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Reports

How extending your middle finger affects your perception of others: Learned movements influence concept accessibility ☆

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ABSTRACT

Body movements both express and influence how people feel and think. Conceptualizations of this bidirectional influence assume that movement–concept associations can be innate or learned, although evidence for learned associations remained ambiguous. Providing a conservative test of learned movement–concept associations, two studies investigate the influence of culture-specific body movements, which involve an arbitrary relationship between movements and associated concepts. Paralleling the influence of hostility primes, extending the middle finger influenced the interpretation of ambiguously aggressive behaviors as hostile, but did not influence unrelated trait judgments (Study 1). Paralleling the effects of global evaluative primes, upward extension of the thumb resulted in more positive evaluations of the same target along all trait dimensions and higher liking of the target (Study 2).

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The extended middle finger is a common hostile gesture in the United States. When Nelson Rockefeller, then Vice President of the United States, wagged his finger at protesters in New York, he justified the gesture by noting that he was "just responding in kind" (Matthews, 1976). While Rockefeller's comment suggests that seeing others as hostile can prompt people to extend their middle finger, it is also possible that extending the middle finger can make other people seem more hostile. The present research addresses the latter possibility. It tests whether symbolic body movements affect the interpretation of ambiguous behaviors by increasing the accessibility of learned movement–congruent concepts.

We first place this issue in the broader context of embodied cognition and highlight the need to extend the investigation of bodily influences on cognition and emotion from potentially innate bodily expressions to arbitrary ones, which are clearly culturally learned. Subsequently, we draw on the priming literature in social cognition to derive hypotheses about the likely impact of two bodily gestures on the interpretation of ambiguous behaviors. One gesture, extending the middle finger, is clearly hostile in meaning, whereas the other gesture, giving the "thumbs up," has more general evaluative connotations of a positive valence. Using a cover story that disguised these gestures, we find that extending one's middle finger while reading about an ambiguously described target person (taken from Srull & Wyer, 1979) results in a more hostile impression, but does not affect impressions along unrelated, non-hostile trait dimensions (Study 1). Conversely, the "thumbs up" elicits more positive impressions that generalize across trait dimensions (Study 2). These findings are consistent with trait priming experiments (reviewed below) that observed trait-specific effects of hostility primes (e.g., Srull & Wyer, 1979) and more generalized effects of global evaluative primes (e.g., Stapel & Koomen, 2000), suggesting that bodily expressions can prime arbitrarily associated concepts with downstream consequences on impression formation. We find no evidence that these effects are mediated by movement induced changes in affect.

Bodily influences on thoughts and feelings

As a growing number of studies indicate feedback from a wide variety of motor movements—including facial expressions (e.g., Buck, 1980; Laird, 1974), posture (e.g., Stepper & Strack, 1993), arm movements (e.g., Förster & Strack, 1997) and hand configurations (e.g., Schubert, 2004)—can influence individuals' thoughts and feelings. Such influences have been observed for emotional experience (e.g., Strack, Martin, & Stepper, 1988), memory (e.g., Förster & Strack, 1996; Förster & Strack, 1997), spatial representation (e.g., Tucker & Ellis, 1998), problem solving (Broaders, Cook, Mitchell, & Goldin-Meadow, 2007), cognitive style (e.g., Friedman & Förster, 2001) and person perception (Mussweiler, 2006), among others (for reviews see Barsalou, 2008; Niedenthal, Barsalou, Winkielman, Krauth-Gruber, & Ric, 2005). Whereas some theories (e.g., Izard, 1977; Izard & Abe, 2004; Zajonc, Murphy, & Inglehart, 1989) have focused on how motor movement effects can be

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accounted for by innate physiological structures, others have allowed for the development of learned movement–concept associations (e.g., Barsalou, 1999, 2008; Förster & Strack 1996; Niedenthal et al. 2005). According to recent models of embodied cognition, perceptual patterns are an integral part of the representation of concepts. As the activation of perceptual patterns (including motor movements) related to a concept increases, so does the accessibility of the concept, influencing thoughts and feelings to which the concept is applicable (Barsalou, 1999, 2008; Niedenthal et al., 2005).

