

## **Embodiment in Social Psychology**

Brian P. Meier  
Gettysburg College

Simone Schnall  
University of Cambridge

Norbert Schwarz  
University of Michigan

John A. Bargh  
Yale University

***Topics in Cognitive Science, in press***

Direct correspondence to Brian P. Meier, Department of Psychology, Gettysburg College, Gettysburg, PA, 17325. Email: [bmeier@gettysburg.edu](mailto:bmeier@gettysburg.edu).

**Abstract.** *Psychologists are increasingly interested in embodiment based on the assumption that thoughts, feelings, and behaviors are grounded in bodily interaction with the environment. We examine how embodiment is used in social psychology, and explore the ways in which embodied approaches enrich traditional theories. Although research in this area is burgeoning, much of it has been more descriptive than explanatory. We provide a critical discussion of the trajectory of embodiment research in social psychology. We contend that future researchers should engage in a phenomenon-based approach, highlight the theoretical boundary conditions and mediators involved, explore novel action-relevant outcome measures, and address the role of individual differences broadly defined. Such research will likely provide a more explanatory account of the role of embodiment in general terms as well as how it expands the knowledge base in social psychology.*

Does thinking about one's unethical behavior lead to a desire to choose an antiseptic wipe over a pencil? Does holding a heavy versus light clipboard cause people to more positively rate the resume of a job candidate? Do people perceive a manager to be more powerful if that manager is depicted higher on a chart of a company's organizational structure? Such questions would have seemed dubious just ten years ago; however, in order to shed light on how the human mind works social psychologists have been examining questions like these using an embodied approach as a guide.

Several core assumptions of the developing field of embodied cognition (for a discussion, see Wilson, 2002) are highly compatible with how social psychologists have traditionally approached their key topic, namely the study of how the presence of others affects thoughts, feelings, and behaviors (Ross, Lepper, & Ward, 2010). Having long emphasized the power of situations as well as goals (for an early history, see Krech & Crutchfield, 1948), social psychologists always assumed that cognition is situated and action oriented. Their subject matter also never allowed them to fully ignore bodily processes, which are centrally involved in many social phenomena, from emotion to mating to aggression. Hence, social psychology was very receptive to the notion of *embodiment*, which refers to the assumption that thoughts, feelings, and behaviors are grounded in sensory experiences and bodily states (for reviews, see Barsalou, 2008; Niedenthal, Barsalou, Winkielman, Krauth-Gruber, & Ric, 2005; Spellman & Schnall, 2009). The contention is that mental processes involve simulations of body-related perceptions and actions, for which a variety of different, not mutually exclusive, conceptualizations has been offered. Some note that we "evolved from creatures whose neural resources were devoted

primarily to perceptual and motoric processing” (Wilson, 2002, p. 625) and suggest that higher mental processes reuse evolutionarily older programs (Anderson, 2010); others emphasize developmental processes and suggest that our early experiences with the physical world (e.g., moving around in space) structure our later understanding or representation of more abstract concepts (e.g., likes and dislikes), a process referred to as scaffolding (Williams, Huang, & Bargh, 2009).

Embodied processes have often been identified by the examination of common metaphors in which abstract target concepts are described using concrete source concepts derived from perceptual experience. For example, a bad relationship is described as a “distant” one, whereas a good relationship is described as a “close” one likely because we are often physically near people we like and physically distant from people we dislike. One approach considers metaphors the key driver, rather than only a reflection, of embodied influences (Lakoff & Johnson, 1980, 1999). Not surprisingly, metaphors figure prominently in social life (for a review, see Landau, Meier, & Keefer, 2010); whether such metaphors are a manifestation (Anderson, 2010; Williams et al., 2009), a reinforcement (Landau et al., 2010), or the cause (Lakoff & Johnson, 1990) of embodiment effects in social judgment and behavior is a topic of some controversy.

Despite a long tradition of compatible theorizing, embodiment has only recently developed into a distinct theoretical approach in social psychology (e.g., Niedenthal et al., 2005; Schubert & Semin, 2009; Semin & Smith, 2002). This review addresses how embodied approaches are used to examine social behavior; it is illustrative rather than exhaustive and emphasizes the metaphor related work that found most interest in social psychology. We first illustrate how embodiment is explored in social psychology and then examine the trajectory of embodiment in social psychology, highlighting some promising future directions.

