

Research Report

Cold and Lonely

Does Social Exclusion Literally Feel Cold?

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ABSTRACT—*Metaphors such as icy stare depict social exclusion using cold-related concepts; they are not to be taken literally and certainly do not imply reduced temperature. Two experiments, however, revealed that social exclusion literally feels cold. Experiment 1 found that participants who recalled a social exclusion experience gave lower estimates of room temperature than did participants who recalled an inclusion experience. In Experiment 2, social exclusion was directly induced through an on-line virtual interaction, and participants who were excluded reported greater desire for warm food and drink than did participants who were included. These findings are consistent with the embodied view of cognition and perceptual content. The psychological experience of coldness not only aids understanding of social interaction, but also is an integral part of the experience of social exclusion.*

Deprivation of social contact is stressful to both humans and animals. Being rejected by others not only induces anxiety (Baumeister & Tice, 1990; Beck, Laude, & Bohnert, 1974) and depression (Coie, Terry, Zakriski, & Lochman, 1995), but also activates brain areas known to regulate physical pain (Eisenberger, Lieberman, & Williams, 2003). Although there is little doubt that social exclusion has significant adverse effects on people's psychological and physical well-being, in this article, we ask a different question: Does social exclusion literally feel cold?

Loneliness and coldness seem to go side by side in everyday language. For example, in a popular 1970s song, "Lonely This Christmas," Nicky Chinn and Mike Chapman wrote, "It'll be lonely this Christmas, lonely and cold, it'll be cold so cold, without you to hold" (Chinn & Chapman, 1974). This linguistic

coupling between social isolation and coldness may reflect people's predisposition to use concepts that are based on bodily experience (e.g., cold) to describe complex concepts such as social rejection (Lakoff, 1987). For example, early research revealed that traits such as generous, sociable, popular, and humane are often associated with the impression of a "warm" person (Asch, 1946), and lecturers tended to elicit lower audience participation when they were described, prior to the lecture, as "cold" rather than "warm" (Kelley, 1950). At the extreme, when people view members of groups that are seen as cold and incompetent (e.g., the homeless), their brain patterns resemble the brain patterns activated during viewing of nonsocial objects (Harris & Fiske, 2006).

Not only do people consciously describe social interactions using temperature concepts, but they also understand interpersonal situations differently depending on temperature concepts that are activated incidentally. In a recent study by L.E. Williams and Bargh (2008), the experimenter asked participants to hold a cup of hot or cold coffee temporarily before they assessed the traits of another person. This very implicit temperature manipulation changed these assessments: Contact with a cup of hot coffee led individuals to rate a random person as warmer and friendlier than did contact with a cup of cold coffee. As Lakoff and Johnson (1980) and Bargh (2006) noted, metaphors are not simply isolated concepts; they are constellations of concepts and experiences established through interaction and negotiation with the natural and social environment and are later used to understand more complex interactions.

Metaphors are not usually literal (e.g., Galinsky & Glucksberg, 2000)—the term *icy stare* makes no reference to actual experience with ambient temperature. In fact, metaphors have typically been considered unidirectional (Bargh, 2006; Lakoff & Johnson, 1980). For example, experience with coldness, a concept acquired early in life, should prime more abstract concepts related to interpersonal interaction (L.E. Williams & Bargh, 2008), but priming interpersonal interaction should not affect experience with coldness (Bargh, 2006; Lakoff & Johnson, 1980). Boroditsky (2000) found that priming spatial information affected how people construed time, but priming

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temporal information did not influence how people thought about space. Recent studies, however, suggest that metaphors may be bidirectional. In a number of experiments, Zhong and Liljenquist (2006) found that people not only described moral transgressions using terms related to physical cleanliness (e.g., he has a *clean* record), but also actually experienced the need to cleanse themselves physically after recalling past misdeeds. This suggests that how people think about moral concepts influences how they perceive physical cleanliness. Similarly, Schubert (2005) showed that priming power automatically induced positional reference such that words related to power were judged more slowly if words related to high power were physically placed below words related to low power, rather than the other way around. In both cases, priming complex and abstract experience (i.e., morality and power) changed the perception of physical concepts (i.e., cleanliness and spatial relationship).