Learned and arbitrary motor movements

Whereas the general support for motor movement effects on feeling and thinking is unequivocal, the bulk of the available research reflects researchers' early interest in the influence of innate motor movements upon affect and cognition (e.g., Darwin, 1965/1872; Izard, 1977; Tompkins, 1962). Examples include the role of facial and bodily expressions in emotional experience (e.g., Stepper & Strack, 1993; Strack et al., 1988) and the link between arm contraction (as in pulling something closer) vs. extension (as in pushing something away) and approach vs. avoidance related processing styles (e.g., Friedman & Förster, 2002). To date, research into the influence of *learned* movements upon affect and cognition has focused on the evaluative effects of head-nodding or shaking (e.g., Förster & Strack, 1997; Wells & Petty, 1980) and the influence of slow movement on the accessibility of stereotypes of the elderly (Mussweiler, 2006). While the obtained findings are compatible with the assumed role of learned movement–concept associations, the support they offer for the learning hypothesis remains ambiguous.

With regard to head-nodding and shaking, Darwin (1965/1872) noted that infants often move their heads vertically when searching for the mother's breast and move their head horizontally when they have finished feeding, suggesting that the association between head movement and evaluation may have an innate component (see also Eibl-Eibesfeldt, 1972). Consistent with this possibility, cultures that do not use head-nodding as a sign of agreement and positive evaluation are the exception rather than the rule (Darwin, 1965/1872; Eibl-Eibesfeldt, 1972). Hence, the observation that nodding or shaking one's head influences the encoding of valenced information (e.g., Wells & Petty, 1980) and people's confidence in their own thoughts (e.g., Briñol & Petty, 2003) may involve the generalization of an innate movement–evaluation association. While such generalizations entail learning, they are silent on the influence of non-innate movement–concept relationships (for a general discussion see Tooby & Cosmides, 2005).

Such ambiguities can be avoided by examining the influence of *arbitrary* movement–concept associations. Following the terminology of semiotics (e.g., Saussure, 1985/1919), arbitrary movement–concept associations exist only as a result of convention, whereas non-arbitrary associations are ones in which the movement has a direct relationship with the associated meaning. Inborn movement–concept associations are necessarily non-arbitrary, whereas associations acquired later in life can be either non-arbitrary or arbitrary. Non-arbitrary movement–concept associations include associations between movements and the concepts that they directly simulate (e.g., the movement of picking up a cup and the concept of picking up a cup; Tucker & Ellis, 1998) as well as associations between movements and concrete concepts that are used to represent more abstract ones (e.g., kneeling and the representation of power in vertical space; Schubert, 2005).

This distinction bears on the second line of evidence for the influence of learned movement–concept associations. Specifically, Mussweiler (2006) showed that mimicking motor movements associated with a particular kind of person increases the accessibility of related person concepts. In his studies, participants who were induced to walk slowly rated an ambiguous target person as acting more stereotypically elderly. This may reflect that slow movement directly primes the learned stereotype (as suggested by Mussweiler, 2006) or that the perceptual patterns of slow movement activate the non-arbitrary association "slow" (as assumed by models of embodied concept representation; e.g., Barsalou, 2008), which in turn is associated with the learned stereotype. In the latter case, stereotype activation would be a downstream effect of the non-arbitrary link between slow movement and the concept "slow." Motor movements with arbitrary movement–concept associations avoid this ambiguity and offer a more conservative test of the hypothesis that motor movements can affect social perception through *learned* movement–concept associations.

Present research: Arbitrary movement–concept associations

To provide such a conservative test, we focus on movements whose meaning are unequivocally grounded in convention. In Study 1, we examine the effects of extending the middle finger on people's evaluations of an ambiguous target. In Study 2, we investigate the effects of extending the thumb when evaluating the same ambiguous target. We first review the culture-specific meaning of these gestures and subsequently derive specific hypotheses about their potential cognitive and affective impact.

