

Research article

Body posture effects on self-evaluation: A self-validation approach

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Abstract

Building on the notion of embodied attitudes, we examined how body postures can influence self-evaluations by affecting thought confidence, a meta-cognitive process. Specifically, participants were asked to think about and write down their best or worse qualities while they were sitting down with their back erect and pushing their chest out (confident posture) or slouched forward with their back curved (doubtful posture). Then, participants completed a number of measures and reported their self-evaluations. In line with the self-validation hypothesis, we predicted and found that the effect of the direction of thoughts (positive/negative) on self-related attitudes was significantly greater when participants wrote their thoughts in the confident than in the doubtful posture. These postures did not influence the number or quality of thoughts listed, but did have an impact on the confidence with which people held their thoughts. Copyright © 2009 John Wiley & Sons, Ltd.

The term “attitude” originally referred to a physical posture, and today people often use the term *position* or *posture* to refer to their evaluation of an object or issue. Indeed, attitudes are embodied and closely linked to postures and bodily responses. Previous research has shown that a large number of bodily movements (e.g., head nodding vs. shaking, Wells & Petty, 1980; arm extension vs. flexion, Cacioppo, Marshall-Goodell, Tassinary, & Petty, 1992) can influence attitudes and persuasion (see Petty & Cacioppo, 1983). In other domains, people subtly induced to smile (vs. frown) feel amused by cartoons (Strack, Martin, & Stepper, 1988), and, when induced to slump in their chairs, people feel diminished pride in their performance (Stepper & Strack, 1993). Similar results have been found for a wide range of body movements (see Briñol & Petty, 2008 for a review). In this research, we examine the impact of body posture on self-evaluation.

Although the ability of bodily movements to influence attitudes is a well-established phenomenon, most research on this topic has not focused on the psychological mechanisms by which this influence occurs. Understanding these processes is essential in order to predict *whether*, *when*, and *how* attitudes will change as a function of body posture, as well as to predict the *strength* of those changes (Petty & Krosnick, 1995).

PROCESSES UNDERLYING THE PERSUASIVE EFFECTS OF POSTURE

Consistent with the Elaboration Likelihood Model of persuasion (ELM; Petty & Cacioppo, 1986), we argue that the psychological processes relevant to attitude change can be organized into a finite set which operate at different points along an elaboration continuum. Under low thinking conditions, body postures can influence attitudes via a variety of low-effort

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processes, such as mere association (e.g., Priester, Cacioppo, & Petty, 1996) and self-perception (e.g., “*if I am inclined toward it, I must like it*,” Bem, 1972; see Laird & Bresler, 1992). When the likelihood of thinking is relatively high, body postures can impact persuasion by affecting the direction of the thoughts that come to mind (i.e., by making positive or negative thoughts more likely to occur; see Neumann, Förster, & Strack, 2003).

According to the ELM, body postures can not only influence attitudes by serving as simple cues and affecting the direction of thinking, but also by influencing the amount of thinking when elaboration is not constrained to be very low or high. In an early demonstration that body posture can affect susceptibility to a persuasive communication by affecting the extent of thinking, Petty, Wells, Heesacker, Brock, and Cacioppo (1983) asked undergraduate students to try a new headphone in order to rate its qualities. Some participants were told to stand while testing the headphone, whereas others were told to lie down. After the participants were in the appropriate body position, they listened to a persuasive message composed of either strong or weak arguments on a relatively personally relevant topic. Varying the quality of the arguments in a message allows the researcher to distinguish among the many mechanisms by which variables can impact persuasion (Petty & Cacioppo, 1986). For example, the standing posture might facilitate the production of negative thoughts (i.e., biasing thinking) or produce discomfort that can serve as a simple negative cue. Both the biased processing and simple cue accounts predict a main effect for the posture manipulation regardless of the quality of the arguments. In contrast, if body posture influences persuasion by affecting the amount (rather than the direction) of thinking, an interaction between posture and argument quality should be observed. For example, if a standing posture reduces thinking relative to a reclining posture, then the attitudes of reclining participants should be more polarized in response to the strong and weak arguments than should the attitudes of standing participants. This is because if reclining participants are thinking more about the message, they should better recognize the flaws in the weak arguments and the virtues in the strong ones.