### ***The Use of Embodiment in Social Psychology***

Although embodied theories started gaining steam in the 1990s (Barsalou, 1999; Gibbs, 2006), approaches related to embodiment have a long tradition in social psychology. From addressing how physiological arousal affects emotions (Schachter, 1959) to examining the influence of high temperatures on aggressive behaviors (Griffit & Veitch, 1971), social psychologists have traditionally been aware that people think, feel, and act inside their bodies. Their work revealed how sensory, motor, and perceptual processes influence thoughts, feelings, and behaviors before this enterprise received a unifying framework with the development of embodied theories. For example, Wells and Petty (1980) showed that people who engaged in vertical (nodding) rather than horizontal (shaking) head

movements were more likely to agree with a message; Zajonc, Pietromonaco, and Bargh (1982) found that chewing gum while viewing faces interfered with participants' later memory for those faces by impairing mimicry; Frank and Gilovich (1988) observed that athletes who wore darker (versus lighter) uniforms committed more malevolent behavior; and Strack, Martin, and Stepper (1988) found that people rated cartoons as funnier if they held a pen with their teeth (facilitating a smile) rather than their lips (inhibiting a smile).

While social psychological research that explicitly uses an "embodied" language is fairly new, even this work builds on a long tradition. For example, consider some early work by Solarz (1960). He found that people are faster at initiating motor movements towards themselves when viewing words with a positive meaning, but at initiating motor movements away from themselves when viewing words with a negative meaning. Although not couched in embodied terms, Solarz's (1960) findings suggest that approach and avoidance movements become part of our representation of evaluations. We have extensive experience physically moving our bodies toward things we like (e.g., a tantalizing cocktail), but away from things we dislike (e.g., a slithering snake). Eventually, through repeated experiences and the accompanying metaphors, evaluations become grounded in perceptions of physical distance and in actions related to enhancing or decreasing that distance. Indeed, more recent research revealed many ways in which physical distance influences behavior. For example, physical distance manipulations bias people's perception of their psychological bonds with family members (Williams & Bargh, 2008a), evaluative judgments (Cacioppo, Priester, & Berntson, 1993), and anger-related experiences (Hauser, Carter, & Meier, 2009).

Other recent work tested whether metaphors that figure prominently in everyday discourse about social phenomena reflect embodied processes. Such work illuminates whether the representation of a concept depends upon basic physical experience and addresses how the physical experience, in turn, affects cognition, emotion, and behavior. Reflecting the metaphorical link between physical and moral cleanliness (e.g., "a clean conscience"), researchers found, for example, that cleaning one's hands with soap or an antiseptic wipe can alleviate the guilt of moral transgressions (Zhong & Liljenquist, 2006) and influence one's moral judgment (Schnall, Benton, & Harvey, 2008); conversely, engaging in unethical behavior increases the appeal of cleaning products and one's willingness to pay for them (Lee & Schwarz, 2010a; Zhong & Liljenquist, 2006). The findings also suggest that the effects are modality specific – lying with one's mouth increases the appeal of mouthwash but not of hand sanitizer, whereas the reverse holds for typing the lie with one's hands (Lee & Schwarz, 2010a). Exploring the metaphorical links between physical and social temperature (e.g., "showing someone a cold shoulder"; having "a

warm disposition”), researchers found that participants perceive others as “warmer” after they held a warm rather than cold cup of coffee (Williams & Bargh, 2008b; see also Ijzerman & Semin, 2010) and experience a room as physically colder after having been socially rejected (Zhong & Leonardelli, 2008). Other work highlighted the impact of metaphorical links between verticality and power (e.g., “high in the hierarchy”; Schubert, 2005), affect (e.g., “feeling down in the dumps”; Crawford, Margolies, Drake, & Murphy, 2006; Meier & Robinson, 2004), divinity (Meier, Hauser, Robinson, Friesen, & Schjeldahl, 2007) and other variables.

The insights offered by embodied approaches have also enriched existing accounts of social judgment, as examples from person perception may illustrate. In a classic study, Carver, Ganellen, Froming, and Chambers (1983, Experiment 1) showed participants a videotape of a hostile or non-hostile interaction between a boss and employee. Next, in a supposedly unrelated task, participants judged the ambiguous behavior of a hypothetical individual. Participants exposed to the hostile interaction viewed the hypothetical individual as more hostile as well. Mere semantic priming with hostility-related words has the same effect (Srull & Wyer, 1979) and social cognition explanations of the Carver et al. (1983) results trace them to increased concept accessibility (Higgins, 1996; Todorov & Bargh, 2002). Going beyond mere differences in concept accessibility, embodied approaches assume that exposure to a hostile social interaction causes participants to simulate or re-enact the sensations, perceptions, and motor processes of previous hostile confrontations (Barsalou, 1999), which then influence the impressions formed of an unrelated individual. Such accounts contend that bodily states (e.g., motor movements) are an integral aspect of the representation of hostility.

