight of the clipboard should induce the conscious processing that diminishes embodiment processes (e.g., Schwarz & Clore, 1983). Thus, even when the weight is moderate and subject to embodiment

influence, a cue that directs attention to the weight should circumvent the embodiment process. This leads to the prediction that when participants are told about the weight of a moderately heavy clipboard, they may report lower ratings of the survey topic's importance. To test this prediction, Study 3 conceptually replicated the procedure in Schwarz and Clore (1983) by providing perceivers with an explicit cue to the use of their body as a source of information. The hypothesis was that perceivers holding a moderately heavy clipboard, and given an explicit attention cue to the weight of the clipboard, would report significantly lower ratings of topic importance than perceivers who held a moderately heavy clipboard but were not given an attention cue to the weight of the clipboard.

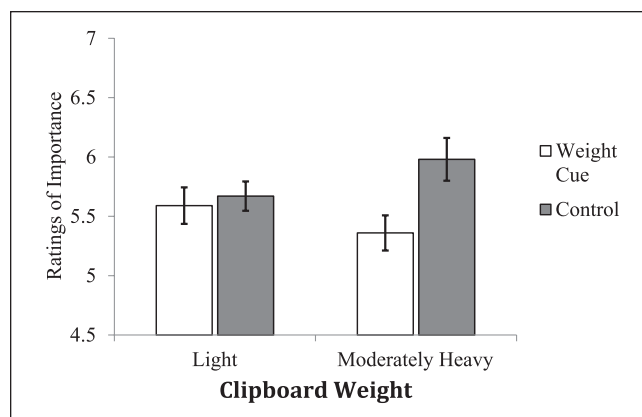
### Study 3

#### Method

**Participants.** In total, 169 passersby on and near the University of Arizona campus completed the study. Five participants were eliminated from data analysis for sitting down while completing the measures. Thus, 164 participants (female = 72, male = 92) were included in the data analysis. The mean age was 27.25 years ( $SD = 11.95$ ).

**Procedure and materials.** The procedure was similar to Studies 1 and 2 with a few exceptions. Participants completed the survey on either the light (1.45 lbs) or moderately heavy (2.29 lbs) clipboard used in the first two studies. However, prior to rating the topic, participants were randomly assigned to receive or not receive a cue about the weight of the clipboard. In the weight cue condition, immediately after the second experimenter gave the participants the clipboard, the first experimenter told participants “and one last thing—just to let you know—some people have found the weight of the clipboard to feel heavy.” Participants in the weight cue control condition did not receive this information from the first experimenter. To keep the experimenters blind to condition, neither knew what information (cue vs. no cue; light vs. moderately heavy clipboard) the other was going to present before they interacted with participants.

**Questionnaire.** The questions assessing perceived importance of funding for road infrastructure and the demographic questions were identical to the first two studies. Participants also completed a manipulation check question after the dependent variable was collected. Specifically, on a scale of 1 (*strongly disagree*) to 7 (*strongly agree*) participants responded to the statement, “The experimenter told me that some people feel that the clipboard is heavy,” that was embedded between two other questions about the experimenter's behavior (e.g., “The experimenter was polite”).



**Figure 2.** Ratings of importance by attribution cue and clipboard condition in Study 3.

Note. The error bars represent standard errors of the mean.

#### Results

**Manipulation check analysis.** As expected, participants in the weight cue condition ( $M = 6.48$ ,  $SD = 1.29$ , 95% CI = [6.19, 6.77]) were more likely to agree that the experimenter told them the clipboard was heavy compared with those in the cue control condition ( $M = 2.74$ ,  $SD = 2.06$ , 95% CI = [2.28, 3.20]),  $t(162) = 13.91$ ,  $p < .001$ ,  $d = 1.46$ . These data suggest that the manipulation of the cue alerting participants to the left of the clipboard was successful.