Consistent with the idea that posture can affect the amount of message-relevant thinking, this study showed that reclining participants were differentially persuaded by the strong and weak arguments, but that standing participants were not. This research is consistent with the idea that the physical posture of the message recipient can affect the extent of message processing and can thereby impact his or her susceptibility to persuasion. In line with the attitudinal findings and with this interpretation, the interaction between argument quality and posture was also found on a measure assessing the valence of the thoughts that participants generated in response to the message. Briñol and Petty (2008) suggested that standing is a more confident posture than reclining. If confidence generalized to the person’s pre-message position, it would lead them to process the message less carefully than when in the more vulnerable reclining position.

The findings for posture and persuasion are consistent with research conducted in other domains, which has shown that body postures can influence the motivation and ability of individuals to think in self-unrelated domains. For example, Riskind and Gotay (1982) found that slumped-over (relative to upright) physical posture reduced the amount of thinking dedicated to various cognitive tasks, as assessed by the amount of time spent in completing those tasks. Specifically, participants in the former (vs. the latter) posture were less persistent while working on a series of geometric puzzles (including some insoluble ones), presumably due to the association between slumping over and feelings of helplessness.¹

POSTURES CAN INFLUENCE THOUGHT CONFIDENCE

Recently, we have documented another mechanism through which bodily responses can operate. Unlike the previous processes, which focus on first-order cognition, this new process emphasizes secondary or *meta-cognition* (see Petty, Briñol, Tormala, & Wegener, 2007). According to the *self-validation* perspective (Petty, Briñol, & Tormala, 2002), although postures can serve as a cue or influence the amount and direction of thoughts, they can also affect what people think about their thoughts, especially the extent to which they are confident in these thoughts. We argue that the confidence (or doubt) that emerges from postures can magnify (or attenuate) the effect of anything that is currently available in

¹Taken together, these two lines of research seem to imply that doubtful postures can either increase thinking (as shown by the argument quality effect in the persuasion study, Petty et al., 1983) or decrease thinking (as revealed by the reduction in persistence in the puzzle study, Riskind & Gotay, 1982). We speculate that postures associated with doubt are likely to increase elaboration, as individuals in these postures may be motivated to think more in an attempt to deal with and resolve their uncertainty (for a related argument regarding uncertainty and elaboration, see Weary & Edwards, 1996). However, if thinking is too difficult in a particular situation, or if thinking cannot allow an individual to resolve his or her feelings of uncertainty (as in the case of insoluble puzzles), the effect of doubt on elaboration might be eliminated or even reversed. Indeed, increasing elaboration is just one of several possible methods by which individuals attempt to resolve uncertainty.

people's minds. For example, Briñol and Petty (2003) found that when people generated positive thoughts toward a proposal, vertical head movements during the message led to more thought confidence and more favorable attitudes than horizontal head movements. When people generated mostly negative thoughts toward the proposal, vertical head movements led to less favorable attitudes than horizontal head movements because people had more confidence in their negative thoughts in the nodding condition.

As suggested earlier, the confidence that emerges from bodily cues can be applied to whatever mental contents are salient, and this should include thoughts about the self. In an initial exploration of this possibility (Briñol & Petty, 2003), participants were asked to write down their best or worse qualities using their dominant or non-dominant hands (overt behavior manipulation). Since writing with the non-dominant hand is very difficult and appears "shaky," we expected and found that using the non-dominant hand decreased the confidence with which people held the thoughts they had listed. As a consequence, the effect of thought valence on state self-esteem was significantly greater when participants wrote their thoughts with their dominant hand than when they wrote their thoughts with their non-dominant hand.

In line with this initial evidence, we argue that any postures associated with confidence (e.g., pushing one's chest out) should magnify the effect of anything that is currently available in people's minds relative to postures associated with doubt (e.g., slouching forward with one's back curved). Importantly, this research examines whether relatively static body responses, such as postures, are able to influence individuals' reliance on their own thoughts, as previous research has shown that reliance on one's thoughts can be influenced by more dynamic behaviors and body movements.²

We postulate that people in an erect, vertical posture are seen as (and feel) more confident than people who are slumped over. People might associate the former posture with confidence because of their prior experiences observing confident people. Moreover, just as individuals pushing their chest out often look as if they are confident, subjectively experiencing that posture might likewise activate confidence. Conversely, people who are slumped look as if they lack confidence. Previous research reveals that when people slump in their chair, they feel diminished pride in their performance (Stepper & Strack, 1993). Furthermore, if people who expand their body by pushing their chest out also feel more dominant or powerful than people who are curving their backs, this may predispose the former to feel confident (e.g., Argyle, 1988; Schubert, 2005), thereby increasing their use of mental contents relative to slouched individuals (Briñol, Petty, Valle, Rucker, & Becerra, 2007b).³

OVERVIEW OF THE PRESENT RESEARCH

The goal of the present research was to examine, for the first time, the impact of recipient posture on self-evaluation through a meta-cognitive mechanism. In this experiment, college students had to think about their best or worst qualities. This manipulation was designed to produce positive or negative self-related thoughts. Participants were asked to write down their personal qualities while sitting with their chest out (confidence posture) or their back curved (doubt posture). In line with the self-validation hypothesis, we expected to find that the effect of the thought direction induction on self-evaluations would be greater for postures associated with confidence than for those associated with doubt, because when they are enacting a confident posture, participants should be more likely to rely on the self-relevant thoughts they generated.

