Warm It Up with Love: The Effect of Physical Coldness on Liking of Romance Movies

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Are romance movies more desirable when people are cold? Building on research on (bodily) feeling-as-information and embodied cognition, we hypothesize that physical coldness activates a need for psychological warmth, which in turn leads to an increased liking for romance movies. Four laboratory experiments and an analysis of online movie rental data provide support for our hypothesis. Specifically, studies 1A and 1B show that physical coldness increases the liking of and willingness to pay for romance movies. Study 2 shows that the effect of physical coldness on liking of romance movies only occurs for people who associate romance movies with psychological warmth. Study 3 shows that people correct for the influence of physical coldness on their liking of romance movies when physical coldness is made salient. In study 4, using data on online movie rentals and historical temperature, we found a negative relationship between weather temperature and preference for romance movies.

The movie industry is characterized by strong seasonality in viewer demand (Einav 2007). In the United States, the majority of total box office revenues are generated around six major holidays (Valentine's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving, and Christmas; Foutz and Kadiyali 2006). This highlights the importance of studios taking seasonality into account in timing movie releases, which is one of the most important decisions in the movie industry considering that the opening weekend typically accounts for 40% and the first four weekends 80% of a movie's box office (Foutz and Kadiyali 2006).

Two observations emerge from the past literature on seasonality in the movie industry. First, prior research has typically examined seasonality in terms of holiday seasons versus off-holidays (e.g., Einav 2007; Foutz and Kadiyali 2006). However, the impact of another important dimension of seasonality—temperature and thereby people's feeling of physical warmth (coldness)—on consumers' movie preference has not been examined; yet consumers' bodily feelings have been shown to influence a wide range of behavior (Peck and Childers 2008). Second, past research has not distinguished between different genres in examining the seasonality issue. Given the uniqueness of cinematic consumption experiences, it is likely that the impact of seasonality on consumers' movie preference varies as a function of genre. In this research, we examine the influence of physical coldness on consumers' movie preferences, and in particular, their preferences for romance movies. Drawing on recent research on (bodily) feeling-as-information and embodied cognition, we propose that physical coldness activates the need for psychological warmth and that this motivational input from physical coldness in turn leads to an increased liking for romance movies, which are associated with psychological warmth.

Interestingly, a quick look at the release date and opening week box office revenue data of movies between 1995 and 2010 from the-numbers.com reveals a pattern consistent with our conjecture: one-tailed *t*-tests on the ticket sales show that romantic comedies released in the winter season (December, January, and February; M = \$8.38 million)

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received significantly higher opening week box office revenue than those released in the summer season (June, July, and August; M = \$5.23 million; $p < .05$), even after excluding those released in the 2-week period around Valentine's Day, whereas the box office for other major genres (action: M_{winter} = \$15.05 million vs. M_{summer} = \$20.00 million; comedy: M_{winter} = \$7.14 million vs. M_{summer} = \$8.59 million; thriller: M_{winter} = \$7.25 million vs. M_{summer} = \$8.90 million) did not exhibit this pattern ($p > .10$). To systematically examine the relationship between physical coldness and consumers' liking of romance movies, we conducted four laboratory experiments and an analysis of online movie rental data to provide support for our hypothesis. Our findings offer practical implications for movie studios trying to determine the best movie release times to maximize revenue.

THEORETICAL BACKGROUND

Bodily Feelings as Informational Input to Consumer Judgment

Consumers often use their bodily feelings in forming their judgment and decision making. Bodily feelings include states of our physical or sensory experiences such as hunger and pain (Greifeneder, Bless, and Pham 2011; Schwarz and Clore 2007). Past research has examined the influence of a range of bodily feelings on consumer behavior, including haptic feeling attained through touch by hands (e.g., Peck and Childers 2003), scent from products or from the environment (e.g., Bosmans 2006; Krishna, Lwin, and Morrin 2010), feeling of physical confinement (Levav and Zhu 2009; Meyers-Levy and Zhu 2007), and a sense of physical comfort from soft carpet versus hard tile flooring (Meyers-Levy, Zhu, and Jiang 2010).

This body of literature collectively provides evidence consistent with the recent theorizing on (bodily) feeling-as-information (Greifeneder et al. 2011; Schwarz and Clore 2007). Specifically, it is proposed that people's bodily feelings can serve as informational input to consumers' judgment, regardless of whether the bodily feelings are an integral part of the judgment task or arise from incidental factors that are irrelevant to the judgment task. It is further proposed that the use of bodily feelings should operate in much the same way as when people use their affective feelings as information. One of the properties of affective feelings as information is that feelings can convey motivational information and in turn influence subsequent decision making (e.g., Raghunathan and Pham 1999; Raghunathan, Pham, and Corfman 2006). Interestingly, recent research on bodily feelings has indeed shown that consumers' incidental feeling of physical confinement (induced by aisle width) can prompt a motivational state of reactance, which in turn leads them to seek more variety in subsequent choices (Levav and Zhu 2009). In this research, we propose that the incidental feeling of physical coldness can activate the motivation for psychological warmth, which in turn influences their subsequent preference for romance movies.

Physical Coldness Activates the Motivation for Psychological Warmth

Our conjecture that physical coldness may activate the motivation for psychological warmth builds on the recent notion of embodied cognition (e.g., Barsalou 1999, 2008; Williams, Huang, and Bargh 2009). Despite the differences in the theorizing of the specific processes, embodied cognition theories share the main idea that cognition is fundamentally grounded in the physical context and perceptual processes. According to Barsalou's (1999) theory of Perceptual Symbol Systems, concepts (including objects, actions, motivational states, etc.) are multimodal representations rather than amodal abstractions. For example, the concept of *nervous* is stored in memory as a multimodal representation, which might include the sensations of a dry mouth, a rapid heart beat, and sweating, along with the situations and emotions experienced. These multimodal representations of concepts are developed through integrating modality-specific features of the concept during repeated encounters across situations and instances; and, once developed, as the perceptual processes associated with the concept are engaged, the multimodal representation of the concept gets activated (Barsalou et al. 2003). Moreover, abstract concepts are often grounded in concrete physical processes metaphorically in our language (Lakoff and Johnson 1980). For example, happy is up and sad is down. Thus, the activation of an abstract concept through bodily experiences may also be a result of metaphoric mapping (Landau, Meier, and Keefer 2010). Finally, the scaffolding model (Williams et al. 2009) suggests that high-order cognition is grounded in foundational concepts concerning the physical world (e.g., size, temperature), which are formed early in childhood through concrete experiences. These foundational concepts concerning the physical experiences are used to acquire an initial comprehension of more abstract concepts, and thus these abstract concepts are automatically tied to the physical experiences. It should be noted that these mechanisms are not necessarily mutually exclusive and may in fact reinforce each other. For example, the multimodal nature of concept representation and the physical-to-mental scaffolding may form the basis of the metaphoric connections between physical experience and abstract concept (Barsalou 1999; Landau et al. 2010). Therefore, the activation of an abstract concept through physical experience can involve more than one process (Landau et al. 2010).