**Main analysis.** A 2 (weight cue: yes vs. no)  $\times$  2 (clipboard weight: light vs. moderately heavy) ANOVA was conducted with importance for funding for road infrastructure as the dependent variable. Results revealed a significant interaction between the weight cue and clipboard weight,  $F(1, 160) = 5.74$ ,  $p = .018$ ,  $\eta_p^2 = .04$  (see Figure 2). Although not statistically significant, the results revealed a similar pattern found in Studies 1 and 2 where participants in the no cue control condition with the moderately heavy clipboard ( $M = 5.98$ ,  $SD = 0.82$ , 95% CI = [5.73, 6.23],  $n = 44$ ) rated funding for road infrastructure as more important compared with those in the light clipboard condition ( $M = 5.59$ ,  $SD = 0.90$ , 95% CI = [5.30, 5.88],  $n = 37$ ),  $F(1, 160) = 3.18$ ,  $p = .076$ ,  $\eta_p^2 = .02$ ,  $d = 0.40$ .

However, consistent with predictions, when told about the weight of the clipboard in the weight cue condition, participants with the moderately heavy clipboard ( $M = 5.36$ ,  $SD = 1.17$ , 95% CI = [5.00, 5.72],  $n = 42$ ) rated the topic as significantly less important than participants who held the moderately heavy clipboard in the no cue control condition,  $F(1, 160) = 8.93$ ,  $p = .003$ ,  $\eta_p^2 = .06$ ,  $d = 0.63$ . There was no difference between the weight cue ( $M = 5.67$ ,  $SD = 0.96$ , 95% CI = [5.36, 5.98],  $n = 39$ ) and no cue control condition for the light clipboard ( $p < .60$ ). The main effects of weight cue and clipboard weight were not significant in the ANOVA analysis ( $ps < .09$ ).



## Discussion

The results of Study 3 showed that focusing participants' conscious attention on the weight of a moderately heavy clipboard eliminated the effect of weight as an embodiment of importance. While the first two studies circumvented the embodiment process by drawing attention to the bodily state through increasing the weight, Study 3 reduced the embodiment process through a verbal cue to draw attention to the weight of a moderately heavy clipboard. It is possible that those who held the light clipboard in the weight cue condition would show increased ratings of importance because weight is salient, even though the clipboard does not supply such information to the perceiver. However, the present data support the prediction that drawing conscious attention to weight does not increase importance related ratings.

Of note, although the difference in the importance ratings between the moderate clipboard and light clipboard in the no cue control condition was in the predicted direction, as in Study 1, the difference did not reach statistical significance.

## Combined Analysis

The results across the present set of studies exhibited similar patterns to the initial effect found by Jostmann et al. (2009) where a moderately heavy clipboard caused greater ratings of survey topic importance than a light clipboard. However, the pattern of data in Studies 1 and 3 replicating the Jostmann et al.'s finding was not statistically significant. Although non-significant results, even those that are directionally significant, may be a cause for concern regarding the robustness of an effect, it is possible that such results strengthen the meta-analytic case for an effect (Fabrigar & Wegener, 2016). Moreover, if the lack of statistical significance is due to underpowered sample sizes in the present studies, a combined analysis of all the collected data may provide a more powerful test. Indeed, scholars note that meta-analysis may be important to understand the reliability and replicability of an effect (e.g., Braver, Thoemmes, & Rosenthal, 2014; Galak & Meyvis, 2012). Thus, to test the robustness of the basic weight-as-importance effect in the current set of studies, the difference in importance ratings between the moderately heavy and light clipboard was subjected to a combined analysis. The analysis also examined the difference in ratings of importance between the moderately heavy and very heavy clipboard across the current set of studies. The analysis included another set of data collected using a similar design that is described in the Supplemental Material.

## Method

**Data preparation.** A first data file was created that included clipboard condition (light vs. moderately heavy), ratings of importance, and study number in the three studies as well as the study presented in the Supplemental Material. This file yielded a total of 283 participants who were either assigned to

the light or moderately heavy clipboard condition in Studies 1 and 2 or the no cue control condition that varied a light or moderately heavy clipboard in Study 3 and the Supplemental Material study. There were 138 participants in the light clipboard condition and 145 participants in the moderately heavy clipboard condition.