A study by Chandler and Schwarz (2009) can illustrate the different perspectives. Participants read a paragraph about Donald (taken from Srull & Wyer, 1979) who behaved in ambiguously aggressive ways. While doing this, participants moved their hands in a steady rhythm through a motion detector, ostensibly as part of a study on multi-tasking. Depending on conditions, Donald was paired with an arm movement that involved an extended middle-finger (as in “the finger”) or thumb (as in “thumbs up”), though these terms were never used and the digits were referred to as “digit A, B” and so on. Extending the middle finger increased perceptions of Donald as hostile, but did not affect perceptions of traits unrelated to hostility; this parallels the influence of semantic “hostility” primes. In contrast, extending the thumb resulted in more favorable judgments on all traits, including traits unrelated to hostility (e.g., smart). What remains open is whether motor action is (i) *sufficient* to produce this effect (as Chandler & Schwarz, 2009, concluded) because motor action, just like semantic priming, can affect concept accessibility or (ii) *necessary* because all comprehension involves bodily simulation (as others suggested;

e.g., Barsalou, 1999); from the latter perspective, the influence of semantic priming manipulations is mediated by the associated covert simulations. Such questions and research can enrich social psychological analyses of impression formation, as is the case for embodiment research in other domains of social behavior, including persuasion (Sherman, Gangi, & White, 2010), political attitudes (Oppenheimer & Trail, 2010), and helping behavior (Liljenquist, Zhong, & Galinsky, 2010).

### ***The Trajectory of Embodiment in Social Psychology***

The exploration of embodied metaphors has led to many memorable findings of everyday interest that have spurred much attention for the field. But observers increasingly wonder how much can be learned by repeatedly showing that metaphors have “real” consequences (Landau et al., 2010). This state of affairs reflects that social psychologists (and others) have focused on the first step involved in any new research program, namely demonstrating that there is, indeed, a finding worth studying. This step is usually followed by more extensive description before different process accounts are refined and juxtaposed (cf. Rozin, 2009). An increasing number of observers from multiple disciplines suggest that it is time to focus more explicitly on theory testing and application (Landau et al., 2010; Schubert & Semin, 2009). Acknowledging this need, we examine the possible trajectory of embodiment research across four areas, a phenomenon-based focus, theoretical boundary conditions and mediators, action-relevant outcome measures, and individual differences.

#### ***A Phenomenon-Based Focus***

Current embodiment research in social psychology typically aims to identify whether a concept or related metaphor is embodied. This approach usually starts with the identification of a metaphor followed by a test of whether the metaphor is suggestive of embodied processes. For example, Meier and Robinson (2004) proposed that the concept of affect is grounded in spatial perceptions because metaphors routinely describe affective concepts using descriptors of vertical space (“I’m feeling down today”). If so, affective judgments should be biased by verticality manipulations. Indeed, they found that people were more efficient at determining that a word had a positive meaning if the word appeared in the top section of a computer screen, but more efficient at determining that a word had a negative meaning if the word appeared in the bottom section of a computer screen.

While identifying whether a concept or metaphor is embodied is an important contribution, and a necessary first research step, there is little to be gained from extending this strategy to each of the plethora of concepts and accompanying metaphors. Thus, researchers are beginning to approach the

study of embodiment in social psychology be *starting* with a phenomenon-based focus rather than a metaphor-based focus, as suggested by Landau et al. (2010). This approach begins by focusing on a particular behavior (e.g., loving, eating, hurting, helping, etc.) and then examines how embodied theories can be used to explain and modify the behavior in predictable ways; it also examines the situations and contexts in which the behavior is more or less likely to be affected by embodied processes.