The embodied view has received much empirical support. Recent research in neuroimaging has shown that participants who were made to feel rejected in a computerized game exhibited greater activation in the anterior cingulate cortex, an area also implicated in responding to physical pain (Eisenberger, Lieberman, and Williams 2003). More recently, DeWall et al. (2010) found that participants who took acetaminophen, a physical pain suppressant, daily for 3 weeks reported decreased feelings of social pain over time, whereas those who took a placebo showed no change. Studies in behavioral research have also provided evidence consistent

with the embodied view. For example, it has been shown that holding a heavy clipboard increased judgments of monetary value and perceptions of decision importance (Jostmann, Lakens, and Schubert 2009). More recently, Hung and Labroo (2011) found that firming one's muscles can help firm willpower and facilitate self-regulation.

Of particular relevance to the current research are the recent findings suggesting that the concept of psychological warmth is embodied in the experience of physical warmth. As Williams and Bargh (2008) argued, the feeling of psychological warmth is usually accompanied by a physical sensation of warmth, such as when being affectionately and safely cradled in a caregiver's arms and experiencing the sensation of physical warmth as infants. Consistent with this theorizing, they found that participants who held a cup of hot (vs. iced) coffee perceived a fictitious person as having a warmer personality (generous, caring, sociable). Along similar lines, physical warmth has been found to induce a greater perception of social proximity (IJzerman and Semin 2009). Zhong and Leonardelli (2008) also showed that social exclusion leads people to feel physically cold. Indeed, research from neuroscience suggests that the insular cortex is involved in processing both psychological and physical warmth information (e.g., Kang et al. 2011). These findings provide convergent evidence for the notion that the concept of psychological warmth (coldness) is embodied in the experience of physical warmth (coldness), as captured by the metaphor "warmth is affection" (Lakoff and Johnson 1999). It is worth noting that although most of the embodiment studies have demonstrated that physical experiences influence cognition in an assimilative manner, past research has also suggested that a motivational effect might occur when a basic human need is involved. For example, it has been shown that recalling an unethical behavior in the past led to a greater need for physical cleansing (Zhong and Liljenquist 2006). Moreover, people who chronically feel lonely have been found to exhibit an increased tendency to take warmer and longer baths or showers (Bargh and Shalev forthcoming). We propose that, since humans have the basic need to keep themselves warm (Maslow 1943), the experience of physical coldness should activate a desire for warmth and that given the close association between physical warmth and psychological warmth, this desire for warmth might manifest itself as a greater need for psychological warmth.

Romance and Psychological Warmth

Romantic love is defined as intimacy and passion (Sternberg 1986). Romantic love is often metaphorically described as being warm in our language. For example, in a 1970s hit song, Van Morrison wrote, "It's just warm love, and it's ever present everywhere." The association between romance and psychological warmth may come from the physiological changes associated with being in love. Research examining the physiology of love has documented that when people are in love, they usually experience sweaty palms, flushing, increased heart palpitations, and accelerated breathing (Fisher 1998), all of which are also associated with a physical experience of warmth.

Consistent with the view that the feeling of warmth is an integral part of the romantic love experience (Sprecher and Regan 1998), empirical studies have documented that people indeed perceive romantic love as closely related to psychological warmth. For example, Shaver, Morgan, and Wu (1996) proposed that love is accompanied by a distinct feeling of warmth, and they found that warmth was among the top features of love for both American and Chinese participants. Research has also shown that people perceive partner warmth as an ideal quality in intimate relationships (Fletcher et al. 1999). Similarly, Barnes and Sternberg (1997) identified two clusters of love in close relationships: a "hot" cluster of passionate love and a "warm" cluster of companionate love. In a semantic analysis of people's association with the experience of warmth, Fenko, Schifferstein, and Hekkert (2009) found that love and intimacy were strongly associated with the metaphoric meaning of warmth. Based on extant research, we argue that the romance movie genre, with the central plot revolving around a romantic love story, is associated with psychological warmth and thus the genre might be more desirable when people are physically cold.

In sum, building on prior research on (bodily) feeling-as-information and embodied cognition, we hypothesize that physical coldness (vs. warmth) would activate a need for psychological warmth, which in turn increases consumers' liking of romance movies given the close association between romance movies and psychological warmth. We tested our hypothesis in four laboratory experiments and one analysis of online movie rental data. Studies 1A and 1B test our basic hypothesis that physical coldness leads to an increased liking for romance movies. Study 2 provides evidence for the underlying mechanism by showing that consumers' perceived association between romance movies and psychological warmth moderates the basic effect. Past research on feeling-as-information suggests that people tend to correct for the influence of incidental feelings when they are aware that their judgment may be affected by an incidental factor (Pham 2009; Schwarz and Clore 2007). Thus, in study 3, we examined whether people would correct for the influence of the incidental bodily feeling on their liking of romance movies when physical coldness was made salient. Finally, in study 4, we analyzed a data set from an online movie rental company to provide external validity for our laboratory findings.

STUDY 1A: ICED VERSUS HOT TEA AND LIKING OF ROMANCE MOVIES

The objective of study 1A was to examine the hypothesized effect of physical coldness on consumers' liking of romance movies. We manipulated physical coldness by having participants drink an iced or a hot tea. To examine whether physical coldness would also affect the liking for other genres, we also included action, comedy, and thriller movies in the stimuli. Thus, a 2 (physical coldness: cold vs. warm) × 4 (genre: romance vs. action vs. comedy vs. thriller) ×

3 (replicate within genre) mixed design was employed, with physical coldness as a between-subject factor and genre and replicate as within-subject factors.

Method

Procedures. Fifty-three undergraduate students (28 female) participated in the study in exchange for course credit. Participants were first told that they would be taking part in a drink evaluation study. They were randomly assigned to either the warm or the cold condition. Those in the warm condition were given a cup of hot tea, and those in the cold condition were given a cup of iced tea. Participants were told to finish the drink slowly while completing another study on movie preference, which was our main task.

For the movie preference task, we selected movies from four genres (romance, action, comedy, and thriller) based on the genre categorization used by the Internet Movie Database. To minimize the influence of participants' prior impression of the movies, we conducted a pretest with 86 participants from the same population and selected a total of 12 movies (three movies from each genre), all of which were unknown to at least 80% of the participants.

Then participants were given the information about the movies while they drank the tea. For each movie, participants were first presented with the title, a synopsis, a fictitious viewer rating (ranging from 8.5 to 8.8 out of 10), and the movie genre. They were then asked to indicate how much they would like to watch the movie and how good they think the movie would be on two 7-point scales (1 = not at all, 7 = very much). The order of the movies presented was randomized. At the end of the movie preference task, participants also reported their liking of each of the genres in general (1 = not at all, 7 = very much).

After participants had completed the movie preference task, they were asked to indicate how warm or cold they felt on a 7-point scale (1 = very cold, 7 = very warm). This serves as a check for our physical coldness manipulation. Participants also indicated their mood on a series of 7-point scales (happy, joyful, excited, sad [reverse-coded], depressed [reverse-coded], nervous [reverse-coded]).

Results

Manipulation Check. A one-way ANOVA showed that participants who drank the iced tea felt colder ($M = 3.90$) than those who drank the hot tea ($M = 4.54$; $F(1, 51) = 6.86$, $p < .05$), suggesting that our physical coldness manipulation was successful.

