



Cold-blooded loneliness: Social exclusion leads to lower skin temperatures

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ABSTRACT

Being ostracized or excluded, even briefly and by strangers, is painful and threatens fundamental needs. Recent work by Zhong and Leonardelli (2008) found that excluded individuals perceive the room as cooler and that they desire warmer drinks. A perspective that many rely on in *embodiment* is the theoretical idea that people use metaphorical associations to understand social exclusion (see Landau, Meier, & Keefer, 2010). We suggest that people feel colder because they *are* colder. The results strongly support the idea that more complex metaphorical understandings of social relations are scaffolded onto literal changes in bodily temperature: Being excluded in an online ball tossing game leads to lower finger temperatures (Study 1), while the negative affect typically experienced after such social exclusion is alleviated after holding a cup of warm tea (Study 2). The authors discuss further implications for the interaction between body and social relations specifically, and for basic and cognitive systems in general.

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1. Introduction

In the realm of social relations, people often use metaphors such as “she is cold and aloof” or “she is a warm person.” Temperature metaphors conveniently establish and explain what is meant, and often show a remarkable similarity in imagery across languages. In particular, people’s “social temperature” is central to the perception of relationships. These ideas are reminiscent of Asch’s (1946) early work, which proposed psychological warmth as being the central dimension in which people judge one another (see also Fiske, Cuddy, & Glick, 2007). But what may be the underlying cause for the strong metaphorical connections between warmth and social relations? In later work, Asch (1958) advanced the theory that the metaphor of warmth may be related to the real, physical experience of warmth.

Metaphors based on physical warmth describing one’s social relations have thus been suggested to combine elements of very concrete experiences and more abstract conceptions of how people think of others, learned early in life. In the present report, we will go beyond such metaphorical perspectives of warmth by suggesting that temperature changes constitute the “fabric” of social relations, hinging on specific, basic, and possibly biologically evolved simulators. We

hypothesized and found that people literally decrease in skin temperature after social exclusion. In addition, we found that “fooling” the fingers, by briefly stimulating them with a cup of warm tea, eliminates the negative feelings typically experienced after social exclusion.

2. Metaphorical perspectives on warmth and social relations

The recent metaphor perspective in psychology, proposed by cognitive linguists Lakoff and Johnson (1999) and antedated by Asch (1958), suggested that people experience concrete source domains (e.g., physical warmth) jointly with abstract target concepts (e.g., affection), and as a result “conflate” the mapping of physical warmth and affection (see also Johnson, 1997). Recent social psychological investigations seem to support this learning process: The experience of subtle manipulations of physical warmth (as compared to coldness) leads to the perception of another as more sociable (central to the person characteristic of “warm”) and to greater prosocial behavior of the participant (Williams & Bargh, 2008).

In addition, subtle manipulations of physical warmth (as compared to coldness) lead to cognitions that form the basis for communal relations: people in physically warmer conditions use more verbs (indicative of social closeness; Semin & Fiedler, 1988), are more focused on relationships in their environment, and construe themselves as having greater psychological overlap with the experimenter (IJzerman & Semin, 2009). In other words, due to learning that physical warmth

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and affection go hand-in-hand, people seem to develop mental representations that include both abstract conceptions of affectionate feelings and the sensorimotor experience of physical warmth, such that when they are in a warm environment, they will interact as if they are psychologically closer to others.

Yet, Lakoff and Johnson (1999) proposed unidirectionality to be central to such conceptual metaphors. Indeed, experiencing affection almost always includes physical warmth (but not vice versa), integrating the sensorimotor experience of physical warmth into the mental representation of affection, but characteristics of the mental representations of affection do not become an integral part of the mental representation of warmth (cf. Landau, Keefer, & Meier, 2011). Such a perspective was confirmed in a different domain by Casasanto and Boroditsky (2008), who showed the connection between time and space. Indeed, they find that people's experience of space affects their perception of time, but not vice versa.

However, in the domain of physical warmth and affection, the effect seems to be *bi-directional*: When people are socially excluded or primed (either physically or psychologically) with distance they perceive ambient temperature as lower (for our theoretical background, see also Ijzerman & Koole, 2011; also Ijzerman & Semin, 2010; Zhong & Leonardelli, 2008). Previous work has suggested that conceptual metaphors may be learned linguistically (Boroditsky, 2000), or experientially (Casasanto, 2008), allowing for possibilities to map such effects bi-directionally through the integration of sensorimotor experiences into the abstract concept domain. In addition, recent reviews support the idea that many conceptual metaphors may be dynamic and flexible (Santiago, Román, & Ouellet, 2011). However, do experiences related to social relations rest on conceptual metaphors, or, if not, what may then account for earlier findings linking physical warmth and affection?