As an example, consider recent research into cognitive dissonance, that is, the aversive tension that arises when people are faced with inconsistent cognitions (Festinger, 1957; Harmon-Jones & Mills, 1999). When choosing between two attractive options (e.g., attending Harvard versus attending Princeton) dissonance results from the attractive features of Harvard that one forgoes by choosing Princeton (or vice versa). To reduce dissonance, people typically enhance the chosen option and downgrade the non-chosen option, thus bringing their perception of the choice alternatives into line with the choice made. Building on embodiment research in the domain of moral judgment, where Zhong and Liljenquist (2006) showed that guilt about one's own moral transgressions can be "washed away" by a physical cleansing, Lee and Schwarz (2010b) speculated that hand washing might more generally remove traces of the past by metaphorically "wiping the slate clean." If so, it may also reduce the dissonance arising from past decisions. Indeed, merely cleaning one's hands with soap or an antiseptic wipe after a difficult choice was sufficient to eliminate changes in the evaluation of choice alternatives.

This example illustrates how an embodied approach can raise new questions about classic findings while broadening the exploration of embodied process beyond the core metaphors that usually capture researchers' initial attention. With regard to post-decisional dissonance, the findings indicate that metaphorically washing one's hands of one's decision can eliminate the need for cognitive reevaluation of the alternatives, potentially by allowing a distancing from the decision that reduces further contemplation of foregone benefits. The findings also highlight that moral impurity (Schnall et al., 2008; Zhong & Liljenquist, 2006) is not the only things that can be "washed away"; physical cleansing can "wipe the slate clean" (Lee & Schwarz, 2011) by metaphorically removing traces of the past that are not only related to moral issues. Hence, it can attenuate or eliminate a broad range of otherwise robust effects of past behavior, from the impact of difficult choices on later evaluations (Lee & Schwarz, 2010b) and the influence of winning or losing streaks on subsequent risk taking (Xu, Zwick, & Schwarz, 2011) to the effects of lingering romantic memories on general well-being (Lee, Shaw, & Schwarz, 2011), inviting new questions about evaluative judgment, risk taking, coping, and related issues.

***Theoretical Boundary Conditions and Mediators***

To date, the fascination of novel and surprising findings has often taken priority over the identification of theoretical boundary conditions and mediators. This is likely to change and researchers are beginning to test boundary conditions that make embodied processes more or less likely to influence behavior. For example, if a particular behavior is expected to be influenced by motor actions and/or body-related perceptions, then using a theoretically consistent manipulation to remove the influence of the body on the behavior would provide compelling support for embodiment. As an illustration, consider research by Foroni and Semin (2009). They examined the role of embodiment in emotion language and found that reading action words for positive emotional expressions (e.g., smile) activated smile muscles more than reading adjectives that were simply positive in nature (e.g., funny). Thus, they concluded that emotion language is not symbolic but embodied. Importantly, they further found that exposure to action words for positive (e.g., smile) versus negative (e.g., frown) emotion expressions caused people to rate cartoons as funnier, but not when participants held a pen between their lips, which inhibited the activation of facial muscles. This research reveals that positive evaluations are partially based upon the bodily actions (activation of smile muscles) involved in happy experiences, and blocking these actions reduces positive evaluations. Thus, Foroni and Semin (2009) showed a boundary condition that is theoretically consistent with the embodiment of emotion language.

In addition to testing boundary conditions, researchers are beginning to explore the mediating or intervening variables that guide embodied behavior. Although any particular behavior is likely to have multiple mediators, the identification of significant mediators helps clarify how or why an effect occurs (Baron & Kenny, 1986). To date, few studies have focused on mediators, in part because current theorizing does not typically specify mediators and in part because many potential mediators are difficult to assess. Regarding the link of physical and social warmth, Kang, Williams, Clark, Gray, and Bargh (2010) used fMRI techniques to show that insular regions sensitive to physical warmth perception were structurally associated with regions reactive to violations of trust when participants played a decision-making game involving trust-related behavior. In other words, at least some embodied metaphor effects may be physically instantiated or mediated in brain structure and function.

Landau et al. (2011) provide another compelling example of mediation. They examined the embodiment of the self in terms of physical expansion, noting that people often describe the self as a physical entity that can expand or contract (e.g., “let me inside of your head”, “I want to grow inside”). They reasoned that exposing people to an image of an expanding figure (e.g., squares becoming larger) versus a static or fragmented figure would lead people to feel more self-actualized because a “growing”



self is a self-actualizing self. Furthermore, they predicted that accessibility of the concept of expansion (e.g., thoughts like “grow” and “broaden”) would mediate the effect. Indeed, participants exposed to an expanding physical image perceived themselves as more self-actualized and this was mediated by accessible thoughts related to the concept of expansion. Thus, Landau et al.’s (2011) research shows that exposure to visual stimuli primes concepts of expansion, which in turn influence metaphorically related social perceptions. Such process orientated research is necessary to provide a thorough understanding of the pathways that lead from “embodied” manipulations to observed cognitive, affective or behavioral effects.