A similar second data set was created to assess the overall effect of differences in importance ratings between the moderately heavy and very heavy clipboard. This data set contained the clipboard condition (moderate vs. very heavy), ratings of importance, and study number in Studies 1 and 2 and the Supplemental Material study. This data set contained a total of 204 participants with 100 participants in the moderately heavy clipboard condition and 104 in the very heavy clipboard condition.

## Results

An ANOVA on the first data set tested the combined difference between the light and moderately heavy clipboard condition on ratings of importance. There was no significant interaction between clipboard condition and study number,  $F(3, 276) = 0.18, p > .91, \eta_p^2 = .002$ , suggesting that study sample size did not moderate the effects. Results revealed a significant effect of clipboard weight on ratings of importance,  $F(1, 276) = 17.75, p < .001, \eta_p^2 = .06$ , such that the moderately heavy clipboard ( $M = 5.98, SD = 0.83, n = 146$ ) elicited greater ratings of importance than the light clipboard ( $M = 5.53, SD = 0.93, n = 138$ ).

An ANOVA on the second data set tested the difference between the very heavy clipboard condition and the moderately heavy clipboard condition on ratings of importance. Again, there was no significant interaction between clipboard condition and study number,  $F(2, 202) = 0.09, p > .91, \eta_p^2 = .001$ , suggesting that study sample size did not moderate the effect. Results showed a significant effect of clipboard weight on ratings of importance,  $F(1, 202) = 18.08, p < .001, \eta_p^2 = .08$ , such that the moderately heavy clipboard ( $M = 5.97, SD = 0.85, n = 102$ ) elicited greater ratings of importance than the very heavy clipboard ( $M = 5.39, SD = 1.07, n = 106$ ).

The results of the local combined analysis suggest that, despite the failure to find a statistically significant replication in Studies 1 and 3, the overall effect of weight as an embodiment of importance when comparing the light with moderately heavy clipboard in the present research is statistically reliable. Moreover, we found support across the three studies for the hypothesis that a very heavy clipboard weight will fail to serve as an embodiment of importance.

## General Discussion

The present research provides initial support for the moderating role of conscious attention in embodied cognition. Specifically, using the effect of weight as an embodiment of importance (e.g., Ackerman et al., 2010; Jostmann et al.,



2009), Studies 1 and 2 showed that weight increased perceptions of the importance of a survey topic up to the point where the weight of the clipboard became noticeable, upon which importance ratings decreased. These findings are consistent with the assumption that when participants consciously recognized the weight, they ignored what they were “feeling” and instead focused their attention on the attributes of the judgment task, in this case, the topic of road infrastructure. The data also showed that the curvilinear relationship between weight and importance was not due to changes in attitude toward the survey topic or activation of the alternative metaphor of burden.

Study 3 examined whether an explicit cue drawing attention to the weight would attenuate embodied processes under conditions demonstrated to facilitate the effects. The results showed that, when perceivers were given an explicit cue alerting them to the heft of a moderately heavy clipboard, they reported similar ratings of importance to those holding a light clipboard, suggesting that participants were no longer using their body as a source of information. Although the current evidence is in line with previous scholars who propose that embodiment may be an implicit response when a concept is simulated based on previous multimodal experiences (Niedenthal et al., 2005), the present studies suggest that drawing conscious attention to the body as a source of information can activate explicit processing, which, in turn, can result in body states no longer influencing metaphorically related social judgments.

There are two possible processes by which perceivers may switch to more controlled processing when conscious attention is drawn to a bodily state: discounting effects and bias correction processes.

### *Discounting Effects*

Several lines of research suggest that drawing a perceiver’s attention to their bodily state will eliminate embodied effects through discounting. For example, research on cognitive dissonance shows that misattributing arousal to a placebo pill or an overheated room shifts the attribution for the arousal from an internal to an external source which eliminates the need to reduce dissonance via attitude change (e.g., Fazio, Zanna, & Cooper, 1977; Fried & Aronson, 1995; Zanna & Cooper, 1974). Similarly, research in excitation transfer shows that incidental affect from one stimulus will only influence subsequent judgments when the source of the initial affect is unknown (Zillman, 1978). In each case, drawing conscious attention to the source of arousal causes people to discount other potential sources of the arousal, such as their own behavior.