3. Evolved primitives for social relations

We propose that central to answering this question is the functionality of physical warmth in social relations and that the body may constrain people's learning processes for social relations. One may trace back our approach to Bowlby (1969), who suggested that 1) people become equipped with basic perceptual inputs to comprehend their social environment, and that 2) close relationships serve security-provision and distress-alleviation regulatory functions. In addition, Harlow's (1958) classical work suggested that close, physical comfort may be a biologically evolved need. He showed that close comfort is necessary for healthy psychological functioning, as young rhesus monkeys displayed a greater preference for terry-clothed surrogate mothers as compared to a wire mother, while those raised with a wire mother had greater physiological and psychological problems. Harlow's (1958) findings resonate with and predated the Relational Models Theory, which summarized people's basic forms of interactions into four elementary ways (Fiske, 1991).

The most basic of these interaction types are *communal sharing* relationships, which are relationships prototypically implemented among close kin. Examples of communal sharing relationships are relationships between mother–infant, close romantic partners, and tight knit military units. In order to be able to identify how to interact with whom in what way, Thomsen and Carey (in press) suggested that people may rely on evolved primitives for elementary social relations (see also Ijzerman & Cohen, 2011; Williams & Bargh, 2008). Some support for this idea seems to be derived from developmental work: Priming 18-month old children with touch in the background of a picture (versus no touch) significantly increases helping behavior from those infants later (Over & Carpenter, 2009).

The proposition that some kind of structure is present on which young children map their knowledge of social relations, is further buttressed by findings that securely attached children become more generous in physically warm conditions (versus cold), whereas insecurely attached children lack this effect (q.v. Ijzerman, Karremans, Thomsen, & Schubert,

in press; Ijzerman & Koole, 2011). In order to learn such relational structures, some kind of basic system needs to be in place in order to learn which kind of relation needs to learn in which way. In other words, a basic type of model seems to be present among infants to engage in a basic (finite) set of relations. Even though the child consistently encounters a bigger parent, it does not map relative size to understand its trusting relation with the security-providing caregiver. Thomsen and Carey (in press) therefore suggest that “humans have evolved an innate, finite set of conceptual primitives that specify relational models for communal sharing [...] coupled with innate input-analyzers that automatically identify some instances [...] in the social world”.

4. Warmth as the ‘fabric’ of social relations

Indeed, research has supported that people often rely on perceptual symbols to represent and retrieve information. Theories on perceptual symbol systems argue that people's neural architecture for imagery and perception is the same architecture for conceptual knowledge (Barsalou, 1999). In order to identify whom to rely on early in life, we suggest that people come equipped with “evolved simulators,” onto which later knowledge on sociocognitive metaphors (such as “holding warm feelings” towards someone) are scaffolded (Mandler, 1992; Williams, Huang, & Bargh, 2009).

But what kind of simulators may be relevant for social relations? Fransson, Karlsson, and Nilsson (2005) found provocative evidence that when a baby was held by the mother, the mean difference between core and skin temperature was much lower than when the baby was in its cot. Relatedly, loneliness leads to relatively high levels of total peripheral resistance, whereas people who are more socially connected have relatively high cardiac output and better levels of autonomic activity (Uchino, Cacioppo, & Kiecolt-Glaser, 1996; for an overview see Cacioppo et al., 2002). A sense of disconnection may lead to vasoconstriction, a state in which the blood vessels are narrowed, maintaining body heat in the core, but not the periphery (like one's finger temperature). Such responses are probably built onto more basic human responses, work on which suggests that in times of threat (such as stress, fear or pain), skin temperature drops (Mittelman & Wolff, 1939). Empirical evidence since has supported this view (e.g., see Boudewyns, 1976; for an overview see Rimm-Kaufman & Kagan, 1996).

Together, these findings suggest that skin temperature plays a vital role in interpersonal relations. In other words, when people are excluded from social interactions, they may literally get colder fingers. Adding to the idea of mental schemas, we suggest that concepts related to social relations rely on evolved simulators that may sense physical warmth. Concretely, when people engage in social interactions they should experience bodily temperature re-adjustments. In order to test this proposition, we used a well-validated interaction paradigm from social psychology, which has been used in over 70 studies (e.g., see Williams, Cheung, & Choi, 2000; Williams, 2007; Van Beest & Williams, 2006).¹ Note that we hereby identify a simulator, and presuppose the possibility of an innate biologically evolved structure rather than empirically proving this proposition.

5. Research overview

In two studies, we aim to support the hypothesis that people experience *literal* temperature changes to process close and affiliative relations. In our first study, we expected that if participants were socially excluded, skin temperatures would drop. Conversely, in our second study, we expected that if we artificially stimulated the periphery of people's hands with physical warmth, people should perceive as if they were again socially connected, causing negative affect typically experienced after social exclusion to be alleviated.

¹ A list of these studies is available at http://www1.psych.purdue.edu/~willia55/Announce/Cyberball_Articles.htm.

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