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Tough and Tender: Embodied Categorization of Gender

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Abstract

Emerging evidence has shown that human thought can be embodied within physical sensations and actions. Indeed, abstract concepts such as morality, time, and interpersonal warmth can be based on metaphors that are grounded in bodily experiences (e.g., physical temperature can signal interpersonal warmth). We hypothesized that social-category knowledge is similarly embodied, and we tested this hypothesis by examining a sensory metaphor related to categorical judgments of gender. We chose the dimension of "toughness" (ranging from tough to tender), which is often used to characterize differences between males and females. Across two studies, the proprioceptive experience of toughness (vs. tenderness) was manipulated as participants categorized sex-ambiguous faces as male or female. Two different manipulations of proprioceptive toughness predictably biased the categorization of faces toward "male." These findings suggest that social-category knowledge is at least partially embodied.

Keywords

embodiment, gender, social categorization

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Emerging theories of grounded cognition describe how sensation, motor activity, and perceptual imagery shape cognitive processes ranging from object representation to emotion recognition (Niedenthal, 2007; Tucker & Ellis, 2001). These models suggest that cognitive representations include sensory, motor, and introspective states that are activated via simulations that reenact those states (Barsalou, 2008). For example, representations of grapes and hammers can be activated through simulations of motor processes involved in precision and power grips, respectively (Tucker & Ellis, 2001). Drawing from this literature, we hypothesized that a fundamental social-cognitive process, social categorization, might also be grounded in sensorimotor activity. Specifically, we explored the possibility that cognitive representations of gender are grounded in, and simulated through, sensorimotor activity.

Studies have demonstrated that many abstract concepts are represented with sensorimotor activity that is a metaphor for the concept (Lakoff & Johnson, 1980, 1999). For example, a representation of the abstract concept of "importance" might reference the sensation of holding something heavy. Indeed, in one study, participants who held a heavy clipboard judged an issue as more important than did those who held a light clipboard (Jostmann, Lakens, & Schubert, 2009). Similarly, perceptions of time are grounded in directional movement (Miles, Karpinska, Lumsden, & Macrae, 2010; Miles, Nind, & Macrae, 2010), moral purity is grounded in experiences of physical cleanliness (Lee & Schwarz, 2010; Zhong & Liljenquist, 2006), and interpersonal warmth is grounded in experiences of physical warmth (Williams & Bargh, 2008).

We suggest that social categories may also be grounded by sensorimotor metaphors. In this respect, our approach is consistent with the view that early perceptual processes, such as sensory feedback, lay the basis for social categorization (see Cloutier, Mason, & Macrae, 2005). This perspective can be distinguished from the view that behavioral representations both initiate action and are linked in memory to other representations, including social-category representations. For example, a behavior linked to elderly persons, such as slow walking, brings to mind "elderly people" and their stereotypical traits (Mussweiler, 2006; see also Bargh, Chen, & Burrows, 1996).

In contrast, our hypotheses are derived from research that emphasizes the fundamental importance of sensation and perceptual cues to social categorization. To be specific, grounded-cognition approaches assume that cognitive representations actually consist of sensorimotor activity. Just as the concept of

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importance can be represented with sensory feedback from holding heavy or light objects (Jostmann et al., 2009), the concept of gender might be represented through sensory feedback from handling hard (tough) or soft (tender) objects.

Indeed, the largest trait difference between males and females appears to be differences in tenderness (Feingold, 1994), and perceivers bring the bipolar extremes of this trait to mind when they think of males ("tough") and females ("tender"; e.g., Blair, Ma, & Lenton, 2001; Gawronski & Bodenhausen, 2005). Critically, *tough* and *tender* also describe opposing forms of proprioceptive feedback, which might serve to ground gender representations in sensorimotor activity. The generation or inhibition of motor pressure against an object provides sensory feedback about the relative toughness (vs. tenderness) of that object. We suggest that this sensory experience provides a foundation for representations of gender categories. Simulations of the proprioceptive experience of toughness (vs. tenderness) may therefore be involved in gender categorization. If so, exerting pressure against hard (vs. soft) surfaces should bias perceivers' categorizations of social targets toward the "male" category.