### ***Action-Relevant Outcome Measures***

Among the various approaches that share similar assumptions, *simple* and more *radical* versions of embodiment theories can be discerned (Clark, 1999). The simple view states that bodily cues play an important role, but the body is conceptualized as a contextual factor that constrains a process that would otherwise happen invariantly. This version of embodiment implicitly holds on to the computational metaphor of traditional cognitive science while viewing the body as just another input factor, an add-on feature so to speak. In contrast, a more radical view necessitates rethinking of the content area of cognition, and how to study it (Clark, 1999). Such radical approaches to embodiment propose that traditional conceptions of the cognitive apparatus are misguided because they underappreciate the close interconnections of the body, the brain, and the world. Such approaches question the sequential nature of cognitive computation or even question the notion of internal cognitive representation itself.

Large parts of the evidence within social psychology are compatible with a weak or simple approach to embodiment, as defined by Clark (1999). For example, studies manipulating bodily cues can still follow the computational metaphor. However, because embodied approaches presume an intricate link between action and perception, the ultimate goal of embodied approaches should not be to investigate the influence of embodied factors on cognition, but to clarify the influence of embodied factors on action. Hence, an embodied approach requires a reorientation from focusing on cognition to focusing on behavior. As Baumeister, Vohs and Funder (2007) noted, current psychological research does not generally focus on actual behavior. A more radical approach to implementing embodiment would be to consider outcome measures that are clearly linked to action, preferably testing whether thoughts and feelings serve as mediators. For example, perceptual measures such as estimates of hill slant have been used because they take into account the body’s current resources to perform actions

(e.g., Schnall, Harber, Stefanucci, & Proffitt, 2008; Schnall, Zadra, & Proffitt, 2010). Similarly, priming people with aggressive concepts can lead to different responses depending on what actions are appropriate in a specific physical environment, such as a “fight” response when the person is confined to a small room, but a “flight” response when the person is in an open field (Cesario, Plaks, Hagiwara, Navarrete, & Higgins, 2010). If we are to take seriously the idea that cognition stands in the service of action, researchers will need to study actions in relevant contexts, or at least processes of social cognition that have immediate relevance for specific actions.

### ***Individual Differences***

Little is known about the role of individual differences in the embodiment of behavior. Embodiment theorists (e.g., Barsalou, 2008; Gibbs, 2006; Lakoff & Johnson, 1999; Niedenthal et al., 2005) have routinely focused on fundamental cognitive processes without attending to how individuals differ. In a straightforward sense, personality theory contends that people’s thoughts, feelings, and behaviors vary in predictable ways across individuals (Carver & Scheier, 2007; Robinson, 2004, 2007). Accordingly, personality theory is likely to be integrated into embodied approaches. For example, Landau et al. (2010) contend that people who have a tendency to avoid abstractness or complexity may be more likely to use embodied metaphors to guide or make sense of their actions.

Some researchers have considered the role of individual differences in the familiarity, usage, and motivation of the abstract and concrete concepts involved in embodied behavior. For example, individuals may have a preference for using metaphors that highlight or downplay information in a way that accords with their motivation to maintain specific beliefs or behaviors. Consistent with this notion, Moeller, Robinson, and Zabelina (2008; also see Robinson, Zabelina, Ode, & Moeller, 2008; Meier, Sellbom, & Wygant, 2007) found that people who report being more dominant in their social lives are also more proficient in using the vertical (versus horizontal) dimension of visual space. Thus, individuals who have a motivation to exert power over others also excel in using a sensory domain (i.e., visual attention in the vertical domain) that is consistent with metaphors for social power. Similarly, Sherman and Clore (2009) found that individuals with a high desire for physical cleanliness have stronger automatic associations between morality and immorality and the colors white and black, respectively, than individuals for whom cleanliness is not as important. These results suggest that individual differences are associated with metaphor-consistent behavior, but such work merely scratches the surface, and leaves plenty of room for further advancement.