More directly related to the topic of embodied cognition effects, Schwarz and Clore’s mood-as-information theory (see Schwarz, 2011) postulates that attributing mood to external sources can diminish downstream cognitions. Studies show that individuals will report greater life satisfaction on

sunny compared with rainy days, but when attention is drawn to the weather, the difference in ratings of life satisfaction disappear, presumably because participants “discount” the cause of the weather on their mood (Schwarz & Clore, 1983). Thus, it is possible that in the present set of studies, providing perceivers with salient environmental cues, such as an overly heavy clipboard or explicit prompt that draws attention to their bodily state caused perceivers to discount the use of their body when judging the importance of a survey topic.

### *Correction for Bias*

Drawing a perceiver’s conscious attention to their bodily state may also activate correction processes. According to Wegener and Petty’s flexible correction model (FCM; 1995, 1997), perceivers may remove or avoid bias if it is associated with an influential factor in the context. For example, when explicit instructions about the potential for bias are present, perceivers then generate naïve theories about the bias and, with ability and motivation to correct, judgments about a target object may be adjusted in the opposite direction of the bias (Petty, Wegener, & White, 1998). For example, Wegener and Petty (1995) showed that perceivers who first thought about the positive aspects of desirable vacation locations subsequently judged target vacation locations as less desirable. However, when perceivers were prompted not to let the ratings by others influence their judgments, they overcorrected and rated average vacation locations as significantly more desirable. Thus, the FCM shows that individuals are motivated to correct for bias when their attention is drawn to information regarding the presence of bias in the context.

Embodiment effects may also be subject to correction when something in the context makes perceivers acutely aware of their bodily state. Taken in the context of the current research, if perceivers are motivated to correct for the influence of a heavy object, they may show a reversal effect, whereby they rate the importance of a neutral survey topic as less important than a low embodiment control condition. Simply increasing the weight of the clipboard itself to make it noticeably heavier may be sufficient to activate correction processes that reverse weight as an embodiment of importance.

### *Conscious Attention and Replication in Embodiment*

Finally, the present results may offer a theoretical explanation for the difficulty that some researchers have replicating embodied cognition findings: Replications seem likely to fail when something in the context draws conscious attention to the perceiver’s bodily state. At least with respect to the embodiment of weight as importance, it appears that even very subtle environmental cues, like the weight of the clipboard itself, can circumvent the process. From this perspective, attenuation of embodiment should occur if a subtle cue drew conscious attention to the temperature of a cup of coffee (e.g.,

Williams & Bargh, 2008) or to the clean smell of a room (e.g., Liljenquist, Zhong, & Galinsky, 2010). Clearly more research is needed to establish the replicability of the present findings, both within the present paradigm and when examining other embodiment processes. But at this writing, conscious attention appears to function as an understudied moderator in how weight serves as an embodiment of importance.

### Limitations and Future Directions

Although the present research examined the role of conscious attention as a moderator of embodiment, there may also be situations in which awareness of information from the body will increase embodied processes. Indeed, past research suggests that awareness of information from the body can promote psychological processes (e.g., Zanna & Cooper, 1974). Future research should examine the conditions under which conscious attention facilitates embodiment. In addition, while very heavy clipboards engage more explicit processing and subsequently reduce embodiment, it is unknown whether very heavy clipboards elicit greater analytical thinking or are experienced as objectively heavy. Future research should examine these assumptions underlying the current research.