Study 1

Seventy college students (41% male, 59% female) continuously squeezed a hard or soft ball (between subjects) while categorizing eight faces as male or female. The two balls were similar in all respects except density. The soft ball was a standard polyurethane-foam stress ball, and the hard ball was made of latex filled with millet (manufactured by Office Playground, www.officeplayground.com). A pilot study confirmed that squeezing the hard ball activated thoughts about toughness more often than squeezing the soft ball did.[1] We used FaceGen Modeler (Singular Inversions, Toronto, Ontario, Canada) to create sex-ambiguous faces. FaceGen uses empirically derived statistical algorithms that enable users to define faces along several continuous parameters, including gender-prototypical facial features. We created faces that were midway along the male-female continuum—that is, realistic human faces whose features captured the empirically derived average of prototypical male and female faces.

Participants were informed that the experiment concerned the influence of a secondary task on face perception, and they were asked to continuously squeeze the ball they were given while categorizing faces. The faces were presented in a random order via computer, and participants clicked the computer mouse on either "male" or "female" to categorize each face. In total, participants squeezed the ball for 2 to 3 min, on average, while categorizing the eight faces. As expected, a 2 (ball type) × 2 (participant's gender) analysis of variance (ANOVA) revealed that faces were categorized as male more often by participants squeezing the hard ball ($M = 48\%$) than by those squeezing the soft ball ($M = 35\%$), $F(1, 66) = 4.03$, $p < .05$, $r = .23$ (there was no significant interaction with participant's gender, $p > .35$). Hence, sensory feedback consistent with toughness (vs. tenderness) influenced gender categorization. The results of this study support the idea that gender-category representations include sensory activity related to toughness.

Study 2

In Study 2, we sought to provide converging evidence for the influence of tough-tender proprioceptive feedback on gender categorization. Participants categorized the same faces as in Study 1 but with a different manipulation. Forty-eight college students (38% male, 62% female) were given two sheets of paper that were stapled together, separated by carbon paper. They were asked to categorize each face by using a pen to circle "male" or "female" on this answer sheet. The eight faces were presented on individual sheets of paper in a second booklet. Critically, participants were told either to press hard with the pen because they were making two copies (via the carbon paper) or to press gently because we wanted to reuse the carbon paper later.[2] As expected, a 2 (pen pressure) × 2 (participant's gender) ANOVA revealed that faces were categorized as male more often by participants who pressed hard on the paper ($M = 67\%$) than by those who pressed gently ($M = 52\%$), $F(1, 34) = 4.95$, $p < .05$, $r = .35$ (there was no significant interaction with participant's gender, $p > .80$). Thus, sensory feedback consistent with toughness (vs. tenderness) again influenced gender categorization.

Discussion

In these two studies, squeezing a soft ball or pressing softly on paper, as compared with squeezing a hard ball or pressing hard on paper, biased gender categorization toward "female." Although prior research has established that cognitive representations of behavior can influence social-cognitive processes such as stereotype activation (e.g., Mussweiler, 2006), we have shown that sensorimotor activity can play a fundamental role in social cognition: In our studies, the proprioceptive experience of toughness versus tenderness influenced gender categorization. Our results are consistent with contemporary models of grounded cognition (Barsalou, 2008). Perceivers' gender-category representations may thus include sensorimotor information related to handling hard and soft objects.

The current work therefore presents evidence consistent with a new conceptualization of social-category representation. Given the foundational role of social categories in phenomena ranging from face perception, to person memory, to stereotyping, the results of these two studies have implications for a variety of phenomena. For example, certain social categories are *essentialized*, meaning that they are perceived as having deep, hidden, and unchanging properties that determine individuals' membership in a group (Prentice & Miller, 2007). According to recent research, gender is the most essentialized human category (Haslam, Rothschild, & Ernst, 2000), and other research has suggested that the key trait for

differentiating males from females is tenderness (Feingold, 1994). Our findings raise the possibility that the sensory experience of toughness or tenderness may provide a concrete foundation for representations of gender categories, which suggests that a proprioceptive simulation might, in part, underlie such essentialized thinking.