Liking of Romance Movies. We first calculated a liking score for each movie by averaging participants' ratings on the two scales ($r > .63$). A 2 (physical coldness) × 4 (genre) × 3 (replicate) mixed ANOVA on movie liking scores showed no significant three-way interaction ($F(6, 306) = 1.13$, $p > .30$). Thus, we calculated a liking index for each genre by averaging the liking scores of the three movies within each genre. A 2 (physical coldness: cold vs. warm) × 4 (genre: romance, action, comedy, thriller) mixed ANOVA on participants' genre liking indices indicated a marginally significant main effect of genre ($F(3, 153) = 2.29$, $p = .08$). Follow-up contrasts showed that participants indicated a higher liking of action ($M = 4.63$; $F(1, 51) = 3.84$, $p < .06$), comedy ($M = 4.54$; $F(1, 51) = 3.03$, $p < .09$), and thriller ($M = 4.62$; $F(1, 51) = 5.78$, $p < .05$) than romance movies ($M = 4.22$), and their liking of action, comedy, and thriller movies did not differ ($F < 1$). The main effect of physical coldness was not significant ($F(1, 51) = 1.04$, $p > .30$). Importantly, the interaction between physical coldness and genre was marginally significant ($F(3, 153) = 2.36$, $p < .08$). To better understand the nature of the interaction, we conducted separate ANOVAs to examine the effect of physical coldness on each of the genre liking indices. The results showed that, consistent with our hypothesis, participants in the cold drink condition indicated a higher liking of romance movies ($M = 4.57$) than those in the warm drink condition ($M = 3.80$; $F(1, 51) = 6.14$, $p < .05$). However, physical coldness did not affect participants' liking of action ($M_{cold} = 4.74$ vs. $M_{warm} = 4.50$; $F < 1$), comedy ($M_{cold} = 4.46$ vs. $M_{warm} = 4.63$; $F < 1$), or thriller movies ($M_{cold} = 4.59$ vs. $M_{warm} = 4.67$; $F < 1$). These results suggest that physical coldness only increases people's liking for romance movies, not just for movies in general. We also ran similar analyses with participants' self-reported general liking of the genre as a covariate in studies 1–3, and the patterns of the results remained the same.

We also examined whether gender difference could account for the observed effect since females tend to like romance movies more than males. A 2 (physical coldness) × 2 (gender) ANOVA on participants' liking of romance movies yielded a significant main effect of gender, indicating that females indeed reported a higher liking of romance movies ($M = 4.55$) than males ($M = 3.85$; $F(1, 49) = 4.67$, $p < .05$). More importantly, however, the main effect of physical coldness remained significant even after controlling for gender ($F(1, 49) = 5.88$, $p < .05$), and the interaction between physical coldness and gender was not significant ($F < 1$). These results suggest that, while females may indeed have a higher preference for romance movies than males, the effect of physical coldness on preference for romance movies was independent of this gender effect. We also conducted similar analyses for subsequent experiments and obtained similar results. These analyses are omitted for brevity.

Mood. A one-way ANOVA of physical coldness on participants' mood index ($\alpha = .77$) revealed a marginally significant main effect ($M_{cold} = 4.95$ vs. $M_{warm} = 4.48$; $F(1, 51) = 3.39$, $p < .08$). Thus, to examine whether mood could account for the effect of physical coldness on movie preference, we performed an ANCOVA on participants' liking of romance movies with mood as a covariate. The results showed that the effect of physical coldness remained significant after controlling for mood ($F(1, 50) = 5.54$, $p < .05$) and the effect of mood was not significant ($F < 1$). Therefore, it appears that even though the physical coldness

manipulation may have slightly affected participants' mood in this study, this change in mood cannot explain the observed effect of physical coldness on the liking of romance movies.

STUDY 1B: AMBIENT TEMPERATURE AND LIKING OF ROMANCE MOVIES

Study 1B was designed to achieve two objectives. First, to provide convergent evidence for our hypothesis that physical coldness increases the liking of romance movies, we used another manipulation of physical coldness. Specifically, we varied the ambient temperature in the room participants were in. Second, to examine whether the effect of physical coldness could extend to a willingness to pay for romance movies, we asked participants to indicate the amount they were willing to pay to watch the movies after they had indicated their liking of the movies.

Method

Procedures. Fifty-six undergraduate students (30 female) participated in the study in exchange for payment. The procedures were similar to those in study 1A except for three changes. First, physical coldness was manipulated by varying ambient room temperature instead of having participants drink an iced versus hot tea. Following IJzerman and Semin (2009), participants were randomly seated either in a cold room (59°–62°F) or a warm room (72°–75°F; outside temperature: 64°–68°F). The two rooms were identical in size and layout. Second, after participants had indicated their liking of each movie on the same scales as in study 1A, they were asked to indicate how much they would be willing to pay to watch the movie by dragging a numbered slider anchored from HK$0 on the left end to HK$200 (equivalent to US$26) on the right end. Finally, we used 9-point scales for all the measures (except for the willingness-to-pay measure) and simplified the mood measure to one item (1 = in a bad mood, 9 = in a good mood).

Results

Manipulation Check. We first examined whether our manipulation of physical coldness was successful. A one-way ANOVA showed that participants in the cold room reported feeling colder ($M = 3.68$) than those in the warm room ($M = 6.14$; $F(1, 54) = 30.70$, $p < .001$), suggesting that our physical coldness manipulation was successful.

Willingness to Pay for Romance Movies. Next, we examined whether the effect of physical coldness on participants' liking of romance movies could extend to their willingness to pay for the movies. A 2 (physical coldness) × 4 (genre) × 3 (replicate) mixed ANOVA showed no significant three-way interaction ($F(6, 324) = 1.67$, $p > .12$). Thus, we calculated a willingness-to-pay (WTP) index for each genre by averaging across the three movies within each genre. A 2 (physical coldness) × 4 (genre) mixed ANOVA on participants' WTP indices yielded a significant main effect of genre ($F(3, 162) = 13.04$, $p < .001$). Follow-up contrasts showed that participants indicated a higher WTP for action ($M = 48.30$; $p < .01$) and thriller ($M = 50.42$; $p < .01$) than for comedy ($M = 40.76$) and romance movies ($M = 42.77$). Neither the difference between the WTP for action and thriller movies nor the difference between the WTP for comedy and romance movies was significant ($p > .20$). The main effect of physical coldness was not significant ($F(1, 54) = 2.61$, $p > .10$). Importantly, the interaction between physical coldness and genre was significant ($F(3, 162) = 2.76$, $p < .05$). Separate one-way ANOVAs showed that physical coldness led to a higher WTP for romance movies ($M_{cold} = 48.99$ vs. $M_{warm} = 36.55$; $F(1, 54) = 6.00$, $p < .05$) but not for the other genres ($p > .10$). We also performed similar analyses on participants' genre liking indices, and the results mirrored the patterns found for participants' WTP indices. These analyses are omitted for brevity.

Mood. A one-way ANOVA of physical coldness on participants' mood measure indicated that the physical coldness manipulation did not affect mood ($F(1, 54) = 2.75$, $p > .10$). Further, an ANCOVA on participants' WTP for romance movies with mood as a covariate revealed that the effect of physical coldness remained significant after controlling for mood ($F(1, 53) = 7.67$, $p < .01$) while the effect of mood was not significant ($F(1, 53) = 2.49$, $p = .12$). A similar analysis on participants' liking of romance movies yielded the same pattern (omitted for brevity). These results again suggest that the observed effect was not likely to be driven by mood.

