

How do consumers' needs and motivations influence their perceptions of external objects? For example, do hungry people perceive a cake to be larger or smaller than do satiated people? According to the New Look psychology literature, the answer is invariably "larger." However, in this article, the authors demonstrate that the answer is more complex depending on whether the object belongs to the perceiver. If the cake does not belong to the perceiver, she will perceive it to be larger if she is hungry than if she is satiated. In contrast, if the cake already belongs to her, she will perceive it to be smaller if she is hungry than if she is satiated. The authors propose a two-process (wishful thinking vs. worryful thinking) hypothesis to explain the finding and discuss its theoretical and marketing implications.

*Keywords:* motivated judgment, need, motivation, ownership, wishful thinking, worryful thinking

## Wish Versus Worry: Ownership Effects on Motivated Judgment

Imagine that you are hungry, so you rush into a bakery to buy something to eat. You see a piece of your favorite kind of cake, but it is somewhat expensive. You carefully evaluate the size of the cake to determine whether it is worth the price. Because you perceive it to be quite large, you happily pay for it. But would your judgment of the cake's size differ if you were not hungry? These kinds of judgments are ubiquitous in daily life; they pertain to the impact of need state on consumers' judgments and evaluations. They are important determinants of consumer decision making, because they are often pitted directly against product prices to determine perceived value of a deal and, consequently, to determine consumers' purchase intentions and consumption (Chandon and Ordabayeva 2009; Chandon and Wansink 2006).

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Answers to these questions come from research in the field of New Look psychology and its recent resurgence (Bruner 1957; Kunda 1990). In this research stream, theories predict that need state will bias perception (and thus judgment) toward the desirable, wishful, or optimistic direction. That is, a hungry person will perceive a piece of cake to be bigger than will a satiated person, and a thirsty person will judge a can of Coke to be fuller than will a person whose thirst has been quenched. For the sake of simplicity, in this article, we call this effect the "hungrier-the-larger effect."

We argue that the opposite can also be true. That is, there are situations in which a greater need for an object will lead to a more pessimistic judgment of its size, volume, weight, and so forth. For example, hungry people may perceive the size of a meal to be smaller, and thirsty people may perceive the volume of water in a cup to be smaller. In this article, we call this effect the "hungrier-the-smaller effect." We further argue that whether the hungrier-the-smaller effect or the hungrier-the-larger effect emerges depends on the perceiver's ownership status of the target item: If the perceiver owns the target item, the hungrier-the-smaller effect will prevail; if the perceiver does not own the target item, the hungrier-the-larger effect will prevail. The purpose of the current research is to show that ownership status systematically moderates the effect of need state on judgment.

We organize the article as follows: We first review existing literature on how need state affects judgment. We subse-

quently present a two-process hypothesis of the effect of need state on judgment and then test this hypothesis in four experiments with volume, size, and weight judgments as dependent variables. Finally, we discuss implications, applications, and potential alternative accounts.

### THEORETICAL BACKGROUND

New Look psychologists first established the hungrier-the-larger effect (Bruner and Goodman 1947), and later studies corroborated it (Brendl, Markman, and Messner 2003; Veltkamp, Aarts, and Custers 2008). In a classic experiment, Bruner and Goodman (1947) show that poor children (who presumably had a greater need for money) perceived coin sizes to be larger than did more affluent children. Although there were many qualifications for the roles of needs and motivations in such perceptual evaluations (Eriksen 1958, 1962; Eriksen and Browne 1956; Goldiamond 1958; McCurdy 1956; Prentice 1958; Wohlwill 1966), this experiment was the first formal demonstration of the effect of motivation on perception. Many other subsequent studies provide cleaner demonstrations of this effect. For example, Brendl, Markman, and Messner (2003) show in a controlled experiment that “deprived” smokers estimated the length of a cigarette to be longer than did their less-deprived counterparts. DuBois, Rucker, and Galinsky (2010) illustrate that those with a high need for power perceived coins to be larger than did those with a low need for power. These research programs, though different in their objectives and underlying theoretical propositions, all support the existence of the hungrier-the-larger effect.

We are not aware of any research showing the reverse—the hungrier-the-smaller effect. The purpose of the current research is to demonstrate the existence of this effect and to show that ownership status moderates the relative prevalence of the hungrier-the-larger and the hungrier-the-smaller effects. Throughout the descriptions of our propositions, we use hunger level as an example of need state and the size of a cake as an example of a target variable; however, our propositions also apply to other needs and other target variables. Thus, the words “larger” and “smaller” simply mean “toward the desired direction” and “away from the desired direction,” respectively. For example, suppose a person encounters a mountain. Then the term “the hungrier-the-larger” means the more exhausted he is, the lower he perceives the mountain to be, and the term “the hungrier-the-smaller” means the more exhausted he is, the taller he perceives the mountain to be. Moreover, we define “ownership” as the perceiver’s accessibility to or right to consume the target item. For example, if the target item is a house and a person owns or can otherwise live in this house, we say she “owns” it. If the target item is her neighbor’s house, we say she does not “own” it. Even if the person lives in a rented house, she may still perceive it as “her home”; in this sense, we also say she “owns” the rented house. We use “ownership” instead of “accessibility” because “accessibility” has other meanings in psychological literature, and we do not want to confuse our definition with those.