Our data also provide further evidence that early perceptual processes contribute to social-categorical thinking. Whereas prior research demonstrated that facial cues and visual acuity can affect the speed of social categorization (e.g., Cloutier et al., 2005), the two studies presented here demonstrated that proprioceptive feedback contributes to social categorization. Just as visual cues are present on every human face and are therefore likely to have a ubiquitous influence on categorical thinking about other people, proprioceptive feedback is normally present for every human movement and is therefore likely to have a ubiquitous influence on categorical thinking. In particular, most human movement exerts varying amounts of pressure on the external world. The experience of such pressure, and specifically the sensory experience of toughness or tenderness, seems to influence the social categorization of gender. The strength of pressure one exerts on a surface—during activities ranging from pressing on an automobile accelerator, to typing on a keyboard, to exercising—can influence what one sees in other people, and this suggests that multiple modes of sensory experience guide how people perceive and think about one another in the social world.

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Declaration of Conflicting Interests

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Notes

1. Seventy-eight participants (36% male, 64% female) performed a word-fragment completion task that included "tough," "tender," and "neutral" word fragments while squeezing either ball. Fragments completed with "tough" words (*tough*, *hard*, *firm*, *rigid*) and "tender" words (*tender*, *soft*, *flexible*, *gentle*) were positively and negatively coded, respectively. Scores on this toughness index were higher for individuals handling the hard ball ($M = 0.54$) than for those handling the soft ball ($M = –0.26$), $t(76) = 2.12$, $p < .05$, $r = .24$.

2. To check pen pressure, condition-blind raters coded writing protrusions on the carbon paper. Eight soft-condition participants pressed hard, and 1 hard-condition participant pressed softly, so these participants were excluded. Finally, 2 participants received help from each other; both were excluded.

References

Bargh, J.A., Chen, M., & Burrows, L. (1996). Automaticity of social behavior: Direct effects of trait construct and stereotype activation on action. *Journal of Personality and Social Psychology*, *71*, 230–244.

Barsalou, L.W. (2008). Grounded cognition. *Annual Review of Psychology*, *59*, 617–645.

Blair, I.V., Ma, J.E., & Lenton, A.P. (2001). Imagining stereotypes away: The moderation of implicit stereotypes through mental imagery. *Journal of Personality and Social Psychology*, *81*, 828–841.

Cloutier, J., Mason, M.F., & Macrae, C.N. (2005). The perceptual determinants of person construal: Reopening the social-cognitive toolbox. *Journal of Personality and Social Psychology*, *88*, 885–894.

Feingold, A. (1994). Gender differences in personality: A meta-analysis. *Psychological Bulletin*, *116*, 429–456.

Gawronski, B., & Bodenhausen, G.V. (2005). Accessibility effects on implicit social cognition: The role of knowledge activation and retrieval experiences. *Journal of Personality and Social Psychology*, *89*, 672–685.

Haslam, N., Rothschild, L., & Ernst, D. (2000). Essentialist beliefs about social categories. *British Journal of Social Psychology*, *39*, 113–127.

Jostmann, N.B., Lakens, D., & Schubert, T.W. (2009). Weight as an embodiment of importance. *Psychological Science*, *20*, 1169–1174.

Lakoff, G., & Johnson, M. (1980). *Metaphors we live by*. Chicago, IL: University of Chicago Press.

Lakoff, G., & Johnson, M. (1999). *Philosophy in the flesh*. New York, NY: Basic Books.

Lee, S.W.S., & Schwarz, N. (2010). 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.

Miles, L.K., Karpinska, K., Lumsden, J., & Macrae, C.N. (2010). The meandering mind: Vection and mental time travel. *PLoS ONE*, *5*(5), e10825. Retrieved June 17, 2010, from http://www.plosone.org/article/info:doi/10.1371/journal.pone.0010825

Miles, L.K., Nind, L.K., & Macrae, C.N. (2010). Moving through time. *Psychological Science*, *21*, 222–223.

Mussweiler, T. (2006). Doing is for thinking! Stereotype activation by stereotypic movements. *Psychological Science*, *17*, 17–21.

Niedenthal, P.M. (2007). Embodying emotion. *Science*, *316*, 1002–1005.

Prentice, D.A., & Miller, D.T. (2007). Psychological essentialism of human categories. *Current Directions in Psychological Science*, *16*, 202–206.

Tucker, M., & Ellis, R. (2001). The potentiation of grasp types during visual object categorization. *Visual Cognition*, *8*, 769–800.

Williams, L.E., & Bargh, J.A. (2008). Experiencing physical warmth promotes interpersonal warmth. *Science*, *322*, 606–607.

Zhong, C., & Liljenquist, K. (2006). Washing away your sins: Threatened morality and physical cleansing. *Science*, *313*, 1451–1452.