Discussion

Studies 1A and 1B provide convergent evidence for our hypothesis that physical coldness increases people's liking of romance movies; this pattern was not observed for action, comedy, or thriller movies. Moreover, we showed that this effect cannot be accounted for by mood or gender difference. In the next study, we sought to shed light on the process underlying the observed effect.

STUDY 2: THE MODERATING EFFECT OF PERCEIVED ASSOCIATION BETWEEN ROMANCE MOVIES AND PSYCHOLOGICAL WARMTH

Study 2 was designed to examine the mechanism underlying the effect observed in studies 1A and 1B that physical coldness increases people's liking of romance movies. We argued that the reason physical coldness increases the liking for romance movies is that physical coldness activates a motivation for psychological warmth and romance movies are perceived as being associated with psychological warmth. To provide evidence for this conjecture, we measured the extent to which people associate romance movies with psychological warmth. Although people in general associate the

romance movie genre with psychological warmth, there should be individual differences in the extent of this association. We expected that people's perceived association between romance movies and psychological warmth would moderate the effect. Specifically, for participants who associate romance movies with psychological warmth, physical coldness would lead to an increased liking for romance movies; conversely, for those who do not associate romance movies with psychological warmth, the effect of physical coldness on the liking of romance movies should be attenuated.

Method

Pretest. To directly examine the assumed association between romance movies and psychological warmth, we recruited 40 participants (24 female) and asked them to indicate the extent to which different movie genres make them feel on a 9-point scale (1 = not at all heartwarming, 9 = very heartwarming). The order of the genres presented was randomized. A repeated-measures ANOVA showed that participants perceived romance movies in general to be more heartwarming ($M = 6.58$) than action movies ($M = 4.65$; $F(1, 39) = 28.51$, $p < .001$), comedies ($M = 4.60$; $F(1, 39) = 18.50$, $p < .001$), and thrillers ($M = 5.23$; $F(1, 39) = 19.87$, $p < .001$). Moreover, a series of one-sample t-tests against the scale midpoint indicated that the perceived heartwarmingness of romance movies was significantly above the midpoint ($t(39) = 6.49$, $p < .001$), whereas the perceived heartwarmingness of the other three genres did not differ significantly from the midpoint ($p > .20$). Taken together, these results provide direct evidence for our assumption that the romance movie genre is associated with psychological warmth. Moreover, the data showing that the perceived heartwarmingness of the other three genres did not differ from the midpoint suggest that the psychological warmth (coldness) dimension is not particularly salient for these genres; hence, the liking of these genres would be less susceptible to the influence of physical coldness, as we observed in studies 1A and 1B.

Procedures. One hundred and forty undergraduate students (85 female) participated in the study in exchange for course credit. They were randomly assigned to one of the experimental conditions. The procedures were similar to those in study 1A except for two changes. First, we included only romance movies in the movie preference task. Second, after participants had indicated their liking of the movies, they were asked to rate the extent to which romance movies in general make them feel on a 7-point scale (1 = give me a cold feeling; 7 = give me a warm feeling). This served as our measure of participants' perceived association between romance movies and psychological warmth.

Results

Manipulation Check. We first checked whether our manipulation of physical coldness was successful. A one-way ANOVA indicated that participants in the cold condition indeed felt colder ($M = 3.42$) than those in the warm condition ($M = 4.67$; $F(1, 138) = 43.41$, $p < .001$).

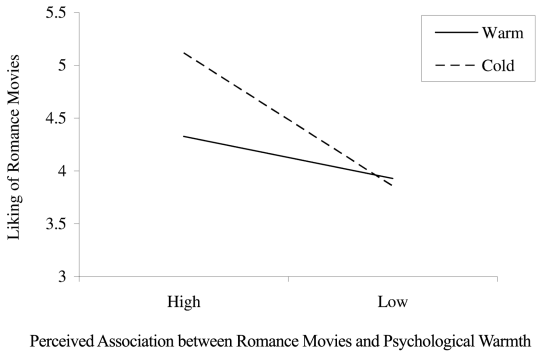
Liking of Romance Movies. A 2 (physical coldness) × 3 (replicate) mixed ANOVA with participants' perceived association between romance movies and psychological warmth (mean-centered) in the model as a continuous variable showed no significant three-way interaction ($F < 1$) on participants' movie liking scores ($r > .81$). Thus, we averaged the movie liking scores to create a romance genre liking index. To test the moderating effect of participants' perceived association between romance movies and psychological warmth, we conducted a regression analysis with physical coldness (−1 = cold, 1 = warm), perceived association between romance movies and psychological warmth (mean-centered), and the interaction term between these two factors in the model to predict their liking of romance movies. The analysis yielded a significant main effect of perceived association between romance movies and psychological warmth such that the more participants associated romance movies in general with psychological warmth, the more they liked romance movies ($\beta = .39$, $p < .001$). Replicating our findings from studies 1A and 1B, there was also a significant main effect of physical coldness such that participants who were feeling cold indicated a higher liking of romance movies ($\beta = -.17$, $p < .05$). Central to our hypothesis, the interaction between physical coldness and perceived association between romance movies and psychological warmth was also significant ($\beta = -.20$, $p < .01$). To explore the nature of the interaction, following Aiken and West (1991), we conducted a spotlight analysis at ±1 SD from the mean of the perceived association between romance movies and psychological warmth (fig. 1). Consistent with our hypothesis, at high levels of perceived association between romance movies and psychological warmth, physical coldness led to an increased liking of romance movies ($\beta = -.40$, $p < .001$); in contrast, at low levels of perceived association between romance movies and psychological warmth, physical coldness did not make a difference ($\beta = .04$, $p > .70$).

Mood. A regression analysis on mood ($\alpha = .73$) with physical coldness (−1 = cold, 1 = warm), perceived association between romance movies and psychological warmth (mean-centered), and the interaction term as predictors yielded a marginally significant main effect of the perceived association ($\beta = .14$, $p < .10$). No other effects were significant ($p > .10$).

We also ran a regression analysis on participants' liking of romance movies with physical coldness, perceived association between romance movies and psychological warmth, and the interaction term as predictors and mood as a covariate. The results showed that, after controlling for mood, both the main effect of physical coldness ($\beta = -.17$, $p < .05$) and perceived association between romance movies and psychological warmth ($\beta = .37$, $p < .001$) were still significant. More importantly, the interaction between phys-

FIGURE 1

LIKING OF ROMANCE MOVIES AS A FUNCTION OF PHYSICAL COLDNESS AND PERCEIVED ASSOCIATION BETWEEN ROMANCE MOVIES AND PSYCHOLOGICAL WARMTH (STUDY 2)



NOTE.—High is one standard deviation above the mean, and low is one standard deviation below the mean.

ical coldness and perceived association between romance movies and psychological warmth also remained significant ($\beta = -.22$, $p < .01$). The effect of mood was not significant ($\beta = .09$, $p > .26$). These results again suggest that the observed effect was not likely to be driven by mood.