²Although we do not think that motion is a critical component for behavior to influence confidence, one might argue that there are important differences between movement (and other actions) and passivity or inaction. For example, Albarracín, Handley, Noguchi, McCulloch, Li, Leeper (2008) suggest that behavioral action, relative to behavioral passivity, can influence the accessibility of different material from memory and thereby influence attitude change.

³Prior research on spontaneous trait inference (see Skowronski, Carlston, Mae, & Crawford, 1998) has shown that people tend to draw dispositional trait inferences when observing others' behavior. When people observe others in a body posture that involves keeping their back vertical and pushing their chest out, one plausible trait inference would be "confident," leading to the development of a strong linkage between posture and confidence over time (much as people naturally infer happiness from observations of smiling, whether the smiling occurs in others or themselves; see Strack et al., 1988; see also Hecht & LaFrance, 1998).

METHOD

Participants and Design

Seventy-one undergraduate students at Ohio State University were randomly assigned to the cells comprising a 2 (thought direction: positive vs. negative) \times 2 (body posture: confidence vs. doubt) between-subjects factorial design.

Procedure

Upon entering the laboratory, participants were seated at individual computer stations and told that all experimental procedures would be carried out electronically. Participants were then told that they were taking part in two separate research projects, one organized by the Business School and the other by the School of Arts. According to the cover story, the Business School was interested in investigating factors contributing to job satisfaction and professional performance. This topic has been shown to be of relatively high personal relevance for students. The School of Arts was said to be examining the skills required to portray another person as an actor or actress, which included the ability to maintain a specific body posture while engaging in other activities (i.e., the 'Business School' study). Thus, participants were asked to enact a particular body posture while simultaneously listing positive or negative self-attributes related to their potential professional success. Finally, participants relaxed their posture, completed all dependent measures, and were debriefed, thanked, and dismissed.

Independent Variables

Body Posture

Consistent with the cover story, participants were told that the School of Arts wished to determine the factors contributing to individuals' acting abilities. Thus, participants were asked to adopt a particular body posture, in as exaggerated a manner as possible, while listing their self-attributes. Participants were asked to "sit straight up" and "push out [their] chest," or to "sit slouched forward" with their "face looking at [their] knees." Importantly, the words "confident" and "doubt" were never used in the description of the posture, thus reducing the possibility that confidence or doubt were semantically primed. The cover story and instructions that participants received are reproduced below:

As you might know, acting usually requires control of body muscles in order to create specific impressions in different scenes. Being able to sustain a body posture while thinking or talking requires certain skills and training. Individuals often differ in their abilities to perform these types of roles. The present part of the research has been designed to gain some insights regarding this issue. In order to examine your ability to perform body poses, the present part of the research is going to require you to position part of your body while you focus on a different, unrelated mental task (the study for the business school). In the following screen you will find a description of the body pose we would like you to enact. Please pay close attention to the instructions.

Thought Direction

While maintaining their "confident" or "doubtful" postures, participants were asked to list either three positive or three negative personal traits relating to future professional performance. All participants were told that this was an important task and were asked to think carefully as they listed their traits.

Dependent Measures

Attitudes

The primary dependent measure was attitude toward the self as a potential professional. This dependent measure was assessed using four items, which possessed adequate internal reliability ($\alpha = .86$) and were averaged to form an index.

Specifically, these items asked participants to rate, on a nine-point scale, the extent to which they believed themselves to be a good candidate for the job market, a good interviewee for a new position, a good performer on-the-job, and a satisfied future employee.

Thoughts

Although we did not predict any difference in the number or content of participants' thoughts as a function of posture, two independent judges coded participants' thoughts with regard to valence (i.e., positivity/negativity), length (i.e., although everybody was asked to write the same number of thoughts, we still coded the number of words written for each thought), quality (i.e., how extreme the traits were), and abstraction (i.e., whether the thoughts mentioned concrete examples or abstract traits).