Culture-specific meanings

Both "giving the finger" and the "thumbs up" have culture-specific meanings, bounded in space and time. Extending the middle finger is a Western expression of hostility that can be traced to Classical-era Greece, in which it was considered a lewd sexual gesture (Aristophanes, n. d.; Robbins, 2008). The extended middle finger has subsequently spread in various forms across Europe, the Middle East and Russia. For example, in Europe, the middle finger is generally extended upwards to indicate hostility. In the middle-east, the middle finger is inverted while the other fingers are splayed outward (Axtell, 1998, p. 30). Although the Western middle finger has become increasingly ubiquitous, its meaning is not universal. At times, this has even allowed "the finger" to be used as a covert signal of defiance. For example, in 1968, the USS Pueblo was captured in North Korean waters. The crew were forced to deliver pro-North Korean messages to the Western media, but were covertly able to signal their defiance by giving the middle finger while doing so (Time, 1968, p. 38).

In Western cultures, the extended middle finger is used in conflict situations and closely associated with hostility; in fact, so closely that prosecutors have argued that "giving the finger" is equivalent to "fighting words" and should hence not be protected by First Amendment rights (Robbins, 2008). However, the middle finger is not associated with other negative concepts (and would seem odd when used in response to a situation that was boring, like waiting in a doctor's office, or sad, like a family member's funeral). Hence, we expect that extending the middle finger primes concepts of hostility but does not prime other, unrelated negative concepts.

The "thumbs up" is also temporally and culturally specific. Its origin can be traced to the Coliseum in ancient Rome, where the audience would extend the thumb upwards and then make a downward stabbing motion if they wanted a gladiator to slay his vanquished opponent. If anything it originally was a sign of hostility (Corbeill, 2003, p. 50), a meaning which it retains to this day in West Africa, the Middle East and parts of the Mediterranean and Australia (Axtell, 1998, p. 46). In contrast, the meaning of the thumb has changed in most Western industrialized countries,

where it is now used to express approval or optimism. Hence, the "thumbs' up" differs from "the finger" not only in valence but also in specificity and we expect that it operates as a global evaluative prime.

Motor movements and impression formation: Mechanisms and predictions

In both experiments, participants read an ambiguous description of Donald, whose behavior can be interpreted as assertive or as hostile (Srull & Wyer, 1979). While doing so, they engaged in a motor task that required them to extend different fingers, moving them up and down through a motion sensor, allegedly to explore the effect of motor movements on reading comprehension. Subsequently, they rated Donald along different trait dimensions, that were either related to aggression (e.g., hostile, unfriendly, considerate) or not (e.g., intelligent, boring, honest). They also reported how much they liked Donald and indicated their own affective state (alert, irritable, confident, happy, uneasy). By pairing the Donald story with different finger movements, including fingers that are not associated with any particular meaning, we can explore the impact of motor movements on impression formation. Moreover, different process assumptions predict different patterns across the dependent variables.

First, previous research into person perception shows that ambiguous behaviors are interpreted in terms of the most accessible applicable trait construct (for reviews see Higgins, 1996; Srull & Wyer, 1989). As Srull and Wyer (1979) demonstrated, the trait construct "hostile" is applicable to the description of Donald and priming "hostile" results in higher ratings of Donald's hostility. Importantly, the impact of specific trait concepts is limited to behaviors and trait judgments to which the concept is applicable and does not generalize to behaviors and judgments to which the concept is not applicable (Higgins, Rholes, & Jones, 1977; Srull & Wyer, 1989; Wyer & Srull, 1989). If extending the middle finger primes the concept "hostile," as we assume, it should result (i) in higher ratings of hostility without (ii) affecting unrelated trait judgments.