These recent findings are consistent with theories of embodied cognition and perceptual symbols. According to such theories, cognition includes not only abstract and modal mental representations, but also amodal perceptual content from various sensors (Barsalou, 1999; Varela, Thompson, & Rosch, 1991, p. 172). These perceptual inputs are recorded by systems of neurons in sensorimotor regions of the brain that capture information about perceived events in the environment and in the body (Barsalou, 1999). This information is used later in perception, categorization, and judgment to construct and run simulations, which are similar to mental models. In other words, these theories propose that thinking involves perceptual simulation (Schubert, 2005). Thus, when asked to choose between a letter dyad typed with the same finger and a letter dyad typed with different fingers using standard typing methods (e.g., FV vs. FJ, respectively), skilled typists were more likely than novice typists to select the latter dyad, which involves less typing interference than the former, even though they could not explain why (Beilock & Holt, 2007). This finding suggests that in skilled typists, perceiving letters prompts covert sensorimotor simulation of typing them, which in turn influences affective judgments about this information. Similarly, the activation of the elderly stereotype has been shown to automatically induce behavioral changes consistent with the stereotype, such as walking more slowly (Bargh, Chen, & Burrows, 1996).

If thinking involves perceptual simulation of the senses, possibly including perceptual simulation of temperature, experiencing social rejection might induce an actual feeling of coldness because perception of coldness often covaries with social exclusion. This association may be rooted in early experience with caregivers, as well as later interactions with people in general. An infant being held closely by the caregiver experiences warmth, whereas distance from the caregiver induces coldness. This basic exposure may produce people's first understanding that social closeness equals warmth, whereas social distance equals coldness (L.E. Williams & Bargh, 2008). The

same correlation may be experienced in later stages of life as well, when social company elevates ambient temperature as a result of increased emission of body heat or when cold weather reduces human contact. Indeed, warm weather has been associated with increased rates of crimes that involve interpersonal contact, such as assault (Sommers & Moos, 1976). Thus, the experience of loneliness is often accompanied by the perception of reduced ambient temperature; experience of social exclusion may not only evoke conceptual metaphors that aid in the understanding of the situation, but also activate perceptual and sensory simulations that change perception of the ambient temperature.

In two experiments, we tested whether social exclusion induces an actual feeling of coldness by asking participants to estimate the current room temperature (Experiment 1) and to indicate their preference for warm versus cold foods and drinks (Experiment 2). We expected that priming social exclusion, as opposed to inclusion, would lead participants to report lower room temperature and a preference for warm foods and drinks.

EXPERIMENT 1

This experiment investigated whether recalling a past experience of social exclusion can induce the feeling of coldness, measured by estimated room temperature. A total of 65 undergraduates at the University of Toronto voluntarily participated in exchange for course credit. Upon arrival, participants were led to a cubicle and told that the experiment consisted of several unrelated tasks. In the first task, they were randomly assigned to one of two conditions, recalling a situation in which they felt socially excluded or included. Afterward, the experimenter asked participants to estimate the current room temperature. As a cover story, the experimenter explained that this information was requested by the lab maintenance staff. None of the participants indicated they had any suspicion.

The temperature estimates ranged from 12 to 40 °C. As expected, participants who recalled the experience of being socially excluded gave lower estimates of the room temperature ($M = 21.44$, $SD = 3.09$) than those who recalled being included ($M = 24.02$, $SD = 6.61$), $t(63) = 2.02$, $p_{\text{rep}} = .88$.¹ Thus, recalled experience of exclusion induced a feeling of coldness.

EXPERIMENT 2

In Experiment 2, we sought to replicate Experiment 1 by creating a real experience of social exclusion through a ball-tossing exercise (K.D. Williams, Cheung, & Choi, 2000) that is often used to induce social ostracism (e.g., Eisenberger et al., 2003). Instead of using the temperature estimate, as in Experiment 1, we examined whether socially excluded participants would be more likely to seek warmth, as measured by their preference for

¹The t test that did not assume equal variances between the two conditions yielded a similar conclusion, $t(43.63) = 2.00$, $p_{\text{rep}} = .88$.

warm foods and drinks, than would participants in the control condition.