Confidence and Other Measures

After completing the key dependent measures, participants also answered a number of ancillary questions, which included items assessing thought confidence, mood, and task difficulty. Thought confidence was measured using a single item, which asked participants to rate, on a nine-point scale, the extent to which the thoughts they generated during the trait-listing task related to confidence vs. doubt (1 = doubt, 9 = confidence). Mood was also measured using a single item, which asked participants to rate their mood "right now" on a nine-point scale (1 = very sad, 9 = very happy). Finally, task difficulty was measured using two items. The first of these asked participants to rate, on a nine-point scale, the extent to which the thought-listing task was difficult (1 = not at all difficult, 9 = very difficult), whereas the second asked participants to rate, on a similar nine-point scale, the extent to which the thought-listing task was easy (1 = not at all easy, 9 = very easy). We included the task difficulty items as proxies for perceived mental fluency, with the understanding that "easy" tasks are associated with greater fluency than are "difficult" tasks.

RESULTS

Attitudes

A 2 (body posture: confident vs. doubtful) \times 2 (thought direction: positive vs. negative) ANOVA revealed a main effect of thought direction on participants' attitudes, $F(1, 67) = 15.83, p < .001$, such that participants who listed three positive characteristics were more favorable about their future professional success ($M = 7.22, SD = 1.09$) than participants who listed three negative characteristics ($M = 6.69, SD = 1.38$). This main effect was qualified by the predicted interaction of thought direction with body posture, $F(1, 67) = 9.91, p < .01$. As shown in Figure 1, this interaction revealed that thoughts

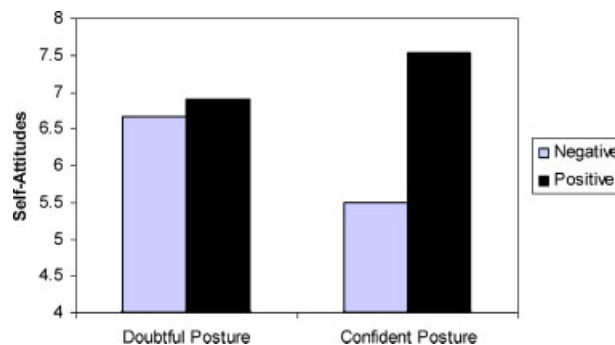


Figure 1. Attitudes toward the self as a job candidate as a function of thought direction and body posture

influenced attitudes among participants in the confident posture, $F(1, 33) = 32.04, p < .01$, but not the doubtful posture, $F < 1, ns$. Viewed differently, the interaction showed that for the negative thoughts condition, the confident posture led to less favorable attitudes ($M = 5.50, SD = 1.15$) than the doubtful posture ($M = 6.67, SD = 1.47$), $F(1, 32) = 6.53, p < .02$. In contrast, participants with positive thoughts tended to see themselves more favorably when placed in the confident ($M = 7.53, SD = 0.97$) than the doubtful ($M = 6.90, SD = 1.14$) posture, $F(1, 35) = 3.20, p < .09$.

Thoughts

The analyses on thoughts revealed only a main effect of thought direction, $F(1, 67) = 272.51, p < .001$. As predicted, participant's thoughts were judged to be more favorable in the positive ($M = 3.87, SD = 0.32$) than in the negative ($M = 2.29, SD = 0.49$) thought direction condition. The effects of thought direction on thought length, abstraction, and extremity were non-significant, $F_s < 2.19, ps > .14$. More importantly, there were no differences in the length, valence, extremity, or abstractness of participants' thoughts as a function of body posture, $F_s < 2.09, ps > .15$.

Other Thought-related Measures

Body posture did not influence participants' mood or perceived ease/difficulty in listing self-attributes, $F_s < 1.62, p > .20$. This is important because affective states (Briñol, Petty & Barden, 2007) and the perceived ease with which thoughts come to mind (Tormala, Petty, & Briñol, 2002) can influence the extent to which participants rely on their thoughts in forming attitudes and judgments.⁴