Second, in contrast to specific trait concepts, the influence of global evaluative concepts—like "good" or "bad"—is not limited to ambiguous behaviors and generalizes across traits (e.g., Martin, Strack, & Stapel, 2001; Stapel & Koomen, 2000). If the "thumbs up" primes global evaluative concepts of approval, as we assume, it should (iii) result in more positive evaluations of Donald across all traits, in contrast to the trait-specific effects expected for "the finger." Conversely, if extending the middle finger primes global negative concepts of disapproval it should (iv) result in generalized negative ratings along all trait dimensions.

Third, these differences in trait judgments should also be reflected in differences in general liking judgments. Specifically, (v) extending the middle finger should decrease liking of Donald, whereas (vi) extending the thumb upward should increase liking of Donald. However, previous research also suggests that accessible global evaluative concepts (like "good") may exert more influence on liking judgments than accessible specific trait concepts of more narrow applicability (like "hostile"; e.g., Stapel & Koomen, 2000). If so, (vii) the positive influence of the "thumbs up" on liking ratings should be more pronounced than the negative influence of "the finger."

Finally, engaging in the respective finger movements may also influence participants' momentary affect, as has been observed for facial feedback (Strack et al., 1988) and bodily postures (Stepper & Strack, 1993). If so participants should (viii) report more positive affect when giving the "thumbs up" and more negative affect when giving "the finger" (relative to conditions involving fingers not associated with a particular meaning). Moreover, they should (ix) evaluate Donald more positively across all measures in the "thumbs up" than in the "finger" condition and their affective state should (x) predict these ratings. The expected generalized effect of affect follows from the observation that positive or negative feelings exert global positive or negative effects on evaluative judgments (for a review see Schwarz & Clore, 2007).

Study 1

In Study 1, participants extended either their index finger or their middle finger while reading a story about a target person whose behavior could be interpreted as assertive or hostile. For the reasons discussed above, the key prediction holds that extending the middle finger would result in increased ratings of hostility without affecting participants' judgments along other trait dimensions. Accordingly, Study 1 followed a 2 (motor movement: index vs. middle finger) $\times$ 2 (trait judgment: hostility related vs. control) factorial design with the latter factor manipulated within participants.

Method

Fifty-eight right-handed undergraduates (34 female) participated individually for course credit; 4 participants expressed suspicion about the hypothesis and were excluded from analysis. Prior research on motor movements has emphasized the need to ensure that people are not aware of the meaning of a motor movement in order to rule out demand characteristics or self-perception effects as explanations for motor movement effects (Strack et al., 1988). Thus, every effort was made to conceal the true purpose of this experiment.

Participants were led to believe that they were taking part in an experiment on language comprehension. Upon arriving at the lab (located in the Communication Department) they were told:

> People use a number of different muscles as a part of the reading process and we wonder what effect using other muscles, ones that are located near the reading muscles on the motor cortex, will have on their reading performance and what effect reading will have on people's motor performance. In this study you will read a number of different passages while making body movements. After each passage you will be asked a number of questions designed to assess your understanding of the text.

A poster showed two hands with all fingers labeled with letters. As part of alleged practice trials, participants were asked to extend "digit A" (the thumb of their right hand) and to move it up and down through a motion sensor (a laser beam hooked up to a computer, which supposedly recorded the rhythm of their movements) in pace with the tones played by "motion detection software" (a metronome). Next, they proceeded to "digit B" (index finger of the right hand) and "digit C" (middle finger of the right hand). While making these movements, they read short texts, including a story about an ambiguously aggressive man named Donald, taken from Srull and Wyer (1979). The story recounts Donald's actions over a single day, many of which could be interpreted as either aggressive or justifiably assertive. For example, Donald refuses to pay his rent, but only after his landlord failed to make promised repairs. This story was paired either with the index finger or the middle finger. To guard against semantic priming and to prevent subjects from guessing the true purpose of the experiment, the experimenter's instructions specifically avoided using the words "middle" or "finger".