Discussion

Study 2 replicates the finding from studies 1A and 1B that physical coldness increases people's liking of romance movies. More importantly, study 2 extends our earlier results by shedding light on the mechanism underlying the observed effect. Consistent with our conjecture that physical coldness increases the liking for romance movies because it prompts a motivational need for psychological warmth and that romance movies are associated with psychological warmth, we found that the effect of physical coldness on the liking of romance movies only occurred for participants who perceived romance movies as being associated with psychological warmth; in contrast, for participants who did not associate romance movies with psychological warmth, physical coldness did not make a difference.

Studies 1 and 2 provide convergent evidence that the incidental feeling of physical coldness can serve as a motivational input and influence people's subsequent judgment of romance movies. Past research on feeling-as-information suggests that people tend to correct for the influence of incidental feelings when they are aware that their judgment may be affected by feelings from an incidental factor (Pham 2009; Schwarz and Clore 2007). Thus, in study 3, we sought to examine whether people would also correct for the influence of the incidental feeling of physical coldness when this bodily feeling is made salient.

STUDY 3: THE EFFECT OF THE SALIENCE OF PHYSICAL COLDNESS ON LIKING OF ROMANCE MOVIES

Past research on feeling-as-information has consistently shown that when people become aware that their feelings arising from an incidental source may be influencing their judgment, they tend to discount the informational value of these feelings and correct for their influence (e.g., Raghunathan et al. 2006; Schwarz and Clore 1983). If bodily feelings indeed operate in a similar way as affective feelings, as hypothesized in recent theorizing on feeling-as-information (Greifeneder et al. 2011; Schwarz and Clore 2007), we should then expect that making people's physical coldness salient would also lead them to correct for this influence and hence attenuate its effect on the liking of romance movies. To examine this possibility, we manipulated the salience of physical coldness by varying the order of the movie preference task and the measure of physical coldness. Thus, a 2 (physical coldness: cold vs. warm) × 2 (salience of physical coldness: salient vs. nonsalient) × 3 (replicate) mixed design was used.

Method

Procedures. One hundred and ninety-one undergraduate students (105 female) participated in the study in exchange for course credit. They were randomly assigned to one of the experimental conditions. The procedures were similar to those in study 2 except for two changes. First, we did not measure the perceived association between romance movies and psychological warmth. Second, to manipulate the salience of physical coldness, we varied the order of the movie preference task and the measure of the feeling of physical coldness, a manipulation that has often been used in feeling-as-information research (e.g., Schwarz and Clore 1983). Specifically, in the physical coldness nonsalient condition, we asked participants to indicate how cold or warm they were after they had completed the movie preference task, as we did in previous experiments; however, in the physical coldness salient condition, participants were asked to indicate how cold or warm they felt before the movie task. Two participants who suspected a connection between the drink study and the movie preference task were excluded (including them in the data did not change the pattern of the results).

Results

Manipulation Check. A 2 (physical coldness) × 2 (salience of physical coldness) ANOVA on participants' ratings on how cold or warm they felt indicated a significant main effect of physical coldness such that participants in the cold condition felt colder ($M = 4.04$) than those in the warm condition ($M = 4.51$; $F(1, 185) = 5.76$, $p < .05$). Neither the main effect of physical coldness salience nor the interaction was significant ($p > .25$). These results suggest that our physical coldness manipulation was successful and that

participants' feeling of physical coldness was not affected by the physical coldness salience manipulation.

Liking of Romance Movies. A 2 (physical coldness) × 2 (salience of physical coldness) × 3 (replicate) mixed ANOVA on the movie liking scores ($r > .84$) indicated no significant three-way interaction ($F < 1$). Thus, we averaged the movie liking scores to create a romance genre liking index. A 2 (physical coldness) × 2 (salience of physical coldness) ANOVA on participants' romance genre liking index yielded a marginally significant main effect of physical coldness salience ($M_{\text{physical coldness nonsalient}} = 4.28$ vs. $M_{\text{physical coldness salient}} = 3.96$; $F(1, 185) = 3.39$, $p < .07$). The main effect of physical coldness was not significant ($F < 1$). Consistent with our hypothesis, there was a significant interaction between physical coldness and the salience of physical coldness ($F(1, 185) = 4.19$, $p < .05$; fig. 2). Planned contrasts showed that when participants' physical coldness was not salient, consistent with our earlier findings, physical coldness led to an increased liking of romance movies ($M_{\text{cold}} = 4.49$ vs. $M_{\text{warm}} = 4.01$; $F(1, 185) = 7.25$, $p < .01$). However, when physical coldness was made salient by measuring it before the movie preference task, there was no difference between the cold and the warm conditions ($M_{\text{cold}} = 3.83$ vs. $M_{\text{warm}} = 4.04$; $F < 1$). These results seem to suggest that when participants' physical coldness was made salient, they corrected for this influence when indicating their liking of romance movies.

Mood. A 2 (physical coldness) × 2 (salience of physical coldness) ANOVA on participants' mood index ($\alpha = .69$) indicated a marginally significant main effect of physical coldness salience ($M_{\text{physical coldness salient}} = 4.49$ vs. $M_{\text{physical coldness nonsalient}} = 4.79$; $F(1, 185) = 3.71$, $p < .06$). Neither the main effect of physical coldness nor the interaction was significant ($F < 1$).

We also conducted a 2 (physical coldness) × 2 (salience of physical coldness) ANCOVA on participants' liking of romance movies with mood as a covariate. The results showed that the main effect of physical coldness was not significant ($F < 1$). The main effect of the salience of physical coldness became nonsignificant after controlling for mood ($F(1, 184) = 2.14$, $p > .14$). The effect of mood was significant ($F(1, 184) = 7.85$, $p < .01$). Most importantly, the interaction between physical coldness and the salience of physical coldness remained significant after controlling for mood ($F(1, 184) = 4.90$, $p < .05$). These results again suggest that the observed effect was not likely to be driven by mood.

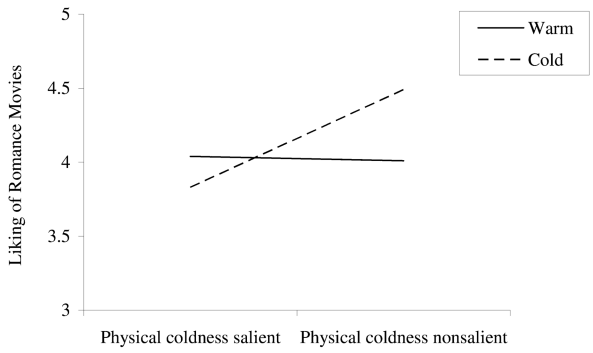
Discussion

By varying the order of the feeling of physical coldness measure and the movie preference task, study 3 examined the effect of the salience of physical coldness on participants' liking of romance movies. We found that when participants' physical coldness was measured after the movie preference task, as in studies 1 and 2, we replicated our earlier findings that physical coldness increases the liking of romance movies. However, when participants' physical coldness was made salient by measuring it before the movie preference task, there was no effect of physical coldness on their liking of romance movies. This result is consistent with Meyers-Levy et al.'s (2010, experiment 2) that the effect of bodily sensation on product judgment disappeared when the source of participants' bodily sensations was made salient (soft carpet vs. hard tile flooring). These findings provide evidence for the conjecture that bodily feelings may operate in the same way as affective feelings such that people would correct for the influence of their incidental feeling when they become aware that it may be influencing their judgment.