Thought Confidence

As predicted, body posture had a significant effect on thought confidence. Specifically, upright postures were associated with greater confidence ($M = 6.31, SD = 1.86$) than were slouched postures ($M = 4.86, SD = 1.76$), $F(1, 67) = 11.42, p < .01$.⁵ In order to examine whether thought confidence was responsible for the effect of body posture on self-attitudes, a mediational test was conducted (see Baron & Kenny, 1986). In the first step of this test, we established that body posture significantly affected thought confidence, $\beta = 1.45, t(69) = 3.38, p = .001$. This demonstrated that the independent variable of interest (i.e., body posture) had a significant impact on the proposed mediator (i.e., thought confidence). Next, we established that the body posture (dummy-coded) \times thought direction (dummy-coded) interaction significantly predicted self-attitudes (continuous dependent measure), $\beta = 1.79, t(67) = 3.15, p = .002$. Essentially, this interaction term replicates—in regression—the earlier finding from ANOVA, which showed a significant body posture \times thought direction interaction for self-attitudes. In the following step, we added to the regression equation an interaction term, in which the proposed mediator (i.e., thought confidence) was substituted for the independent variable of interest (i.e., body posture). That is, we examined whether thought confidence (continuous predictor) interacted with thought direction (dummy-coded) in predicting self-attitudes (continuous dependent measure). As predicted, the thought confidence \times thought direction interaction term significantly predicted self-attitudes, $\beta = .30, t(66) = 2.49, p < .02$. More interestingly, the magnitude of the body posture \times thought direction interaction term dropped noticeably (i.e., from 1.79 to

⁴Not only did we assess participants' subjective level of attention and elaboration and have external judges code participants' thoughts, but also we included an objective measure of the time participants spent entering their self-related thoughts. Previous research has found that slumped-over, relative to upright, physical posture affected amount of thinking by reducing the amount of time spent in subsequent tasks (e.g., Riskind & Gotay, 1982). Specifically, we asked a new sample of 28 participants to write down their qualities while sitting with their chests out (confidence posture) or their backs curved (doubt posture) and measured the time that participants spent writing in each condition. The results showed that the two posture conditions did not differ in the time participants spent thinking about and listing personal traits. In other words, participants in the confident posture ($M = 75.00, SD = 29.44$) spent as much time (in seconds) in the thought-listing task as did participants in the doubtful posture ($M = 64.20, SD = 30.35$), $F(1, 24) < 1, p > .56$. Although this argument is based on a null effect, this measure has proven sensitive to differences in information processing in other studies that varied body posture. As described earlier (see also Footnote 1), slumping may not have affected cognitive effort in our task since the task was relatively simple and highly relevant to participants compared to the task used in prior studies.

⁵There was also a main effect of thought direction on thought confidence, which showed that participants reported more confidence when thinking about positive ($M = 6.16, SD = 1.82$) than negative ($M = 4.94, SD = 1.89$) personal characteristics, $F(1, 67) = 8.06, p < .01$. No other effects emerged.

1.27) when controlling for the thought confidence \times thought direction interaction term. In order to examine whether this drop in magnitude was statistically significant, we performed a Sobel test (see Preacher & Hayes, 2004). As predicted, the Sobel test revealed that the magnitude of the body posture \times thought direction interaction in predicting self-attitudes was significantly reduced when controlling for the thought confidence \times thought direction interaction, $Z = 2.01$, $p < .05$.

Given that the body posture \times thought direction interaction remained statistically significant ($\beta = 1.27$, $t[66] = 2.18$, $p < .04$) even when controlling for the thought confidence \times thought direction interaction, this suggests that thought confidence was a partial, rather than full, mediator of the effect of body posture on self-attitudes. Nonetheless, this mediational analysis is consistent with our theoretical account. Specifically, the finding that thought confidence did not *fully* mediate the effect of body posture on self-attitudes likely reflects the fact that body posture can serve multiple roles in the persuasive context. Thus, while postures can impact attitudes via self-validation, they can also affect attitudes via classical conditioning, self-perception, and the like. Instead of demonstrating all of these processes—which have already been thoroughly documented—in a single mediational test, it was important that we test the unique prediction offered by our theoretical account, namely that body postures can influence attitudes via thought confidence. In our view, the results of the mediational analysis are consistent both with our novel prediction and with our broader theoretical framework, in which specific variables (e.g., body posture) can impact attitudes via a variety of processes (e.g., self-validation, self-perception, classical conditioning) depending on the persuasive context.⁶

DISCUSSION

In line with the self-validation hypothesis, we found that the effect of the direction of thoughts on self-evaluations was greater when participants had a confident rather than a doubtful posture. Thus, with a confident body posture, participants seemed to rely on their thoughts in forming their self-attitudes, but with a doubtful posture, participants did not use their thoughts to judge their promise as job candidates. Even though thought valence was not affected by body posture, the pattern of self-evaluation was quite different as a function of body posture.

