

The cold heart:

Reminders of money cause feelings of physical coldness

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Short biographies

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Abstract

Mere reminders of money have been shown to cause socially “cold” behavior. Recent research suggests that the metaphor of “social coldness” is bodily grounded and thus linked to actual sensations of physical coldness. We therefore hypothesized that reminding individuals of money causes them to feel physically colder. This hypothesis was put to the test in two studies, drawing on predictions from psychophysiological thermal perception: In Study 1, individuals who had been reminded of money perceived the air in the room as colder compared to a control group (an assimilation effect). Contrarily, in Study 2, they perceived water (a medium that was only momentarily experienced) as warmer than individuals not reminded of money (a contrast effect). Together these findings demonstrate that reminders of money cause sensations of actual physical coldness, and add to the literature of both the psychological effects of money and human thermal perception.

Keywords: money, embodiment, coldness perception, adaptation, thermal perception

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In his fairytale “The Cold Heart,” Wilhem Hauff tells the story of a man who exchanged his heart for money and a cold heart of stone. This tale reflects the popularly held belief that money and wealth change people and turn them into self-centered and socially cold individuals. Here we will argue that money does not only lead to social coldness as a vast body of literature suggests (e.g., Vohs, Mead, & Goode, 2008, 2006), but that the metaphor of money inducing a cold heart holds some literal truth in the sense that thinking about money indeed causes individuals to feel colder.

Money is linked to social coldness

Money plays an important role in most people’s life. It is seen as the key to success, power, and social status. Because money is symbolic for these assets, its meaning goes far beyond its original purpose as a tool for exchange. It has even been likened to a drug that individuals succumb to during their striving for success, power, and status (Lea & Webley, 2006). Following from that, the reputation of money’s psychological consequences is not entirely favorable. For example, rich people are seen as competent but cold-hearted (Cuddy, Fiske, & Glick, 2007; Fiske et al., 2002). They are thought to focus on their own advancement, thereby neglecting the needs of others (Cuddy, Fiske, & Glick, 2008). In line with this stereotype of the “cold-hearted rich”, members of the upper class compared to members of the lower class show less pro-social behavior, less empathy, and less social valuation for others (Piff, Kraus, Côté, Cheng, & Keltner, 2010), but more greed (Piff, Stancato, Côté, Mendoza-Denton, & Keltner, 2012).

Interestingly, actual wealth is not a necessary ingredient; even mere thoughts of money suffice to cause socially cold behavior. For example, individuals who have been reminded of money (e.g., by grasping bank notes), show less inclination to help other people (Vohs, Mead, & Goode, 2006), place less importance on their social lives (Mogilner, 2010)

and physically distance themselves from others (Vohs et al., 2006). Likewise, reminders of money cause individuals to cheat more frequently (Gino & Pierce, 2009) and to show a higher inclination to engage in behavior that could be harmful to other people (Reutner & Wänke, 2013). In sum, merely thinking of money leads to social coldness; or, to put it in a literary way, money causes cold-hearted *behavior*.

Social coldness causes physical coldness

Recent research on embodiment has demonstrated that the metaphor of physical coldness for unsocial, self-centered behavior is more than a simple literal illustration (Landau, Meier, & Keefer, 2010). Instead, feelings of social and physical coldness are to some degree interchangeable (Bargh & Shalev, 2012). This overlap is thought to stem from early childhood experiences of physical warmth (or lack thereof), which are later abstracted to broader concepts of (social) warmth and coldness (Lakoff & Johnson, 1999; Williams, Huang, & Bargh, 2009). This “embodied” notion has been supported by findings showing that experiences of physical or social warmth lead to activation in the same brain regions (Inagaki & Eisenberger, 2013). Similarly, the sensation of physical coldness increases feelings of social coldness towards others (IJzerman & Semin, 2009). Conversely, social distance (IJzerman & Semin, 2010) and social coldness (Zhong & Leonardelli, 2008) cause feelings of physical coldness. In fact, feelings of physical coldness as a response to metaphorical social coldness do not seem to be a mere illusion of the mind. Instead, social coldness elicits actual physical responses observable in a decrease of skin temperature (IJzerman et al., 2012).