In addition to personality-related individual differences, other critical individual differences might relate to people's varying levels of bodily ability. For example, to clarify mediating variables and mechanisms, it will be highly illuminating to examine physical abilities that tend to decay over the lifespan, after injury, or through declining physical health (e.g., vision, hearing, and physical strength). For example, might elderly people represent their social environments differently because they have limited physical capabilities? Furthermore, might a person's representation of their world change after a physical injury or declining health? Research by Bhalla and Proffitt (1999) suggests that such variables can influence embodiment. They found that elderly people and individuals in declining health perceive hills as steeper, reflecting their decreasing ability to climb them. Future research of this type can explore to a much greater extent the manner in which embodied constraints on behavior are innate or instead, malleable across physical disabilities and the lifespan.

### ***Summary and Conclusion***

An increasing number of social psychologists are joining researchers in cognitive psychology, neuroscience, and developmental psychology in exploring the embodiment of behavior. The current research is innovative and provides a welcome perspective to the field. However, the current research is in its early stages and tends to be descriptive rather than explanatory. We believe the trajectory of embodiment in social psychology is heading towards a deeper level of understanding and is beginning to focus on phenomenon-based studies, theoretical boundary conditions and mediators, action-relevant outcome measures, and individual differences in a broadly defined manner. Research of this type will further open the door for collaborative work between social psychology and other disciplines and will likely provide significant contributions to what could be a major approach to the study of behavior.

### ***References***

- Anderson, M. (2010). Neural reuse: a fundamental organizational principle of the brain. *Behavioral and Brain Sciences*, 33, 245-266.
- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51, 1173-1182.
- Barsalou, L.W. (1999). Perceptual symbol systems. *Behavioral and Brain Sciences*, 22, 577-660.
- Barsalou, L.W. (2008). Grounded cognition. *Annual Review of Psychology*, 59, 617-645.
- Baumeister, R. F., Vohs, K. D., & Funder, D. C. (2007). Psychology as the science of self-

- reports and finger movements: Whatever happened to actual behavior? *Perspectives on Psychological Science*, 2, 396-403.
- Bhalla, M., & Proffitt, D. R. (1999). Visual-motor recalibration in geographical slant perception. *Journal of Experimental Psychology: Human Perception and Performance*, 25, 1076-1096.
- Cacioppo, J. T., Priester, J. R., & Berntson, G. G. (1993). Rudimentary determinants of attitudes. II: Arm flexion and extension have differential effects on attitudes. *Journal of Personality and Social Psychology*, 65, 5-17.
- Carver, C. S., Ganellen, R. J., Froming, W. J., & Chambers, W. (1983). Modeling: An analysis in terms of category accessibility. *Journal of Experimental Social Psychology*, 19, 403-421.
- Carver, C. S., & Scheier, M. F. (2007). *Perspectives on personality*. Boston, MA: Allyn and Bacon, Inc.
- Cesario, J., Plaks, J. E., Hagiwara, N., Navarrete, C. D., & Higgins, E. T. (2010). The ecology of automaticity: How situational contingencies shape action semantics and social behavior. *Psychological Science*, 21, 1311-1317.
- Chandler, J. & Schwarz, N. (2009). How extending your middle finger affects your perception of others: Learned movements influence concept accessibility. *Journal of Experimental Social Psychology*, 45, 123-128.
- Clark, A. (1999). An embodied cognitive science? *Trends in Cognitive Sciences*, 3, 345-351.
- Crawford, L. E., Margolies, S. M., Drake, J. T., & Murphy, M. E. (2006). Affect biases memory of location: Evidence for the spatial representation of affect. *Cognition & Emotion*, 20, 1153-1169.
- Festinger, L. (1957). *A theory of cognitive dissonance*. Stanford, CA: Stanford University Press.
- Feroni, F., & Semin, G. (2009). Language that puts you in touch with your bodily feelings: The multimodal responsiveness of affective expressions. *Psychological Science*, 20, 974-980.
- Frank, M. G., & Gilovich, T. (1988). The dark side of self and social perception: Black uniforms and aggression in professional sports. *Journal of Personality and Social Psychology*, 1, 74-85.
- Gibbs, R. W. Jr., (2006). *Embodiment and cognitive science*. New York: Cambridge University Press.
- Griffit, W., & Veitch, R. (1971) Hot and crowded. *Journal of Personality and Social Psychology*, 17, 92-98
- Harmon-Jones, E., & Mills, J. (1999). An introduction to cognitive dissonance theory and an overview of current perspectives on the theory. In E. Harmon-Jones & J. Mills (Eds.), *Cognitive dissonance: Progress on a pivotal theory in social psychology* (pp. 3-21). Washington, DC: American Psychological Association.
- Hauser, D. J., Carter, M. S., & Meier, B. P. (2009). Mellow Monday and furious Friday: The approach-related link between anger and time representation. *Cognition and Emotion*, 23, 1166-1180.