These findings are important for a number of reasons. Notably, they suggest an entirely unexplored role for body postures in self-evaluation and demonstrate the importance of understanding meta-cognitive processes in embodiment. Previous research has found that people's dynamic overt behavior (e.g., head movements, handwriting; Briñol & Petty, 2003) can influence persuasion by increasing or decreasing the confidence with which people hold their thoughts. The present studies extend this line of research by demonstrating that static body postures can also be amenable to a self-validation analysis, suggesting that the self-validation mechanism may provide a novel explanation for other behaviors and, perhaps, for other non-evaluative phenomena.

Although we have focused on meta-cognitive processes in this research, the examined body postures, like any other bodily response (and variable in a persuasion setting), can influence judgment by other mechanisms under different circumstances (see Briñol & Petty, 2008). Rather than revisit these possibilities, we chose to focus on the more novel issue of how postures might impact evaluation of the self by affecting the use of self-relevant thoughts.⁷

⁶Because we were interested primarily in demonstrating that body posture can impact self-attitudes via thought confidence, we only explored the mediational path described in the text. As indicated in the discussion of the mediational analysis, other possible mediating processes could possibly have been operative in this context. The critical point for the present work, however, was to demonstrate that body posture *could* impact attitudes via thought confidence, not that it impacts attitudes *exclusively* via a thought-validation mechanism. However, given that the posture induction did not influence any of the other factors assessed in the present research, those factors (e.g., amount of thoughts) do not provide a plausible mediator for the current results. It is also possible that partial mediation was observed because we only used a one-item measure of thought confidence. With a more extensive index, a stronger relationship might have been observed.

⁷The interaction found for posture and thought direction clearly favors the self-validation hypothesis over those predicting main effects (e.g., self-perception, classical conditioning, and biased elaboration) and those predicting other patterns of interactions (e.g., compatibility). For example, the results suggest that confident postures increased reliance on both positive and negative self-related thoughts relative to doubtful postures. Although it might have been possible, based on current conceptualizations of embodiment congruency effects in memory (e.g., Förster & Strack, 1996) to predict that confident postures would increase confidence in positive thoughts and that doubtful postures would increase confidence in negative thoughts, this did not occur in this study.

The Role of Timing in Embodied Evaluation

Although the data from our experiment favor the self-validation hypothesis over the alternatives based on differences in the amount and direction of thinking, we have often found that separating the thought-generation and confidence-induction tasks allows us to distinguish these alternate mechanisms from one another. Our previous work has clearly revealed that self-validation processes are particularly likely to operate when thoughts are generated before the validating variable (e.g., body posture) is introduced. Specifically, our research suggests that the sequence of evaluation affects what construct confidence is attached to (for a detailed review, see Briñol & Petty, 2009). Whereas a variable (e.g., body posture) tends to affect one's own, previously established points of views (thereby influencing the extent or direction of thinking), when it is induced *prior* to thinking about an attitude object, the same variable can affect thought confidence (thereby influencing attitude extremity through self-validation) when it is induced *after* thinking about an attitude object. For example, recent research on the power experienced by recipients of persuasive messages has shown that the same manipulation (e.g., power) can influence the number of thoughts an individual generates *or* the confidence with which these thoughts are held, depending on when this power manipulation takes place (Briñol et al., 2007b).

In sum, our framework makes very clear predictions regarding the role of the timing of body posture inductions in evaluation. However, the prediction is less clear when the validating variable (body postures in this case) is induced simultaneously with—rather than before or after—the thought-generation task. In theory, when cognitive (e.g., thought-listing) and embodied (e.g., enactment of body postures) processes occur simultaneously, either process could impact attitudes. As indicated above, the likelihood that either of these processes will play the predominant role in affecting attitudes is a function of (a) what is more accessible in participants' minds at the time of judgment and (b) the elaboration likelihood of the situation. For this reason, it is very important to examine evidence that can help us to discriminate between these two underlying mechanisms, one predicting changes in the number or length of thoughts as a function of body postures and the other predicting changes in thought confidence due to body postures.

A first piece of evidence can be found in previous research. Indeed, existing theory, along with the majority of the empirical evidence relevant to confidence and information processing, suggests that confidence should decrease the amount of thinking that a person does. Specifically, confidence has been argued to reduce the motivation to think, whereas doubt- and uncertainty-related states are often associated with more information processing (Briñol, Petty, & Wheeler, 2006; Petty, Tormala, Briñol, & Jarvis, 2006; Tiedens & Linton, 2001; Weary & Jacobson, 1997). If we had only considered the research involving confidence and information processing, we would have expected confident-posture participants in our study to have shown a *smaller* effect of thought direction than we would have expected to observe among doubtful-posture participants (see Footnote 1). Of course, this is not the pattern of data that we observed. In fact, the exact opposite pattern of data was found.