These findings reviewed above are reminiscent of the protagonist’s heart in “The Cold Heart,” which was not just metaphorically cold but—as it was made from stone—also physically cold. As reminders of money lead to social distance and these, in turn, lead to physical coldness, we propose that reminding people of money will not only trigger cold-hearted behavior, but in fact *feelings* of physical coldness. We will report two studies that

empirically substantiate this argument. Before doing so, however, we briefly discuss various ways of how to measure thermal sensations.

The assessment of thermal sensations

Perhaps the most straightforward way to assess changes in thermal sensations is to simply ask participants to indicate how warm or cold they feel. However, this method is rarely used in embodiment research (for an exception, see Inagaki & Eisenberger, 2013). Among other reasons, this is because warmth and coldness are confounded with their social dimensions (IJzerman & Semin, 2009) and hence social information might be activated and influence the response to reporting sensations of warmth or coldness. Somewhat relatedly, warmth and coldness differ in valence. While feeling warm is a positive experience, feeling cold is rather negative (Bargh & Shalev, 2012; IJzerman et al., 2012; Zhong & Leonardelli, 2008). Hence it is possible that participants might be more motivated to report feeling warm than feeling cold. Both reasons question the suitability of self-reports in this domain.

Assimilation effects as response to adaptation

Given that directly asking participants for their sensations may prove problematic, the embodiment literature has developed more indirect, less obtrusive ways of measuring thermal sensations. Among these, ambient room temperature estimation has become the standard (e.g., IJzerman & Semin, 2010; Szymkow, Chandler, & IJzerman, 2012; Zhong & Leonardelli, 2008). In these studies, individuals are thought to rely on their feelings of warmth or coldness as a proxy to estimate ambient temperature. Why do internal bodily sensations act as a proxy for estimating an external thermal source such as room temperature? As argued in classical psychophysics, this is because the human body adapts quite quickly (within minutes) to a continuously experienced, moderate temperature such as the ambient temperature of a room (Hensel & Schafer, 1984; Hensel, 1973). As a result of adaptation the ambient temperature is experienced as neutral (Helson, 1964a, 1964b). Because a temperature to which one has adapted is not actually consciously perceived, individuals use their bodily sensations of

warmth or coldness to estimate the current room temperature. As a result, room temperature estimates are higher when one feels warm and lower when one feels cold (an assimilation effect). Study 1 capitalizes on these findings and tested the prediction that participants reminded of money experience an adapted temperature (i.e., the room temperature) to be *colder* than control participants.

Contrast effects as response to non-adaptation

Interestingly, before the adaptation to an experienced temperature is completed, external sources of temperature are evaluated in *comparison* to the body temperature resulting in contrast effects (Helson, 1964a, 1964b; Hensel, 1981; Hering, 1877; Tritsch, 1986, 1988). This has been most impressively demonstrated by Hering (1877) in his classical “three-bowls experiment” (see also, Weber, 1834, for a similar experiment). In this demonstration, the left and the right hand are simultaneously immersed in two bowls for several minutes so that complete adaptation can occur. The left hand bowl contains cold water, whereas the right hand bowl contains warm water. Next, both hands are placed in a third bowl containing lukewarm water. Even though they are objectively experiencing the same temperature, the left hand feels distinctly warm whereas the right hand feels distinctly cold (see also, Tritsch, 1986, 1988, for a replication and extension). This fascinating phenomenon can often be experienced in everyday life (e.g., when coming home from the cold and immediately feeling like one is hit by a wave of heat) and served as a foundation for Study 2. In particular, Study 2 tested the prediction that participants reminded of money experience a non-adapted temperature (i.e., lukewarm water after being adapted to room temperature) to be *warmer* than control participants (a contrast effect).

Study 1

Method

In Study 1, we relied on the standard measure of thermal sensations employed in embodiment research. We assessed feelings of physical coldness by asking participants to

estimate the ambient temperature of the room they were located in—a measure known to result in assimilation effects (cf., IJzerman & Semin, 2010; Szymkow, et al., 2012). We hypothesized that reminding participants of money would lead to a lower temperature estimate compared to reminding participants of control concepts.