To add additional credibility to the cover story, participants first provided demographic data that might plausibly influence language comprehension (language of birth, SAT scores, etc.). Then

they answered specific questions for each text immediately after reading it. First, they were asked two filler questions about the factual content of the text. They then rated Donald on aggression related traits (hostile, unfriendly, considerate; with considerate reverse coded) as well as control traits (intelligent, boring, honest; with positive traits reverse coded), with 1 = *disagree*; 11 = *agree*. Next, they reported how much they liked Donald (1= *not at all;* 11 = *very much*) and how difficult and distracting they found the movements (which had no effect and will not be discussed further). In addition, participants rated the extent to which they felt several different emotions (alert, irritable, confident, happy and uneasy; 1= *not at all*; 11 = *very much*). Finally, participants were probed for suspicion and debriefed.

Results

We first examined whether the finger movements influenced participants' mood. This was not the case and participants' self-reports of emotions revealed no effect of finger movements, *F*s < 1, except for reports of happiness. Participants who extended their middle finger reported feeling somewhat less happy ($M = 6.90$, $SD = 1.87$) than those who did not ($M = 7.96$, $SD = 1.56$), $F(1,51) = 4.49$, $p < .05$, $\eta_p^2 = .08$.

Turning to participants' trait judgments, a 2 (finger movement) × 2 (trait type) × 2 (gender) mixed model ANCOVA with happiness as a covariate revealed a significant interaction of condition and trait type, $F(1,50) = 5.47$, $p < .03$, $\eta_p^2 = .10$. As expected, participants rated Donald as more hostile when they read about him while extending their middle finger ($M = 8.41$, $SD = 2.49$) rather than index finger ($M = 6.74$, $SD = 2.73$); $F(1,50) = 4.80$, $p < .05$, $\eta_p^2 = .09$, for the simple main effect. In contrast, their ratings along other trait dimensions were unaffected by their finger movements, $F < 1$.

Finally, extending the middle finger did not significantly influence liking ratings, $F(1,50) = 1.8$, *ns,* for the main effect of finger movements.

Discussion

In sum, participants who extended their middle finger while reading a description of an ambiguously hostile person rated the person as more hostile than participants who extended their index finger. Importantly, the impact of finger movements was limited to ratings of hostility related traits and did not generalize to ratings of other traits. This pattern is consistent with previous trait priming experiments (Higgins et al., 1977; Srull & Wyer, 1979) and suggests that giving "the finger," a hostile gesture, primes the associated concept of hostility. This supports the hypothesis that body movements can prime related concepts, even when the movement–concept association is arbitrary and culture-specific.

In addition, we observed no evidence that the impact of extending the middle finger is mediated by participants' affective state. Participants' body movements did not affect self-reported feelings, except for reports of happiness. More important, the influence of the middle finger on hostility ratings remained significant after controlling for differences in happiness and the pattern of the trait ratings did not mirror the usually generalized influence of moods (Schwarz & Clore, 2007). Finally, although it is conceivable that men and women might be differentially influenced by extending the middle finger, no gender specific effects were observed.

Study 2

In contrast to the extended middle finger, which conveys hostility, the meaning of the "thumbs up" is of a more global evaluative nature. It conveys general approval and optimism and hence differs from "the finger" in specificity as well as valence. Accordingly, we expect that the "thumbs up" results in more positive evaluations of the target person across all measures, consistent with earlier person perception experiments that primed global evaluative concepts like "good" (Stapel & Koomen, 2000).

Method

Seventy-four right-handed undergraduates (43 female) participated individually for course credit; three expressed suspicion and were excluded from analysis. The procedure and measures were identical to Study 1, except that the Donald story was now paired with the thumb and index fingers. This resulted in a 2 (motor movement: thumbs up vs. index finger) × 2 (trait judgment: hostility related vs. control) factorial design with the latter factor manipulated within participants.

Results

Participants' self-reported emotions were unaffected by their body movements, all *F*s < 1.5, indicating that their judgments of Donald were not mediated by emotional experience.