- Higgins, E. T. (1996). Knowledge activation: Accessibility, applicability, and salience. In E. T. Higgins & A. W. Kruglanski (Eds.), *Social psychology: Handbook of basic principles* (pp. 133-168). New York: Guilford Press.
- Izjerman, H., & Semin, G. (2010). Temperature perceptions as a ground for social proximity. *Journal of Experimental Social Psychology, 46*, 867-873.
- Kang, Y., Williams, L., Clark, M., Gray, J., & Bargh, J. A. (2010). Physical temperature effects on trust behavior: The role of insula. *Social Cognitive and Affective Neuroscience*; doi: 10.1093/scan/nsq077.
- Krech, D., & Crutchfield, R. S. (1948). *Theory and problems of social psychology*. New York: McGraw-Hill. (1948).
- 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 challenges to western thought*. New York: Basic Books.
- Landau, M. J., Meier, B. P., & Keefer, L. A. (2010). A metaphor-enriched social cognition. *Psychological Bulletin, 136*, 1045-1067.
- Landau, M. J., Vess, M., Arndt, J., Rothschild, Z. K., Sullivan, D., & Atchley, R. A. (2011). Embodied metaphor and the “true” self: Priming entity expansion and protection influences intrinsic self-expressions in self-perceptions and interpersonal behavior. *Journal of Experimental Social Psychology, 47*, 79-87.
- Lee, S.W.S., & Schwarz, N. (2010a). Of dirty hands and dirty mouths: Embodiment of the moral purity metaphor is specific to the motor modality involved in moral transgression. *Psychological Science, 21*, 1423-1425.
- Lee, W. S., & Schwarz, N. (2010b). Washing away post-decisional dissonance. *Science, 328*, 709.
- Lee, S.W.S., & Schwarz, N. (2011). Clean slate effects: The psychological consequences of physical cleansing. *Current Directions in Psychological Science*. – DOI: 10.1177/0963721411422694
- Lee, S.W.S., Schwarz, N., & Shaw, E. (2011, January). *Wiping away the past: Clean slate effects*. SPSP Preconference on Embodiment, San Antonio, TX.
- Liljenquist, K., Zhong, C., & Galinsky, A. D. (2010). The smell of virtue: Clean scents promote reciprocity and charity. *Psychological Science, 21*, 381-383.
- Meier, B. P., Hauser, D. J., Robinson, M. D., Friesen, C. K., & Schjeldahl, K. (2007). What’s “up” with God?: Vertical Space as a representation of the divine. *Journal of Personality and Social Psychology, 93*, 699-710.

- Meier, B.P., & Robinson, M.D. (2004). Why the sunny side is up: Associations between affect and vertical position. *Psychological Science, 15*, 243-247.
- Meier, B. P., Sellbom, M., & Wygant, D. B. (2007). Failing to take the moral high ground: Psychopathy and the vertical representation of morality. *Personality and Individual Differences, 43*, 757-767.
- Moeller, S. K., Robinson, M. D., & Zabelina, D. L. (2008). Personality dominance and preferential use of the vertical dimension of space: Evidence from spatial attention paradigms. *Psychological Science, 19*, 355-361.
- 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.
- Oppenheimer, D. M., & Trail, T. E. (2010). Why leaning to the left makes you lean to the left: Effect of spatial orientation on political attitudes. *Social Cognition, 28*, 651-661.
- Robinson, M. D. (2004). Personality as performance: Categorization tendencies and their correlates. *Current Directions in Psychological Science, 3*, 127-129.
- Robinson, M. D. (2007). Personality, affective processing, and self-regulation: Toward process-based views of extraversion, neuroticism, and agreeableness. *Social and Personality Psychology Compass, 1*, 223-235.
- Robinson, M. D., Zabelina, D. L., Ode, S., & Moeller, S. K. (2008). The vertical nature of dominance-submission: Individual differences in vertical attention. *Journal of Research in Personality, 42*, 933-948.
- Ross, L., Lepper, M., & Ward, A. (2010). History of social psychology: Insights, challenges, and contributions to theory and application. In S. T. Fiske, D. T. Gilbert, & G. Lindzey (Eds.), *Handbook of social psychology* (vol. 1, 5<sup>th</sup> ed., pp. 3-50). Hoboken, NJ: Wiley.
- Rozin, P. (2009). What kind of empirical research should we publish, fund, and reward? A different perspective. *Perspectives on Psychological Science, 4*, 435-439.
- Schachter, S. (1959). *The psychology of affiliation*. Stanford, CA: Stanford University Press.
- Schnall, S., Benton, J., & Harvey, S. (2008). With a clean conscience: Cleanliness reduces the severity of moral judgments. *Psychological Science, 19*, 1219-1222.
- Schnall, S., Harber, K., Stefanucci, J. & Proffitt, D. R. (2008). Social support and the perception of geographical slant. *Journal of Experimental Social Psychology, 44*, 1246-1255.
- Schnall, S., Zadra, J., & Proffitt, D. R. (2010). Direct evidence for the economy of action: Glucose and the perception of geographical slant. *Perception, 39*, 464-482.