Participants. Forty individuals (32 women, 8 men, $M_{\text{age}} = 25.03$ $SD = 6.62$) participated in an experiment on “perception of physical environment” in exchange for course credit. They were randomly assigned to a “money” or a “control” condition. We aimed for about 20 participants per cell.

Material and Procedure. Firstly, to control for individual variations in core temperature, the experimenter measured participants’ core body temperature by using an ear thermometer. For the money and control manipulation, we then followed a procedure employed by Reutner and Wänke (2013), in which participants either placed their hand in a bowl filled with 97 bank notes of various value (an equivalent of \$1,292) or an equal number of similarly colored paper slips. Participants were asked to estimate the number of bank notes or paper slips. Participants were then asked to give various estimates on their surroundings. First they gave an estimate for the ambient temperature in degrees Celsius. To test whether the hypothesized effect of priming money is indeed specific to temperature, or whether it generally produces larger estimates, we subsequently asked participants to estimate the size of the room in square meters, the height of the ceiling, and the distance of the room’s floor to ground level in meters. In the meantime, the experimenter discretely noted the actual room temperature to be able to control for slight variations. Lastly, participants were probed for suspicion and debriefed. None of the participants mentioned money or influences on temperature perception in their comments.

Results

To test the hypothesis that reminding participants of money would lead them to feel physically colder and hence reduce their estimation of room temperature compared to control

participants, we conducted an analysis of covariance with room temperature estimate (in degrees Celsius [degrees Fahrenheit in square brackets]) as dependent variable, priming as independent variable, and core body temperature as well as actual room temperature as covariates. As predicted, individuals in the money condition gave significantly lower estimates of room temperature ($M = 21.33^{\circ}\text{C}$ [70.39°F], $SD = 1.62$) compared to the control condition ($M = 22.91^{\circ}\text{C}$ [73.24°F], $SD = 1.59$), $F(3, 36) = 8.36$, $p = .006$, $\eta_p^2 = .19$, CI of difference [-2.615, -.459]. Omitting one or both covariates does not alter the significance of the effect. Importantly, money did not affect any of the other estimates, $t_s < 1$, indicating that priming money had an influence on temperature perception only. This rules out alternative explanations suggesting that money priming might have led to lower estimates in general.

Discussion

The findings of Study 1 suggest that individuals feel physically colder after being reminded of money. Participants perceived the room temperature as colder than individuals who had not been reminded of money. As temperature to which one has fully adapted to seems neutral and hence difficult to estimate, participants used their feelings of coldness as a proxy to judge the temperature in the room, resulting in an assimilation effect as demonstrated in previous studies (cf., IJzerman & Semin, 2010).

Study 2

Method

Study 2 aimed to corroborate and extend the findings of Study 1 with a different measure of subjective thermal sensations predicted to elicit contrast rather than assimilation. Specifically, we designed a temperature reproduction task in which participants placed their hand in water while the water was heated. Participants were asked to indicate when the water had reached the temperature that had been experienced in a previous trial. Just like the “three-bowls-experiment” by Hering (1877), this task constitutes a sudden change in temperature (when participants place their hand in the water) that should disrupt coldness

experiences triggered by the priming task. In line with previous studies on thermal perception (cf., Tritsch, 1986, 1988), such a disruption should result in a contrast effect: If participants feel cold (versus warm), they should judge the water temperature as warmer (versus colder). We hence expected that participants primed with money (which causes them to feel colder) would experience water as *warmer* compared to control participants.

Participants. Sixty-two students (46 women, 16 men; $M_{\text{age}} = 23.25$, $SD = 4.34$) participated in the experiment. Because Study 2 employed a methodological approach previously untested in the realm of embodiment, we aimed for more statistical power with about 30 participants per cell.