The first three studies demonstrate the effect of physical coldness on consumers' liking of romance movies in laboratory settings. In study 4, we sought to provide support for our hypothesis in a real-world consumption context.

FIGURE 2

LIKING OF ROMANCE MOVIES AS A FUNCTION OF PHYSICAL COLDNESS AND SALIENCE OF PHYSICAL COLDNESS (STUDY 3)



STUDY 4: ANALYSIS OF ONLINE MOVIE RENTAL DATA

Study 4 was designed to demonstrate the external validity of the observed effect. Specifically, we tested our hypothesis using a data set of rental records from an online movie rental company in the United States. The data span from August 2002 to May 2005 and include detailed user information and rental history. Since we could not manipulate physical coldness in this study, we used weather temperature as a proxy. Our assumption is that when the temperature outside is lower, people would feel colder even if they are indoors. However, it is possible that outside temperature may produce a contrast effect on people's feeling of physical coldness when they are inside a room. To validate our assumption, we conducted a pretest with 60 adults from various geographic locations in the United States. Participants were first asked how warm or cold they felt at the time on a 9-point scale (1 = very cold, 9 = very warm). They were then

asked to report the weather temperature outside (mean temperature = 47.0°F). We checked the accuracy of the self-reported weather temperatures based on participants' zip codes. All the weather temperatures reported fell within the high-low range of the archived temperature information on the date of the data collection. Validating our assumption, a regression analysis showed that participants' reported outside weather temperature indeed positively predicted how warm they felt ($\beta = .29$, $p < .05$).

Data

The focal company operates on a "movie-in-the-mail" business model. A customer starts by selecting from four service plans. Each of the plans involves a fixed monthly subscription fee and a quota, or the maximum number of movies that can be checked out at any single time. After subscribing to a plan, the customer can log on to the company's website to browse the inventory of available movies. For each movie, the customer can see the synopsis, the genre, cast information, and the average rating of the movie provided by previous viewers. The customer requests the movies he or she would like to watch, and the company then ships the requested movies to the customer.

The focal company's movie pool contains 10 genres, and we focused on five major genres: romance, action, comedy, drama, and thriller. Collectively these five genres accounted for 64.8% of all movies in the company's inventory at the end of the observation period. The key dependent variable is the percentage of romance movies in all movies watched in a given week. Following Milkman, Rogers, and Bazerman (2009), we used the dates when the movies were returned to the company and the standard mailing turnaround time to infer when the consumption occurred. To control for any potential confounding effect of the plan-specific consumption limit on viewing preferences, we focused on customers who had subscribed to the most popular standard service plan since their sign-up date. This plan charges a $19.99 monthly fee and allows two movies to be checked out at the same time; 83.5% of all customers chose this plan.

Next, we matched the movie rental record with historical temperature data. Ideally, we would match the temperature of the geographic location using each customer's zip code. However, the only geographic information available in the data was whether the customer was residing in the same city as the focal company. This rendered us an estimation sample of 2,500 customers with known geographic locations. We then obtained the daily temperatures of the city where the customers were residing during the observation period (ranging from 9.5°–91.0°F; mean temperature = 52.0°F, SD = 18.1°F) from the National Climactic Data Center (2004) and calculated the average weekly temperatures.

Model

We used subscripts i and t, respectively, to denote individual customer and week. The key dependent variable, Pct_{it}, is defined as the ratio between the number of romance movies watched by customer i in week t and the total number of movies watched by the same customer in the same week. The empirical model (model 1) we estimated is as follows:

$$\begin{aligned}\text{Pct}_{it} = {} & \gamma_0 \text{CVIEW}_i + \gamma_1 \\ & + \sum_{j=1}^{51} \gamma_{j+1} \text{WeekDum}_j + \delta_1 \text{NROM}_{it} \\ & + \delta_2 \text{RROM}_{it} + \delta_3 \text{DROM}_{it} \\ & + \delta_4 \text{NOTHER}_{it} + \delta_5 \text{ROTHER}_{it} \\ & + \delta_6 \text{DOTHER}_{it} + \beta \text{TEMP}_t + \varepsilon_{it}.\end{aligned}$$

The focal independent variable TEMP_t is the average temperature of week t. We also included the following variables. First, CVIEW_i is the percentage of romance movies among all movies viewed by customer i throughout his or her entire tenure with the company; this variable captures the customer's idiosyncratic preference for romantic movies. Second, to control for any seasonality effect that is independent of temperature (e.g., holidays), we included 51 weekly dummy variables WeekDum_j, and the fifty-first week was used as the reference week. Third, we also controlled for the availability and quality of romance movies and other genres. Specifically, NROM_{it} and NOTHER_{it} are, respectively, the numbers of unique titles of romance and nonromance movies that have not been watched by customer i in week t. RROM_{it} and ROTHER_{it} correspond, respectively, to the average ratings of the romance and nonromance movies that have not been watched by customer i in week t. Finally, to control for how recently the movies were released for different genres, we included DROM_{it} and DOTHER_{it}, which are, respectively, the average number of days between the movie release date and week t for romance movies and nonromance movies. These six variables are updated based on the dynamics in the company's inventory as well as customer i's rental history.

In addition to estimating the model using the raw temperature information, we also estimated four alternative models to examine any habituation or contextual temperature effect since people's feeling of physical coldness may be influenced by the context in which it is experienced. Specifically, in model 2 and model 3, instead of raw temperature, we calculated a standardized temperature based on the temperature information 1 year (model 2) or 3 years (model 3) preceding the consumption week. In model 4, we used the difference between the temperature of the consumption week (e.g., the sixth week of the year) and the 3-year historical average temperature of the month that the consumption week falls into (i.e., February). Finally, in model 5, we included both raw temperature and the temperature difference between the consumption week and the preceding week to examine whether there is a contextual temperature effect independent of the absolute temperature.

Results

Preference for Romance Movies. Table 1 summarizes the estimation results. We first examined the effect of major holidays on customers' preference for romance movies. The results showed that, independent of the temperature effect, the week of Valentine's Day had a positive and significant effect on the preference for romance movies across all models ($p < .05$). Interestingly, the week of Memorial Day also had a significant positive effect in four of the models ($p < .05$). The week of Christmas also had a marginally significant positive effect in model 3 ($p < .10$). Not surprisingly, the control variable of the idiosyncratic preference for romance movies had a significant positive effect across all models ($p < .01$).

We next examined the temperature effect on the preference for romance movies. The parameter estimate for the raw temperature in model 1 was negative and significant ($B = -.0007$, $p < .05$). The effect of the standardized temperature in model 2 and model 3 was also negative and significant ($B_{\text{model 2}} = -.0161$, $B_{\text{model 3}} = -.0197$, $p < .05$). In model 4, the coefficient for the temperature difference between the consumption week and the historical average temperature of the month was marginally significant ($B = -.0006$, $p < .08$). Finally, in model 5, the effect of the raw temperature was significant ($B = -.0008$, $p < .05$), while the temperature difference between the consumption week and the preceding week was not significant ($B = .0001$, $p > .80$). Taken together, consistent with our hypothesis, these results suggest that as temperature decreases, customers' preference for romance movies increases.