A second point arguing against the possibility that body postures impacted attitudes by affecting the number or length of thoughts involves the format of the study itself. Specifically, the number of thoughts that participants were able to list was kept constant for all participants in order to avoid any differences in the amount of thinking across posture conditions. Further, the content (e.g., favorability, abstractness, extremity) and length of the thoughts that participants listed did not differ by posture condition. Again, these findings are important in that they help to rule out the possibility that participants positioning the upright posture thought more than did participants in the slouched posture. Third, although the elaboration account could fit with the self-attitude pattern of results, it does not account for other findings in the study. According to the alternative view, number of thoughts replaces thought confidence as the mechanism underlying our attitude effects. This alternative is inconsistent with our finding that the attitude effects were (partially) mediated by thought confidence. Fourth and somewhat related, the elaboration account does not explain why posture affected confidence, which itself partially mediated the effect of body posture on self attitudes, but did not affect thought direction. Fifth, even though a measure of perceived elaboration was sensitive in our previous embodiment (e.g., Briñol & Petty, 2003) and self-validation (e.g., Briñol et al., 2007a) research, no effect of body posture was apparent on this measure. Sixth, in case participants were not sensitive to their own cognitive effort, we asked external judges to code the thoughts for differences related to elaboration (e.g., number, length, abstractness). The judges' ratings on these dimensions did not differ as a function of participants' body postures, even when the data were analyzed separately for each judge.

Finally, an objective measure of the amount of time participants spent entering self-related thoughts did not reveal any differences as a function of body posture (see footnote 2). As noted, although this finding represents a null effect, the measure we used (i.e., time) has proven sensitive to differences in elaboration in similar studies varying body postures

(e.g., Riskind & Gotay, 1982). Given this, we are fairly confident that the body posture conditions did not differ in their degree of elaboration. This evidence, in combination with prior literature and other relevant patterns in the current data, provides little reason to believe that elaboration, rather than thought confidence, was responsible for the results we have reported.

The Meaning of Body Postures

The body postures used in this experiment appear to have relatively clear meanings associated with confidence and doubt. However, the meaning of these postures can vary among individuals (e.g., as a function of gender, body shape, and body size) and situations (e.g., public vs. private settings, dressed vs. undressed). Consistent with previous work on embodiment (e.g., Schubert, 2004), we argue that if the meaning associated with the posture changes, the effect of that posture on subsequent attitudes would also change, at least under high elaboration conditions and when attitudes are assessed with explicit measures. Indeed, future research on embodiment should explore whether there is a default meaning associated with certain behaviors which is tapped in low thinking conditions or on measures of automatic evaluation, but which is then modified in high thinking situations or on deliberative measures.⁸

Given the clear meaning associated with the body postures used in this study, one might wonder about possible experimental demands. If the behavioral induction were too blatant, participants might have realized that the experimenter intended for them to feel more or less confident as a function of this behavior, therefore crafting their responses to conform to the experimenter's wishes. We do not consider this possibility to be plausible since the behavioral induction did not mention or include any meaning associated with the bodily poses that participants enacted. Importantly, none of the participants expressed any suspicion regarding the meaning of the behavior or the hypothesis under examination when given the opportunity, at the end of the study, to write about any concerns or suspicions they may have had. Furthermore, even if participants believed that the study was attempting to vary confidence, it is likely that participants would have intuited a main effect hypothesis (more favorable self-evaluations in the confident than doubtful posture) rather than the interaction effect that was observed.