- Schubert, T. W. (2005). Your highness: Vertical positions as perceptual symbols of power. *Journal of Personality and Social Psychology, 89*, 1-21.
- Schubert, T. W., & Semin, G. (2009). Embodiment as a unifying perspective in psychology. *European Journal of Social Psychology, 39*, 1135-1141.
- Semin, G., & Smith, E. (2002). Interfaces of social psychology with situated and embodied cognition. *Cognitive Systems Research, 3*, 385-396.
- Sherman, G. D., & Clore, G. L. (2009). The color of sin: White and black are perceptual symbols of moral purity and pollution. *Psychological Science, 20*, 1019-1025.
- Sherman, D. K., Gangi, C., & White, M. L. (2010). Embodied cognition and health persuasion: Facilitating intention-behavior consistency via motor manipulations. *Journal of Experimental Social Psychology, 46*, 461-464.
- Solarz, A. K. (1960). Latency of instrumental responses as a function of compatibility with the meaning of eliciting verbal signs. *Journal of Experimental Psychology, 59*, 239-245.
- Spellman, B. A., & Schnall, S. (2009). Embodied rationality. *Queen's Law Review, 35*, 117-164.
- Srull, T. K., & Wyer, R. S. (1979). The role of category accessibility in the interpretation of information about persons: Some determinants and implications. *Journal of Personality and Social Psychology, 37*, 1660-1672.
- Strack, F., Martin, L. L., & Stepper, S. (1988). Inhibiting and facilitating conditions of the human smile: A nonobtrusive test of the facial feedback hypothesis. *Journal of Personality and Social Psychology, 54*, 768-777.
- Todorov, A., & Bargh, J. A. (2002). Automatic sources of aggression. *Aggression and Violent Behavior, 7*, 53-68.
- Wells, G. L., Petty, R. E. (1980). The effects of overt head movements on persuasion: Compatibility and Incompatibility of responses. *Basic and Applied Social Psychology, 1*, 219-230.
- Williams, L. E., & Bargh, J. A. (2008a). Keeping one's distance: The influence of spatial distance cues on affect and evaluation. *Psychological Science, 19*, 302-308.
- Williams, L. E., & Bargh, J. A. (2008b). Experiencing physical warmth influences interpersonal warmth. *Science, 322*, 606-607.
- Williams, L. E., Huang, J. Y., & Bargh, J. A. (2009). The scaffolded mind: Higher mental processes are grounded in early experience of the physical world. *European Journal of Social Psychology, 39*, 1257-1267.
- Wilson, M. (2002). Six views of embodied cognition. *Psychonomic Bulletin and Review, 9*, 625-636.

- Xu, A. J., Zwick, R., & Schwarz, N. (2011). Washing away your (good or bad) luck: Physical cleansing affects risk-taking behavior. *Journal of Experimental Psychology: General*. – DOI: 10.1037/a0023997
- Zajonc, R. B., Pietromonaco, P., & Bargh, J. A. (1982). Independence and interaction of affect and cognition. In M. S. Clark & S. T. Fiske (Eds.), *Affect and cognition: The 17th annual Carnegie symposium*. Hillsdale, NJ: Erlbaum.
- Zhong, C. B., & Leonardelli, G. J. (2008). Cold and lonely: Does social exclusion feel literally cold? *Psychological Science*, 19, 838-842.
- Zhong, C. B., & Liljenquist, K. (2006). Washing away your sins: Threatened morality and physical cleansing. *Science*, 313, 1451-1452.