Turning to participants' trait ratings, a 2 (motor movement) × 2 (trait type) × 2 (gender) mixed model ANOVA revealed a main effect of finger movement, $F(1,70) = 5.44$, $p < .05$, $\eta_p^2 = .072$. Participants rated Donald less negatively on all traits when they read about him while extending their thumb ($M = 5.73$, $SD = 1.42$) rather than index finger ($M = 6.59$, $SD = 1.63$). In contrast to Study 1, the interaction between body movement and trait type was not significant, $F < 1$, indicating that the "thumbs up" influenced ratings on all traits.

However, we obtained an unexpected marginally significant interaction between gender and condition, $F(1,70) = 3.74$, $p < .06$. Analyses of simple effects revealed that women rated Donald less negatively on all trait dimensions when giving the thumbs up ($M = 5.54$, $SD = 1.52$) than when extending their index finger ($M = 7.10$, $SD = 1.28$), $F(1,42) = 13.18$, $p < .01$, $\eta_p^2 = .24$, whereas no difference was observed for men, $F < 1$.

Turning to liking for Donald, an ANOVA revealed that participants also rated Donald as more likeable under thumb ($M = 4.92$, $SD = 2.26$) than index finger ($M = 3.89$, $SD = 2.19$) conditions, $F(1,70) = 3.97$, $p < .051$, $\eta_p^2 = .054$, again consistent with the assumption that extending the thumb primes positive global evaluative concepts. However, this effect was again limited to women, who liked Donald more when giving the thumbs up ($M = 5.67$, $SD = 2.20$) than in the control condition ($M = 3.20$, $SD = 1.60$), $F(1,42) = 17.37$, $p < .001$, $\eta_p^2 = .29$, and was not obtained for men, $F < 1$. This pattern is reflected in a significant interaction of gender and body movement, $F(1,70) = 7.61$, $p < .01$, $\eta_p^2 = .10$.

Discussion

In sum, women who extended the thumb while reading a description of an ambiguously hostile person rated the person more favorably overall, irrespective of the specific trait dimension; in contrast, men's judgments were unaffected by the motor movements. Extending the thumb had no effect on self-reported emotion, indicating that the observed effects are not mediated by participants' emotional experience. Moreover, the pattern observed among women is consistent with previous experiments that primed global evaluative concepts (Stapel & Koomen, 2000), again suggesting that body movements can prime related concepts, even when the movement–concept association is arbitrary and culture-specific.

Men were not significantly affected by the "thumbs up" movement used in Study 2, whereas no gender difference emerged in the impact of "giving the finger" in Study 1. This surprising pattern may potentially reflect gender differences in dealing with ambiguous interpersonal threats. In general, women are more likely to use "tend-and-befriend" strategies in interacting with potentially threatening others, like the ambiguously hostile Donald, than men (Taylor et al., 2000; Turton & Campbell, 2005). They may therefore be more sensitive to the implications of prosocial body language, like the "thumbs up," in such situations than men, who are less likely to rely on tend and befriend strategies. In contrast, hostile expressions, like "the finger," are more extreme and unusual and may exert an influence independent of the person's chronic or situation specific sensitivity to body language. These conjectures deserve testing, but are tangential to the key interest of the present research.