It is also important to consider the role of motivational states in embodiment processes. Hauser and Schwarz (2015) found that individuals high in cognitive motivation show increased ratings of importance when holding a book about which they possess knowledge. However, it is unclear how cognitive motivation states impact embodied processes for contextual cues that promote explicit processing, such as a very heavy clipboard. It is possible that individuals high in cognitive motivation show an even more robust decrease in ratings of importance when holding a very heavy clipboard compared with those who hold a light clipboard. Moreover, it is possible that individuals who are low in cognitive motivation are more likely to use a very heavy clipboard as a cue that left equals importance and rate topics while holding a much heavier clipboard as significantly more important than when holding a light clipboard because their attention is not drawn to their bodily state under very heavy clipboard conditions. In addition, weight may serve as a simple cue of importance for those who heuristically process information, yet moderately heavy weight may also as a strong source of influence for those who are motivated and have the ability to elaborate. Thus, the role of ability and motivation to engage in high levels of information processing may serve as another key moderator of embodied cognition. More research is needed to examine these possibilities.

### Conclusion

Scholars have noted the importance of uncovering theoretical boundary conditions to embodied effects (e.g., Meier et al., 2012). In response to this call, the current research suggests that as with many other effects in social cognition,

the role of conscious attention may serve as important function in embodied cognition. This information not only better informs the conditions under which the body can influence the mind, but it also provides perceivers with the ability to counteract seemingly automatic responses to environmental cues that manipulate their bodily states.

### Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

### Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

### Notes

1. Ackerman, Nocera, and Bargh (2010) and Chandler, Reinhard, and Schwarz (2012) found that weight serves as an embodiment of importance for topics individuals possess knowledge about. Thus, we chose a topic that we believed the majority of participants would be familiar with.
2. Following Jostmann, Lakens, and Schubert (2009), participants held on to the clipboard with their nondominant hand.
3. Gender and age will no longer be discussed in the results because there were no observed effects of these variables in the first two studies.

### Supplemental Material

Supplementary material is available online with this article.

### References

- Ackerman, J. M., Nocera, C. C., & Bargh, J. A. (2010). Incidental haptic sensations influence social judgments and decisions. *Science, 328*, 1712-1715. doi:10.1126/science.1189993
- Barsalou, L. W. (1999). Perceptual symbol systems. *Behavioral and Brain Sciences, 22*, 577-609. doi:10.1017/S0140525X99532147
- Barsalou, L. W. (2003). Situated simulation in the human conceptual system. *Language and Cognitive Processes, 18*, 513-562. doi:10.1080/01690960344000026
- Barsalou, L. W. (2008). Grounded cognition. *Annual Review of Psychology, 59*, 617-645. doi:10.1146/annurev.psych.59.103006.093639
- Bohannon, J. (2014). Replication effort provokes praise—and “bullying” charges. *Science, 344*, 788-789. doi:10.1126/science.344.6186.788
- Borghi, A. M., Binkofski, F., Castelfranchi, C., Cimatti, F., Scorolli, C., & Tummolini, L. (2016). The challenge of abstract concepts. *Psychological Bulletin, 143*, 263-292. doi:10.1037/bul0000089
- Boroditsky, L., & Prinz, J. (2008). What thoughts are made of. In G. R. Semin & E. R. Smith (Eds.), *Embodied grounding: Social, cognitive, affective, and neuroscientific approaches* (pp. 98-118). Cambridge, UK: Cambridge University Press.
- Braver, S. L., Thoenes, F. J., & Rosenthal, R. (2014). Continuously cumulating meta-analysis and replicability. *Perspectives on Psychological Science, 9*, 333-342. doi:10.1177/1745691614529796