A total of 52 undergraduates at the University of Toronto participated voluntarily in exchange for course credit. The experiment consisted of a 2 (prime: exclusion vs. control) \times 2 (food-drink type: warm vs. control) mixed design with food-drink type being the within-participants factor. Upon arrival, participants were led to a computer and told that the experiment consisted of several unrelated tasks. First, participants engaged in what they believed to be a virtual ball-tossing exercise, in which they tossed a ball around with 3 other participants who were supposedly connected on-line. In actuality, a computer program controlled the throws of the other players (K.D. Williams et al., 2000). Participants were randomly assigned to the exclusion or control condition. Those in the exclusion condition received the ball twice in the beginning, but were excluded from the rest of the 30 throws; those in the control condition received the ball intermittently throughout the exercise. Afterward, participants completed a supposedly unrelated marketing survey and rated the extent to which they desired five different products, using a 7-point Likert scale (1 = *extremely undesirable*, 7 = *extremely desirable*). One product was a warm drink (hot coffee), and another was a warm food (hot soup); the other three products were two control foods (an apple and crackers) and a control drink (icy Coke). None of the participants suspected there was a connection between the ball-tossing exercise and the product rating.

Figure 1 presents the mean desirability ratings for these products. Analysis of variance revealed a significant two-way interaction between prime and food-drink type, $F(1, 50) = 4.62$, $p_{\text{rep}} = .90$. Participants in the exclusion condition desired the warm food and drink ($M = 5.17$, $SD = 1.11$) more than those in the control condition ($M = 4.33$, $SD = 1.60$), $F(1, 50) = 4.90$, $p_{\text{rep}} = .91$. However, they desired the control foods and drink ($M = 4.12$, $SD = 1.12$) to the same extent as did participants in the control condition ($M = 4.23$, $SD = 1.01$), $F(1, 50) = 0.15$,

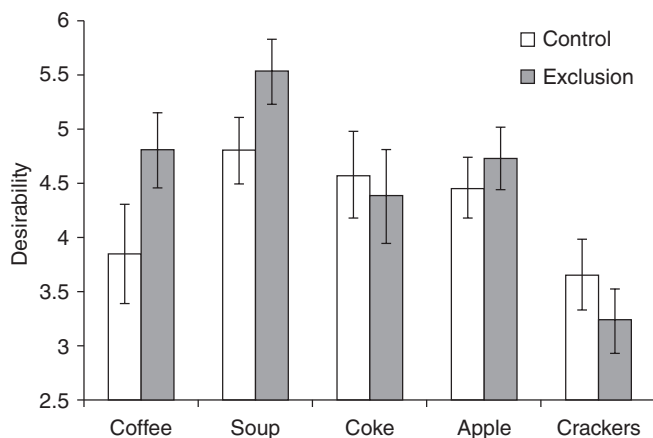


Fig. 1. Desirability of foods and drinks among participants in the exclusion and control conditions in Experiment 2.

$p_{\text{rep}} = .36$.² Thus, the experience of social exclusion during virtual interaction seemed to induce preference for warm foods and drinks.

GENERAL DISCUSSION

In two experiments, we found that people literally felt cold (Experiment 1) or preferred warm food (Experiment 2) when they experienced being socially excluded, regardless of whether such experience was induced through recalling past experience or participating in a virtual interaction. These findings are consistent with theories of embodied cognition and suggest that people's social experience is not independent of physical and somatic perception (Barsalou, 1999; Varela et al., 1991). They also highlight the idea that metaphors are not just linguistic elements that people use to communicate; metaphors are fundamental vessels through which people understand and experience the world around them (Bargh, 2006; Lakoff & Johnson, 1980). Not only does physical experience aid people's understanding of more abstract, complex phenomena, but also domains of different experiences merge and intertwine such that the activation of one domain is automatically accompanied by the activation of another (e.g., Zhong & Liljenquist, 2006); the subjective feeling of coldness may be an integral part of the experience of social rejection.