Preference for Other Genres. We also conducted similar analyses for the other four genres (action, comedy, drama, and thriller) to examine whether there was a temperature effect. None of the coefficients for temperature for these genres came out significant ($p > .13$; table 2). Consistent with the findings from studies 1A and 1B, these results suggest that the negative relationship between temperature and viewing preference is unique to the romance genre.

Discussion

Using an online movie rental data set, study 4 provides evidence consistent with our hypothesis that physical coldness leads to an increased preference for romance movies. However, one limitation of study 4 is that our data lack geographic variation and thus the results might not be generalizable. To further test the external validity of the effect, we conducted a quick empirical analysis using the international movie box office data from boxofficemojo.com. Since different countries tend to screen different movies, we focused on European countries, which allows us to have geographic variation while being able to generate a relatively large number of overlapping movies screened. The top 10 European countries with the most movies screened in 2010 (Austria, Belgium, France, Germany, Italy, Portugal, Russia, Spain, Turkey, and the United Kingdom) were selected. This yielded five common movies from the romantic drama genre screened in all 10 countries for our analysis. We estimated the following model:

$$(\text{Gross per Capita})_{ij} = \gamma_1 + \sum_{i'=1}^{I-1} \gamma_{1+i'}\,\text{Country}_{i'} + \sum_{j'=1}^{J-1} \gamma_{I+j'}\text{Movie}_{j'} + \gamma_{I+J}(\text{Total Box Office})_i + \beta\,\text{AvgTemp}_i + \varepsilon_{ij},$$

where $(\text{Gross per Capita})_{ij}$ is the per capita total gross box

TABLE 1

ESTIMATION RESULTS FOR ROMANCE MOVIES (STUDY 4)

Parameters	Model 1	Model 2	Model 3	Model 4	Model 5
Percentage of romance movies viewed	.9521***	.9516***	.9517***	.9521***	.9472***
Valentine's Day week	.0380**	.0391**	.0409**	.0360**	.0371**
Memorial Day week	.0508**	.0584**	.0641***	.0305	.0567**
Independence Day week	.0117	.0249	.0342	−.0208	.0091
Labor Day week	.0085	.0155	.0241	−.0146	.0146
Thanksgiving week	.0085	.0063	.0073	.0034	.0110
Christmas week	.0222	.0260	.0267*	.0223	.0207
Number of romance movies	.0002	.0005	−.0005	.0003	−.0005
Number of other genres	−.0000	−.0001	−.0000	−.0001	−.0000
Average rating of romance movies	.1354	.1149	.1340	.1369	.1846*
Average rating of other genres	.1845	.1982	.2101*	.1778	.2417*
Average release time of romance movies	−.0000	.0000	.0000	−.0000	.0000
Average release time of other genres	.0000	.0000	.0000	.0000	.0000
Raw temperature	−.0007**				−.0008**
Standardized temperature		−.0161**	−.0197**		
Temperature difference from historical monthly average				−.0006*	
Temperature difference from preceding week					.0001

*$p < .10$.
**$p < .05$.
***$p < .01$.

TABLE 2

ESTIMATES OF TEMPERATURE EFFECT FOR ALL GENRES (STUDY 4)

	Model 1		Model 2		Model 3		Model 4		Model 5	
Genre	Coefficient	*p*-value	Coefficient	*p*-value	Coefficient	*p*-value	Coefficient	*p*-value	Coefficient	*p*-value
Romance	−.0007	.048	−.0161	.048	−.0197	.026	−.0006	.076	−.0008	.032
Action	.0002	.783	.0106	.431	.0128	.376	.0002	.733	.0005	.448
Comedy	−.0005	.373	−.0114	.378	−.0183	.187	−.0006	.273	−.0009	.171
Drama	.0006	.338	−.0057	.701	.0022	.888	.0006	.364	.0010	.136
Thriller	.0003	.461	−.0092	.286	−.0080	.385	.0003	.430	.0001	.734

office revenue (in US$) for romance movie j in country i. To control for any unobservable country- or movie-specific effect, we included country dummy variables, $\text{Country}_i'$, and movie dummy variables, Movie_j'. To rule out the possibility that any effect we observe might be due to the difference in the overall movie consumption across countries, we also included the total box office revenue generated in country i, $(\text{Total Box Office})_i$, as a control variable. Finally, our key independent variable, AvgTemp_i, is the average yearly temperature of the capital city of country i. The results showed that there is a significant and negative relationship between the average yearly temperature of the capital city and the country's per capita box office revenue for the romance movies ($B = -.0064$, $p < .05$). As a robustness check, we also conducted the same analyses with those movies screened in at least nine of the top 10 countries (which yielded nine movies) and eight of the top 10 countries (which yielded 12 movies) and obtained the same pattern of results ($p < .06$). Although these analyses are rather cursory and the findings are by no means conclusive, the pattern of results is on the surface consistent with our hypothesis.

GENERAL DISCUSSION

This research examines the effect of physical coldness on consumers' liking of romance movies. In four laboratory studies and one analysis of online movie rental data, we found support for the hypothesis that physical coldness increases the liking of (studies 1–4) and willingness to pay for romance movies (study 1B) but not for other major genres (studies 1A, 1B, and 4). Moreover, consistent with our theorizing that the observed effect arose because physical coldness activates a need for psychological warmth, we showed that the effect of physical coldness on the increased liking of romance movies only occurred for participants who associated romance movies with psychological warmth (study 2). We also provided evidence that the bodily feeling of coldness seems to operate in a similar way as affective feelings such that when participants' physical coldness was made salient, they corrected for its influence and the effect of physical coldness on their liking of romance movies disappeared (study 3). It should be noted that although this research only examines people's preference for romance movies, the effect of physical coldness on a heightened need for psychological warmth may be manifested as a greater desire for other products associated with psychological warmth. To test this conjecture, we conducted a study ($N = 68$; 29 female) with similar procedures as in study 1B except that novels were used as the stimuli; this replicated our main finding. Specifically, we found that participants who were feeling physically cold indicated a higher liking of romance novels ($M = 5.46$) than those who were feeling physically warm ($M = 4.72$; 9-point scale; $F(1, 66) = 6.48$, $p < .05$), and there was no effect of physical coldness on participants' liking of other genres of novels (science fiction, thriller, action; $p > .10$).

The current research adds to the growing literature on the embodiment effect on social cognition (Briñol and Petty 2008; Niedenthal et al. 2005). Past research has identified two types of embodiment effects. On the one hand, a physical (cognitive) experience may activate a corresponding cognitive (physical) experience and influence subsequent judgment in an assimilative manner. For example, physical warmth leads people to perceive strangers as having a warmer personality (Williams and Bargh 2008) or being socially more proximate (IJzerman and Semin 2009). Similarly, holding a heavy clipboard causes people to consider the decisions they are making as more important (Jostmann et al. 2009). On the other hand, a physical (cognitive) experience may activate a cognitive (physical) experience and influence subsequent judgment in a compensatory manner, serving as a motivational input. For example, Zhong and Liljenquist (2006) showed that asking participants to recall their past unethical behaviors activated a goal of physical cleanliness, and hence they were more likely to choose cleansing products. Similarly, Bargh and Shalev (forthcoming) found that people who chronically feel lonely have an increased tendency to take warmer and longer baths or showers. Our research adds to the latter stream of work by showing that physical coldness activates the motivation for psychological warmth, which in turn increases preference for romance movies.