Materials and Procedure. Participants were asked to place their hand in a water basin preheated to exactly 37°C [98.60°F] for 10 seconds and to give an estimate of the water's temperature in order to control for a priori differences. Participants then completed the same money or control manipulation as in Study 1. In the meantime, the experimenter cooled the water down to an average of 31.14°C [88.05°F] ($SD = 1.34$). Temperatures around 30°C [86°F] have been shown to be ideal to elicit contrast effects (Tritsch, 1986, 1988). Next, participants placed their hand into the basin again while it was being reheated. They indicated when they thought the water had reached its initial temperature by saying "stop." As those who feel colder should perceive the water temperature as higher (cf., Helson, 1964a, 1964b; Tritsch, 1986, 1988), we hypothesized that participants reminded of money would stop at a lower temperature than participants in the control condition. To control for a priori differences in temperature perception, the core body temperature of each participant was measured at the beginning of the experiment. Participants were probed for suspicion and debriefed. None of the participants mentioned money or feelings of warmth or coldness in their responses.

Results

We performed an analysis of covariance with actual water temperature assessed at the time participants said "stop" as dependent and money versus control priming as independent

variables. Participants' body temperature, their initial estimate of the water temperature, and the actual temperature of the water before reheating were entered as covariates. As hypothesized, participants who had been reminded of money indicated that the water had reached its prior temperature at a lower actual temperature ($M = 34.71^{\circ}\text{C}$ [94.48°F], $SD = 1.73$) than participants in the control group ($M = 35.61^{\circ}\text{C}$ [96.10°F], $SD = 1.66$), $F(4, 57) = 5.12$ $p = .026$, $\eta_p^2 = .08$ CI of difference $[-.1.765, -.117]$. Omitting any of the covariates does not alter the significance of the effect. There were no significant differences between the conditions on any other variables, all $t_s < 1$.

Discussion

Using a temperature reproduction task, we conceptually corroborated the findings of Study 1 suggesting that reminders of money cause individuals to feel colder: In contrast to their colder self-perception, the water seemed warmer to participants in the money condition than to the participants in the control group. This caused them to indicate that the water had reached its prior temperature at a lower actual temperature than participants in the control group.

One could argue that money priming motivates participants to quit earlier in Study 2. However, recent findings demonstrating that money priming causes higher self-control (Boucher & Kofos, 2012) and increased endurance (Vohs et al., 2006) render this alternative interpretation unlikely.

General Discussion

The results of two studies suggest that reminding individuals of money leads them to feel physically colder compared to individuals not reminded of money. In Study 1, reminders of money lead to a lower estimate of room temperature. In Study 2, participants primed with money experienced a contrast effect of water temperature relative to their own feelings of coldness: They experienced water as warmer than participants not primed with money. With regard to thermal perception in particular, our results are in line with previous research

showing assimilation when judging adapted temperature (e.g., IJzerman & Semin, 2010; Zhong & Leonardelli, 2008) but contrast to bodily sensations when judging non-adapted, newly experienced temperature (Tritsch, 1986, 1988). That both an assimilation and a contrast effect were observed in our studies strongly supports the conclusion that individuals indeed felt physically colder because alternative explanations, such as demand effects, would predict either an assimilation or a contrast effect but not both. Although we were mainly interested in subjectively experienced bodily sensations, the contrast effect in Study 2 even allows for the speculation that participants' hands had objectively cooled after the money priming. This would be in line with previous studies suggesting that the experience of social coldness leads to cooling of the hands rather than just the perception of physical coldness (IJzerman et al., 2012).

The present findings allow for important conclusions that add to the literature of both the psychological effects of money as well as the experience of thermal sensations. With respect to the latter, our findings demonstrate that subtle environmental cues—in this case, mere reminders of money—can have consequences for thermal sensations. Importantly, these simple changes in personal environment need not be related to temperature in order to have an impact. The possibility to influence thermal sensations by simple means of environmental cues seems especially intriguing in times in which energy consumption and ways to reduce it are debated (e.g., regulating air conditioning).

With regard to money—given its ubiquity in everyday life—it is of high relevance to investigate money's influence on individuals' experiences. Offering a novel and previously unexplored perspective on money research, our findings suggest that mere reminders of money cause perceived physical coldness. Thus, moving away from the predominant focus on behavioral (e.g., Vohs et al., 2006) or cognitive (e.g., Hansen, Kutzner, & Wänke, 2013) consequences of money thoughts, our findings offer fascinating insights into how money makes people *feel*. Even though Willhelm Hauf intended his “Cold Heart” to be a metaphor,

this metaphor might hold some literal truth. While money won't make anyone's heart turn to cold stone, it does make the body feel colder.

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