Our research complements early studies on the relationship between physical temperature and evaluation of personality. Whereas L.E. Williams and Bargh (2008) showed that incidentally touching warm or cold objects influences people's assessments of other people, we have shown the reverse—that being rejected by others induces an actual feeling of coldness. In both cases, an abstract psychological experience is scaffolded onto a physically experienced dimension (Bargh, 2006; L.E. Williams & Bargh, 2008). Thus, metaphors such as *cold and lonely* do not seem to be mere accidents—why is social exclusion described as cold but not dirty? Our findings provide empirical support to the theoretical proposition that metaphors may be based on concurrent psychological or bodily experiences (Lakoff & Johnson, 1980). It is possible that people use coldness to describe social interaction patterns partly because they observe, at an abstract level, that the experience of coldness and the experience of social rejection coincide.

These findings open up new opportunities in exploring the interaction between environment and psychology. First, an interesting direction would be to determine whether experiencing the warmth of an object could reduce the negative experience of social exclusion. Such an implication has been used metaphorically in the self-help literature (i.e., the “Chicken Soup for

²Analyses comparing the desirability of coffee and Coke yielded a consistent pattern: Social exclusion marginally increased the desirability of coffee ($M = 4.81$, $SD = 1.74$, vs. $M = 3.85$, $SD = 2.33$), $F(1, 50) = 2.84$, $p_{\text{rep}} = .82$, but not of Coke ($M = 4.38$, $SD = 2.17$, vs. $M = 4.58$, $SD = 2.04$), $F(1, 50) = 0.11$, $p_{\text{rep}} = .33$.

the Soul” series), but our research suggests that eating warm soup may be a literal coping mechanism for social exclusion.

Second, given that physical coldness seems to be part of the experience of social rejection, it would be interesting to explore how ambient temperature can change the perception and evaluation of social rejection. Earlier research on ambient temperature tended to focus on its effects on productivity and cognitive processing, effects that are possibly mediated through mood (e.g., Allen & Fischer, 1978; Sinclair, Mark, & Clore, 1994). Our research, however, suggests two possible ways through which ambient temperature can directly affect people’s interpretations of social situations. On the one hand, it is possible that in cold weather, people (mis)attribute part of the coldness they feel as a result of exclusion to the physical coldness in the environment and hence reduce the degree to which they feel socially rejected. On the other hand, it is also possible that warm weather can compensate for feelings of coldness after rejection altogether. It would be beneficial to both people who are rejected and those around them if either of these possibilities were true, because social rejection not only reduces subjective well-being (Leary, Tambor, Terdal, & Downs, 1995), but also induces hostile reactivity toward other people (Ayduk, Mischel, & Downey, 2002). Controlling ambient temperature may thus be a relatively inexpensive and nonintrusive way to restore group cohesiveness and prevent damage due to interpersonal friction.

Third, and finally, the connection between coldness and social exclusion may suggest other environmental causes of affective disorders. Seasonal affective disorder (Rosenthal et al., 1984), also called “winter depression,” refers to the experience of depression during the winter months in individuals who are otherwise healthy. Research on this disorder has predominantly focused on the connection between reduced daylight and increased likelihood of winter depression, although some evidence supports the idea that reduced temperature also contributes to an increase in depressive experience (Molin, Mellerup, Bolwig, Scheike, & Dam, 1996). Our research suggests one reason why that may be: Perhaps cold temperatures in the winter serve as a catalyst to the psychological experience of social exclusion.

REFERENCES

Allen, M.A., & Fischer, G.J. (1978). Ambient temperature effects on paired associate learning. *Ergonomics*, *21*, 95–101.

Asch, S.E. (1946). Forming impressions of personality. *The Journal of Abnormal and Social Psychology*, *41*, 258–290.

Ayduk, O., Mischel, W., & Downey, G. (2002). Attentional mechanisms linking rejection to hostile reactivity: The role of “hot” versus “cool” focus. *Psychological Science*, *13*, 443–448.