- Chaiken, S. (1980). Heuristic versus systematic information processing and the use of source versus message cues in persuasion. *Journal of Personality and Social Psychology*, *39*, 752-766. doi:10.1037/0022-3514.39.5.752
- Chaiken, S., & Trope, Y. (Eds.). (1999). *Dual-process theories in social psychology*. New York, NY: Guilford Press.
- Chandler, J. J., Reinhard, D., & Schwarz, N. (2012). To judge a book by its weight you need to know its content: Knowledge moderates the use of embodied cues. *Journal of Experimental Social Psychology*, *48*, 948-952. doi:10.1016/j.jesp.2012.03.003
- Craig, A. D. (2004). Human feelings: Why are some more aware than others? *Trends in Cognitive Sciences*, *8*, 239-241. doi:10.1016/j.tics.2004.04.004
- Damasio, A. (2001). Fundamental feelings. *Nature*, *413*, 781-782. doi:10.1038/35101669
- Ebersole, C. R., Atherton, O. E., Belanger, A. L., Skulborstad, H. M., Allen, J. M., Banks, J. B., . . . Nosek, B. A. (2016). Many Labs 3: Evaluating participant pool quality across the academic semester via replication. *Journal of Experimental Social Psychology*, *67*, 68-82. doi:10.1016/j.jesp.2015.10.012
- Epstein, S., & Pacini, R. (1999). Some basic issues regarding dual-process theories from the perspective of the cognitive-experiential self-theory. In S. Chaiken & Y. Trope (Eds.), *Dual-process theories in social psychology* (pp. 462-482). New York, NY: Guilford Press.
- Fabrigar, L. R., & Wegener, D. T. (2016). Conceptualizing and evaluating the replication of research results. *Journal of Experimental Social Psychology*, *66*, 68-80. doi:10.1016/j.jesp.2015.07.009
- Fazio, R. H. (1990). Multiple processes by which attitudes guide behavior: The MODE model as an integrative framework. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 23, pp. 75-109). San Diego, CA: Academic Press.
- Fazio, R. H., Zanna, M. P., & Cooper, J. (1977). Dissonance and self-perception: An integrative view of each theory's proper domain of application. *Journal of Experimental Social Psychology*, *13*, 464-479. doi:10.1016/0022-1031(77)90031-2
- Fiske, S. T., & Neuberg, S. L. (1990). A continuum of impression formation, from category-based to individuating processes: Influences of information and motivation on attention and interpretation. *Advances in Experimental Social Psychology*, *23*, 1-74. doi:10.1016/s0065-2601(08)60317-2
- Fodor, J. A. (1983). *The modularity of mind*. Cambridge, MA: The MIT Press.
- Fried, C. B., & Aronson, E. (1995). Hypocrisy, misattribution, and dissonance reduction. *Personality and Social Psychology Bulletin*, *21*, 925-933. doi:10.1177/0146167295219007
- Galak, J., & Meyvis, T. (2012). You could have just asked: Reply to Francis (2012). *Perspectives on Psychological Science*, *7*, 595-596. doi:10.1177/1745691612463079
- Gawronski, B., & Bodenhausen, G. V. (2006). Associative and propositional processes in evaluation: An integrative review of implicit and explicit attitude change. *Psychological Bulletin*, *132*, 692-731. doi:10.1037/0033-2909.132.5.692
- Gibbs, R. W., Jr. (2014). Conceptual metaphor in thought and social action. In M. J. Landau, M. D. Robinson, & B. P. Meier (Eds.), *The power of metaphor: Examining its influence on social life* (pp. 17-40). Washington, DC: American Psychological Association.