General discussion

In sum, extending the middle finger (Study 1) or the thumb (Study 2) while reading about an ambiguously hostile person influenced impression formation in ways that parallel the effects of semantic priming procedures. First, participants who extended the middle finger while reading a description of an ambiguously hostile target person (Study 1) rated the target as more hostile than participants who extended their index finger. In contrast, ratings of unrelated traits were not significantly affected by the motor movement. This trait-specific effect parallels the impact of semantic trait priming (Higgins et al., 1977; Srull & Wyer, 1979) and is consistent with the specifically hostile connotation of "the finger." Second, women who gave the "thumbs up" while reading the same description (Study 2) evaluated the target more favorably across all traits than women who extended their index finger. This generalized effect parallels the generalized effects of evaluative semantic primes like "good" (Stapel & Koomen, 2000) and is consistent with the global approval connotations of the "thumbs up." Third, women who gave the "thumbs up" also liked the target person significantly more, whereas the negative influence of giving "the finger" on liking remained nonsignificant. This is consistent with the observation that global evaluative primes may exert more influence on global evaluative judgments than specific trait primes of narrow applicability (see Martin et al., 2001, for a discussion). Surprisingly, however, the influence of the "thumbs up" was limited to women (Study 2), whereas the influence of giving "the finger" was independent of gender (Study 1). As noted in the discussion of Study 2, we conjecture that the observed gender difference reflects that women and men pursue different goals and strategies in the face of adverse interactions (Taylor et al., 2000; Turton & Campbell, 2005), which may themselves contribute to differential concept accessibility and use (Higgins, 1996). To date, the interplay of different sources of concept accessibility has received little attention and future research may fruitfully address this possibility.

Finally, we obtained no evidence that the motor movements influenced participants' emotions, except for an unexpected difference in happiness ratings in Study 1. However, the pattern of participants' trait judgments was unaffected by controlling for differences in happiness (Study 1) and did not conform to the pattern one would expect if the trait judgments were based on current mood (Schwarz & Clore, 2007).

In combination, the close parallels between the influence of motor movements and the influence of semantic primes strongly suggest that engaging in motor movements can prime associated concepts even when the movement–concept association is completely arbitrary, as is the case for "the finger" and the "thumbs up." Both body movements have culture-specific meanings that are geographically and historically confined (Axtell, 1998; Corbeill, 2003; Robbins, 2008) and learned rather than innate. We acknowledge, however, that our studies provide no direct evidence of increased concept accessibility *beyond* the observed effects on impression formation, as is typical for impression formation experiments in the semantic priming tradition (e.g., Higgins et al., 1977; Srull & Wyer, 1979). While future research may provide more direct evidence for increased concept accessibility, our interpretation is consistent with an already extensive list of other parallels between semantic primes and motor movements, based on potentially innate movement–concept associations. For example, just as motor movements can facilitate the encoding of information (Förster & Strack, 1996), so can semantic primes (Sperber, McCauley, Ragain, & Weil, 1979), resulting in enhanced recall for both motor compatible and prime congruent information. Conversely, motor movements can inhibit the encoding of incompatible information (Förster & Strack, 1996), just as semantic trait priming inhibits the accessibility of alternative trait constructs (Newman & Uleman, 1990). Also, motor movements can facilitate the retrieval of information from semantic and episodic memory (Förster & Strack, 1997; Riskind, 1983) as do semantic primes (Bowles & Poon, 1985; Rholes, Riskind, & Lane, 1987). Presumably, future studies will identify additional parallels between semantic priming effects and motor movement effects. For example, awareness of the connotations of the movements may very well eliminate their influence, as has been observed for awareness of semantic priming episodes (e.g., Strack, Schwarz, Bless, Kübler, & Wänke, 1993).

Throughout, the parallel effects of body movements and semantic primes are consistent with core assumptions of embodied cognition research (Niedenthal et al., 2005). Whereas social cognition researchers traditionally assumed that semantic primes activate amodal representations, more recent work indicates that much, if not all of our knowledge is represented across the sensory-motor system rather than amodally (Barsalou, 1999; Barsalou, 2008). This assigns the body a central role in social cognition research although the specific mediating mechanisms and the relative contribution of hot and cold processes await clarification (see the contributions in Semin & Smith, 2008).

Finally, it is worth noting a potentially important real world implication of the present results. Hostile gestures, like an extended middle finger, not only express the actors' feelings but also contribute to the actors' perception of their social environment. Hence, extending "the finger" in response to an annoying behavior may increase one's perception of others' apparent hostility, potentially justifying further aggressive responses. The gratuitous display of hostile gestures may therefore affect the actor as much as the perceiver at whom the gesture is directed.

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