Bargh, J.A. (2006). What have we been priming all these years? On the development, mechanisms, and ecology of nonconscious social behaviour. *European Journal of Social Psychology*, *36*, 147–168.

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. (1999). Perceptual symbol systems. *Behavioral and Brain Sciences*, *22*, 577–609.

Baumeister, R.F., & Tice, D.M. (1990). Anxiety and social exclusion. *Journal of Social & Clinical Psychology*, *9*, 165–195.

Beck, A.T., Laude, R., & Bohnert, M. (1974). Ideational components of anxiety neurosis. *Archives of General Psychiatry*, *31*, 319–325.

Beilock, S.L., & Holt, L.E. (2007). Embodied preference judgments: Can likeability be driven by the motor system? *Psychological Science*, *18*, 51–57.

Boroditsky, L. (2000). Metaphoric structuring: Understanding time through spatial metaphors. *Cognition*, *75*, 1–28.

Chinn, N., & Chapman, M. (1974). Lonely this Christmas [Recorded by Mud]. London: RAK.

Coie, J.D., Terry, R., Zakriski, A., & Lochman, J. (1995). Early adolescent social influences on delinquent behavior. In J. McCord (Ed.), *Coercion and punishment in long-term perspectives* (pp. 229–244). New York: Cambridge University Press.

Eisenberger, N.I., Lieberman, M.D., & Williams, K.D. (2003). Does rejection hurt? An fMRI study of social exclusion. *Science*, *302*, 290–292.

Galinsky, A.D., & Glucksberg, S. (2000). Inhibition of the literal: Metaphors and idioms as judgmental primes. *Social Cognition*, *18*, 35–54.

Harris, L.T., & Fiske, S.T. (2006). Dehumanizing the lowest of the low: Neuroimaging responses to extreme out-groups. *Psychological Science*, *17*, 847–853.

Kelley, H.H. (1950). The warm-cold variable in first impressions of persons. *Journal of Personality*, *18*, 431–439.

Lakoff, G. (1987). *Women, fire, and dangerous things: What categories reveal about the mind*. Chicago: University of Chicago Press.

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

Leary, M.R., Tambor, E.S., Terdal, S.K., & Downs, D.L. (1995). Self-esteem as an interpersonal monitor: The sociometer hypothesis. *Journal of Personality and Social Psychology*, *68*, 518–530.

Molin, J., Mellerup, E., Bolwig, T., Scheike, T., & Dam, H. (1996). The influence of climate on development of winter depression. *Journal of Affective Disorders*, *37*, 151–155.

Rosenthal, N.E., Sack, D.A., Gillin, J.C., Lewy, A.J., Goodwin, F.K., Davenport, Y., et al. (1984). Seasonal affective disorder: A description of the syndrome and preliminary findings with light therapy. *Archives of General Psychiatry*, *41*, 72–80.

Schubert, T.W. (2005). Your highness: Vertical positions as perceptual symbols of power. *Journal of Personality and Social Psychology*, *89*, 1–21.

Sinclair, R.C., Mark, M.M., & Clore, G.L. (1994). Mood-related persuasion depends on (mis)attributions. *Social Cognition*, *12*, 309–326.

Sommers, P., & Moos, R.H. (1976). The weather and human behavior. In R.H. Moos (Ed.), *The human context: Environmental determinants of behavior* (pp. 73–107). New York: Wiley.

Varela, F.J., Thompson, E., & Rosch, E. (1991). *The embodied mind: Cognitive science and human experience*. Cambridge, MA: MIT Press.

- Williams, K.D., Cheung, C.K.T., & Choi, W. (2000). Cyberostracism: Effects of being ignored over the Internet. *Journal of Personality and Social Psychology*, *79*, 748–762.
- Williams, L.E., & Bargh, J.A. (2008). *Temperature to temperament: Warm objects alter personality impressions*. Unpublished manuscript, Yale University, New Haven, CT.
- Zhong, C.-B., & Liljenquist, K. (2006). Washing away your sins: Threatened morality and physical cleansing. *Science*, *313*, 1451–1452.

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