An interesting question is when a physical experience might produce an assimilative effect versus a compensatory effect. One possibility suggested by the feeling-as-information literature is query dependency (Pham 2009), which argues that the same feeling can exert different influences depending on task-related factors that determine the specific question on which the feeling is brought to bear (e.g., Martin et al. 1997). Thus, if the question is conducive to people interpreting their feeling as indicative of their literal reaction toward the target (e.g., "How cold is this person?"), then

an assimilative effect is more likely (i.e., physical coldness leads people to perceive the target as colder). However, if the question is conducive to people interpreting their feeling as informative of what they want from the target (e.g., "How much would you like to hug this person?"), a compensatory effect might be more likely to occur (i.e., physical coldness leads to a greater desire for hugging). To test this possibility, we conducted a study with participants from the same subject pool ($N = 97$; 54 female). The procedures were similar to those in study 1A except for the following changes. Participants were only presented with romance movies, and for half of the participants, we asked them for each movie how much they would like to watch the movie on a 9-point scale (1 = not at all, 9 = very much); for the other half of the participants, we asked them for each movie how heartwarming the movie is (1 = not at all, 9 = very much). Manipulation checks showed that regardless of the question asked, participants in the cold condition reported feeling colder than those in the warm condition ($p < .01$). Two separate ANOVAs showed that when participants were asked how much they would like to watch the movie, we replicated the finding that physical coldness leads to an increased liking of romance movies ($M_{cold} = 6.14$ vs. $M_{warm} = 5.36$; $F(1, 51) = 5.41$, $p < .05$). Interestingly, when participants were asked how heartwarming the movie is, those who felt physically cold perceived the movies as less heartwarming ($M = 5.71$) than those who experienced physical warmth ($M = 6.39$; $F(1, 42) = 3.61$, $p < .07$), a result that conceptually replicates Williams and Bargh's (2008) finding. More systematic research is warranted to examine the factors that determine when an assimilative versus a compensatory effect of physical coldness would occur.

One alternative explanation for the effect observed in our research is that physical coldness merely increases the accessibility of the concept of coldness/warmth (rather than activates the motivation). We think this explanation is less plausible for several reasons. First, a semantic priming effect usually occurs when the accessible construct is applicable to the judgment of the target (Higgins 1996). That is, the salience of the coldness/warmth concept is more likely to affect the judgment of the coldness/warmth of the movies and less likely to affect the global liking judgment of the movies. Second, semantic priming usually produces an assimilative effect unless a correction process is involved (Förster and Liberman 2007), such as when the primes are extreme (e.g., using Einstein to prime smartness), whereas the effect we observed is in a compensatory manner. Moreover, one difference between goal activation and priming of a concept is that goal activation also activates the means for achieving the goal (Förster and Liberman 2007). Our finding that the effect only occurred for the romance genre but not for other genres is consistent with a motivational account. The result from study 2 showing that physical coldness did not affect the liking of romance movies for participants who did not associate romance movies with psychological warmth also suggests that the effect only occurs for means that can satisfy the end, providing additional evidence for the motivational account.

This research also contributes to the feeling-as-information literature (Pham 2009; Schwarz and Clore 1996, 2007). Feeling-as-information theory has traditionally been conceptualized mostly in the context of affective feelings (e.g., Schwarz and Clore 1996). However, more recent theorizing on feeling-as-information has proposed that cognitive feelings (e.g., processing fluency) and bodily feelings also fall under the general theoretical framework of how people use their experiential information as input to their judgment and decision making. It is further postulated that the same principles that guide people's use of affective feelings as information should also guide their use of cognitive and bodily feelings (Greifeneder et al. 2011; Schwarz 2011). One principle of affective feelings as information is that when a feeling is attributed to an incidental source, its informational value is discounted (Pham 2009; Schwarz 2011). Our results from study 3 showing that people corrected for the influence of their bodily feeling of coldness are consistent with the prior findings about affective feelings (e.g., Raghunathan et al. 2006). Another principle is that the same feeling may generate different interpretations depending on the question being asked and therefore have different behavioral consequences (Pham 2009; Schwarz 2011). Consistent with this idea, we found that physical coldness increases people's liking of romance movies when they are asked how much they would like to watch the movie and leads people to perceive romance movies as less warm when they are asked how heartwarming the movie is. Our results provide initial evidence for the conjecture that the same set of principles might guide people's use of their bodily feelings as informational input to their judgments. Future research could examine whether other principles that guide people's use of affective feelings also apply to the use of bodily feelings.

We note that there are several limitations with the current research. First, people's experiences of coldness/warmth are adapted to the environment through behavioral adjustment, physiological acclimatization, and psychological habituation or expectation (de Dear and Brager 1998). Therefore, how cold or warm we feel is influenced by the weather temperatures we are accustomed to and thus the same absolute temperatures may not exert the same influence for places with homogenously warm or cold weather as for places with more heterogeneous weather temperatures. Although we observed the same pattern of results for absolute temperatures and relative temperatures in study 4, the lack of geographic variation in our data suggests caution in interpreting these results. The issue of habituation of physical coldness and how it influences the effect observed in this research warrants more systematic research. Another interesting question is whether the effect of physical coldness on liking for romance movies would vary by culture. It has been well documented that culture can exert systematic influence on people's cognitive and motivational processes (Markus and Kitayama 1991). Our perceptual processes may also be affected by culturally characteristic physical environment (Miyamoto, Nisbett, and Masuda 2006). Further, linguistic theories posit that language produces fundamental differences

in thought, memory, attention, and perception across cultures (Stapel and Semin 2007). Therefore, even though warmth is a universal basic human need (Maslow 1943), culture might exert another layer of influence on the physical-psychological warmth link through our interaction with the physical environment and language afforded by culture. Although the results from our analysis of box office data across some European countries are directionally consistent with the experimental findings, the lack of greater cultural variation and the cursory nature of the analysis render the results inconclusive. The issue of culture (in)variability of embodied cognition presents a fruitful avenue for future research. Finally, we recognize that even though the findings from our experiments and empirical analyses are consistent with our hypothesis, we did not directly examine the mechanism underlying the effect, which makes it difficult to rule out other alternative explanations. Thus, future research should systematically examine the exact process through which physical coldness activates the need for psychological warmth.

Our results offer some managerial implications. Eliashberg, Elberse, and Leenders (2006) pointed out that because of the media's attention to top box office performers in the opening week and its impact on the long-term success of a movie, the timing of a movie's release is becoming increasingly critical. In the United States, it is typically thought that summer and winter holiday seasons are the peak periods, and movie studios strategically plan their most important releases in those two seasons (Einav 2007). Our research suggests that even between these two peak seasons, there may exist another dimension of systematic difference in consumer demand for the romance genre. Specifically, our findings suggest that movie studios might be better off releasing their romance movies in the winter season when the temperatures are low. However, due to the sequential nature of the distribution channels in the movie industry (Lehmann and Weinberg 2000), the release time decisions of movie studios are based on many considerations in order to maximize the total revenue from all sources (theaters, DVD sales, DVD rentals, etc.), and thus the managerial implications from our findings should be taken with caution.

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