- Hadley, R., Ring, C., Gold, M., & Daubman, K. (2013, February 23). *Clipboard weight did not effect issue seriousness*. Retrieved from <http://www.PsychFileDrawer.org/replication.php?attempt=MTUx>
- Häfner, M. (2013). When the body and mind are talking: Interoception moderates embodied cognition. *Experimental Psychology*, *60*, 255-259. doi:10.1027/1618-3169/a000194
- Hauser, D. J., & Schwarz, N. (2015). Elaborative thinking increases the impact of physical weight on importance judgments. *Social Cognition*, *33*, 120-132. doi:10.1521/soco.2015.33.2.120
- James, W. (1884). What is an emotion? *Mind*, *9*, 188-205. doi:10.1093/mind/os-ix.34.188
- Johnson, D. J., Wortman, J., Cheung, F., Hein, M., Lucas, R. E., Donnellan, M. B., . . . Narr, R. K. (2016). The effects of disgust on moral judgments: Testing moderators. *Social Psychological and Personality Science*, *7*, 640-647. doi:10.1177/1948550616654211
- Jostmann, N. B. (2013, March 22). *Clipboard weight did not affect cogn. elaboration*. Retrieved from <http://www.PsychFileDrawer.org/replication.php?attempt=MTU0>
- Jostmann, N. B., Lakens, D., & Schubert, T. W. (2009). Weight as an embodiment of importance. *Psychological Science*, *20*, 1169-1174. doi:10.1111/j.1467-9280.2009.02426.x
- Kaspar, K. (2013). A weighty matter: Heaviness influences the evaluation of disease severity, drug effectiveness, and side effects. *PLoS ONE*, *8*, Article e78307. doi:10.1371/journal.pone.0078307
- Lakoff, G., & Johnson, M. (1980). *Metaphors we live by*. Chicago, IL: The University of Chicago Press.
- Lakoff, G., & Johnson, M. (1999). *Philosophy in the flesh: The embodied mind and its challenge to Western thought*. New York, NY: Basic Books.
- Landau, M. J., Meier, B. P., & Keefer, L. A. (2010). A metaphor-enriched social cognition. *Psychological Bulletin*, *136*, 1045-1067. doi:10.1037/a0020970
- Lee, S. W., & Schwarz, N. (2012). Bidirectionality, mediation, and moderation of metaphorical effects: The embodiment of social suspicion and fishy smells. *Journal of Personality and Social Psychology*, *103*, 737-749. doi:10.1037/a0029708
- Liljenquist, K., Zhong, C., & Galinsky, A. D. (2010). The smell of virtue: Clean scents promote reciprocity and charity. *Psychological Science*, *21*, 381-383. doi:10.1177/0956797610361426
- Lynott, D., Corker, K. S., Wortman, J., Connell, L., Donnellan, M. B., Lucas, R. E., & O'Brien, K. (2014). Replication of "experiencing physical warmth promotes interpersonal warmth" by Williams and Bargh (2008). *Social Psychology*, *45*, 216-222. doi:10.1027/1864-9335/a000187
- Magnini, V. P., & Kim, S. (2016). The influences of restaurant menu font style, background color, and physical weight on consumers' perceptions. *International Journal of Hospitality Management*, *53*, 42-48. doi:10.1016/j.ijhm.2015.11.001
- Meier, B. P., Schnall, S., Schwarz, N., & Bargh, J. A. (2012). Embodiment in social psychology. *Topics in Cognitive Science*, *4*, 705-716. doi:10.1111/j.1756-8765.2012.01212.x
- Newell, A., & Simon, H. A. (1972). *Human problem solving*. Oxford, England: Prentice Hall.
- Niedenthal, P. M., Barsalou, L. W., Winkielman, P., Krauth-Gruber, S., & Ric, F. (2005). Embodiment in attitudes, social perception, and emotion. *Personality and Social Psychology Review*, *9*, 184-211. doi:10.1207/s15327957pspr0903\_1
- Open Science Collaboration. (2015). Estimating the reproducibility of psychological science. *Science*, *349*, Article aac4716. doi:10.1126/science.aac4716