Nevertheless, in order to rule out this possibility in a more definitive way, we asked a new group of participants what they felt and thought in response to the instructions used in the main study. Specifically, 48 participants were asked to write down their qualities while sitting with their chest out (confidence posture) or their back curved (doubt posture). Instead of measuring self-evaluations, we simply asked participants what they thought and felt during and after the posture induction. For instance, we asked participants to rate, on a series of nine-point scales, the extent to which the posture induction had made them feel the following emotions: doubt, pride, sadness, happiness, and being "down" (1 = not at all, 9 = a great deal). Further, we probed participants for suspicion, providing them with the opportunity to write a short, open-ended essay. This essay asked participants to attempt to guess the researchers' hypotheses and goals for the study. None of the mood measures differed by posture condition (all $ps > .35$). Perhaps most notably, participants did not report having felt more confidence in the upright condition than in the slouched condition ($p > .80$), although participants in the upright condition *did* report more confidence in the thoughts they generated during the attribute-listing task than did participants in the slouched condition ($p = .05$). Apparently, the confidence associated with the upright posture was attributed to the thoughts participants listed rather than to the posture itself. This makes sense on a practical level; after all, participants were focused, during the attribute-listing task, on the attributes that they listed and not on the posture they were enacting. It is not surprising that any effects of that posture—be they relating to confidence or to other constructs—were "attached" to self-relevant thoughts rather than to the posture that was being performed. Indeed, if people directly attributed a feeling of confidence to the posture, it is likely that the manipulation would not have affected thought confidence as many studies of misattribution have previously shown (e.g., Schwarz & Clore, 1983). Regardless, these findings replicate those of the main study, showing that while body posture does not—at least in this paradigm—affect subjective feelings of confidence, it does appear to have a robust impact on confidence in one's thoughts. Finally, and also importantly, no participants were able to accurately guess the true purpose of the study or to articulate the researchers' hypotheses when given the opportunity to do so. Taken together, we believe that the findings of this new investigation cast serious doubt on the notion that the effects of body posture in the main study were due to experimental demand characteristics.

⁸Future research should explore the conditions and processes by which the meaning of behavior and the context interact. Literature on placebo effects can be particularly informative in this domain since placebo studies often involve participants performing a behavior (e.g., taking pills, using a lotion) for which a particular meaning is "artificially" provided.

Furthermore, the results of the pilot study are consistent with the idea that the instructions used in the main study led people to perform the required behavior without elaborating on the roles associated with it. In addition, it appears unlikely that participants deliberately modified their responses in order to conform to the research hypotheses. That is, participants did not report having thought much about the meaning of the behavior, and participants were also fairly unlikely to report feeling suspicious about the possible meanings associated with the body postures they enacted. Most importantly, the body posture conditions did not differ in any of the measures designed to assess experimental demand (all $ps > .35$), as noted before. These findings support the conclusion that the induction was not so blatant as to create demand concerns.

The Power and Use of Body Postures

In closing, it is important to note that both the body postures used in this experiment appear to have meanings associated with confidence and doubt. However, given that the meaning of these postures can vary, one might wonder whether one of the body postures used in this research was more powerful than the other in affecting self-evaluations. For example, it might be that the confident posture was more influential than the doubtful posture, or vice versa. A control group (i.e., a non-meaningful posture) might have allowed us to address this issue empirically. According to the self-validation account, however, the baseline level of thought confidence in the experimental setting determines which body posture has a larger impact on attitudes or self-evaluations. There are a large number of background variables that could affect whether the high- or the low-confidence posture group would be more different from the control group in any given study. For example, if we used a persuasion topic for which people had high knowledge (as is often the case with the self), the default level of thought confidence would be relatively high, making the low-confidence posture group more likely to differ from the control group. On the other hand, if knowledge of the topic were low (i.e., the topic were unfamiliar), default (control) thought confidence would likely be low, leading the high-confidence posture condition to show the greater difference from the control condition. Under some moderate level of background variables, a control group for meaningful posture could fall exactly between the high- and low-confidence posture conditions. For practical purposes, it is important to note that even in that potential case, there would be only one particular level of background variables being tested. In the real world, the background level of confidence could vary dramatically from situation to situation, and thus whether the “action” would be in one posture or the other would vary along with these real world background factors (just as they would with the laboratory background factors).

As implied above, people differ with respect to a wide variety of factors potentially relevant to embodiment. Thus, the meaning and the intensity of the induced body postures can vary among individuals and situations. People and contexts can vary in relevant variables other than those related to the meaning of the information that comes from the body, such as the extent to which people attend to and use their behavior in defining their attitudes. For example, the preference for consistency scale (Cialdini, Trost, & Newsom, 1995) has been found to be useful in predicting which individuals will be most susceptible to the effects of induced behavioral compliance. More directly tied to embodiment, Laird and Bresler (1992) have reported that people differ consistently and stably in how large an impact any bodily state has on a variety of cognitive processes—including meta-cognitive processes—relevant to attitude change. Thus, when people are induced to engage in emotional behaviors, some report feeling the corresponding emotions, whereas other people are unaffected by their behaviors. These differences have been found in people’s responses to manipulations of their facial expressions, postures, tones of voice, patterns of gaze, and levels of autonomic arousal (e.g., Duclos & Laird, 2001). Future research should more systematically explore these and other individual differences in responsiveness to behavioral inductions.

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