- Petty, R. E., & Cacioppo, J. T. (1986). *The elaboration likelihood model of persuasion*. New York, NY: Springer.
- Petty, R. E., Wegener, D. T., & White, P. H. (1998). Flexible correction processes in social judgment: Implications for persuasion. *Social Cognition, 16*, 93-113. doi:10.1521/soco.1998.16.1.93
- Piqueras-Fiszman, B., Harrar, V., Alcaide, J., & Spence, C. (2011). Does the weight of the dish influence our perception of food? *Food Quality and Preference, 22*, 753-756. doi:10.1016/j.foodqual.2011.05.009
- Piqueras-Fiszman, B., & Spence, C. (2012). The weight of the container influences expected satiety, perceived density, and subsequent expected fullness. *Appetite, 58*, 559-562. doi:10.1016/j.appet.2011.12.021
- Rabelo, A. L. A., Keller, V. N., Pilati, R., & Wicherts, J. M. (2015). No effect of weight on judgments of importance in the moral domain and evidence of publication bias from a meta-analysis. *PLoS ONE, 10*, Article e0134808. doi:10.1371/journal.pone.0134808
- Schnall, S., Haidt, J., Clore, G. L., & Jordan, A. (2008). Disgust as embodied moral judgment. *Personality and Social Psychology Bulletin, 34*, 1096-1109. doi:10.1177/0146167208317771
- Schneider, I. K., Parzuchowski, M., Wojciszke, B., Schwarz, N., & Koole, S. L. (2014). Weighty data: Importance information influences estimated weight of digital information storage devices. *Frontiers in Psychology, 5*, Article 1536. doi:10.3389/fpsyg.2014.01536
- Schneider, I. K., Rutjens, B. T., Jostmann, N. B., & Lakens, D. (2011). Weighty matters importance literally feels heavy. *Social Psychological and Personality Science, 2*, 474-478. doi:10.1177/1948550610397895
- Schwarz, N. (2011). Feelings-as-information theory. In P. Van Lange, A. Kruglanski, & E. T. Higgins (Eds.), *Handbook of theories of social psychology* (Vol. 1, pp. 289-308). Thousand Oaks, CA: SAGE.
- Schwarz, N., & Clore, G. L. (1983). Mood, misattribution, and judgments of well-being: Informative and directive functions of affective states. *Journal of Personality and Social Psychology, 45*, 513-523. doi:10.1037/0022-3514.45.3.513
- Slepian, M. L., Masicampo, E. J., Toosi, N. R., & Ambady, N. (2012). The physical burdens of secrecy. *Journal of Experimental Psychology: General, 141*, 619-624. doi:10.1037/a0027598
- Smith, E. R., & Semin, G. R. (2004). Socially situated cognition: Cognition in its social context. *Advances in Experimental Social Psychology, 36*, 53-117. doi:10.1016/s0065-2601(04)36002-8
- Stanovich, K. E., & West, R. F. (2000). Individual differences in reasoning: Implications for the rationality debate. *Behavioral and Brain Sciences, 23*, 645-665. doi:10.1017/s0140525x00003435
- Stewart, K., McVeigh, M., Stojkov, I., & Daubman, K. (2012, September 24). *Heavy issues are more important*. Retrieved from <http://www.PsychFileDrawer.org/replication.php?attempt=MTMy>
- Tool. (2001). *Lateralus*. On *Lateralus* [CD]. New York: Volcano Entertainment.
- Wegener, D. T., & Petty, R. E. (1995). Flexible correction processes in social judgment: The role of naïve theories in corrections for perceived bias. *Journal of Personality and Social Psychology, 68*, 36-51. doi:10.1037/0022-3514.68.1.36
- Wegener, D. T., & Petty, R. E. (1997). The flexible correction model: The role of naive theories of bias in bias correction. *Advances in Experimental Social Psychology, 29*, 141-208. doi:10.1016/s0065-2601(08)60017-9
- Wells, G. L., & Petty, R. E. (1980). The effects of over head movements on persuasion: Compatibility and incompatibility of responses. *Basic and Applied Social Psychology, 1*, 219-230. doi:10.1207/s15324834basp0103\_2
- Williams, L. E., & Bargh, J. A. (2008). Experiencing physical warmth promotes interpersonal warmth. *Science, 322*, 606-607. doi:10.1126/science.1162548
- Wortman, J., Donnellan, M. B., & Lucas, R. E. (2014). Can physical warmth (or coldness) predict trait loneliness? A replication of Bargh and Shalev (2012). *Archives of Scientific Psychology, 2*, 13-19. doi:10.1037/arc0000007
- Zanna, M. P., & Cooper, J. (1974). Dissonance and the pill: An attribution approach to studying the arousal properties of dissonance. *Journal of Personality and Social Psychology, 29*, 703-709. doi:10.1037/h0036651
- Zillman, D. (1978). Attribution and misattribution of excitatory reactions. In J. H. Harvey, W. I. Ickes, & R. F. Kidd (Eds.), *New directions in attribution research* (Vol. 2, pp. 335-368). Hillsdale, NJ: Lawrence Erlbaum.