Why does ownership determine the relative prevalence of the hungrier-the-larger and the hungrier-the-smaller effects? We propose that this difference in judgment is due to different motivational foci. When the cake does not belong to the perceiver, the hungrier-the-larger effect will emerge.

According to New Look psychologists (Bruner 1957), this effect is a result of wishful thinking, which serves a motivational function: because the cake is not hers, the perceiver wishes to acquire it. The hungrier the perceiver is, the more she wishes to acquire it. In addition, the larger she perceives the cake to be, the more motivated she will be to acquire it. Thus, the hungrier she is, the larger she perceives the cake to be.

Alternatively, when the perceiver owns the cake, he will be worried that it is not large enough to satisfy him. The hungrier he is, the more worried he will be and the smaller the cake will appear to be, thus, the hungrier-the-smaller effect. Just as New Look psychology (Bruner 1957) conceptualizes the hungrier-the-larger effect as functional, the hungrier-the-smaller effect may also serve a functional purpose. Specifically, if the cake is the perceiver’s, he worries about whether it is big enough to satisfy his needs, and he is better off underestimating the size than overestimating it, because underestimation will motivate him to pursue more.

Our proposition is consistent with the New Look literature. In the typical New Look study, the target item did not belong to the perceiver, and therefore the typical finding was the hungrier-the-larger effect. For example, in the classic coin study (Bruner and Goodman 1947), the coin did not belong to the children, and therefore, poorer children perceived the coins to be larger than did wealthier children. Our proposition is also consistent with Den Daas, Hafner, and De Wit’s (2012) finding that sexually aroused men perceive the breasts of a (unrelated) woman to be larger than do sexually unaroused men, presumably because the woman does not “belong” to them. Our proposition would imply that if the woman “belongs to” (e.g., is the spouse of) a male perceiver, he may perceive her breasts to be smaller if he is sexually aroused than if he is not.

Although we advocate the two-process hypothesis and show that it can account for both the hungrier-the-larger and the hungrier-the-smaller effects, we do not claim that it is the only explanation for these effects. We discuss a possible alternative account in the “General Discussion” section.

We test our two-process hypothesis in four experiments. In Experiment 1, we test the hypothesis with volume judgment by manipulating a physiological need (thirst) and the ownership status of the target item. Experiments 2 and 3 replicate the same results of Experiment 1 in different domains. Experiment 3 also provides process evidence for the proposed hypothesis. Finally, Experiment 4 further tests the processes in weight judgment through a physiological need (hunger).

### EXPERIMENT 1: WATER

Experiment 1 provides the first piece of evidence for the moderating role of ownership leading to either the hungrier-the-smaller or the hungrier-the-larger effect. The experiment followed a 2 (need: high vs. low)  $\times$  2 (ownership: mine vs. not mine) between-participants design. In this study, need was the need for water, which we manipulated by making participants either thirsty (high need for water) or quenched (low need for water) before the study. Then, we asked participants to estimate the volume of a cup of water. We manipulated ownership by telling participants that the water to be evaluated was either for them to drink (mine) or not for them to drink (not mine). In line with our two-

process hypothesis, we predicted that wishful thinking would dominate when participants did not own the water and that worryful thinking would dominate when participants owned the water. That is, thirstier participants should estimate the volume of the water to be larger when they cannot drink it and smaller when they can. Furthermore, thirst levels should be positively correlated with water volume estimations when participants cannot drink the water and negatively when they can.

### Method

A total of 211 participants (99 women) were recruited on campus at a French university to participate in the study for a nominal payment. We informed participants that they would take part in several independent product-evaluation studies. The first part was ostensibly to examine the effect of consumption quantity on consumption experience. We required participants either to drink approximately 12 ounces of water or to eat 10 large pieces of pretzel, which induced either low or high levels of thirst. Participants then answered a few questions about the products. They also rated their thirst level on a seven-point scale (1 = “not at all,” and 7 = “very much”) and then proceeded to the main study. In the main study, we asked participants to directly estimate the volume (in milliliters [mL]) of a cup of water (volume = 4 ounces, or 118.29 mL) placed on the table in front of them. We told half the participants that they would drink this cup of water as part of the study for product evaluation (we did not explicitly state whether they had to finish the entire cup). This group constituted the “mine” condition. We told the other half that the cup of water was not for their consumption, because we would use the water for later participants who would estimate its volume. This group constituted the “not-mine” condition. The cup used for the study was transparent so that participants could easily perceive the water. To reduce variance in the estimation task, we told participants the full volume of the cup was 200 mL. During the estimation process, participants could freely touch and examine the cup of water. To encourage engagement and accuracy, the experimenter informed them that the participant who made the most accurate estimate would win a prize of 20 euros.

### Results and Discussion

**Manipulation check.** Participants in the water-drinking condition showed a much lower thirst level than those in the pretzel-consumption condition ( $M_{\text{water}} = 3.27$ ,  $SD = 1.97$ ;  $M_{\text{pretzel}} = 4.96$ ,  $SD = 1.50$ ;  $t(209) = 7.03$ ,  $p < .001$ ). These results confirm that our manipulation of need was successful.

**Main results (volume estimate).** An analysis of variance (ANOVA) with volume estimation as the dependent variable and need and ownership as the independent variables showed a significant two-way interaction ( $F(1, 207) = 16.88$ ,  $p < .001$ ). Specifically, in the mine condition, participants who were high in need estimated the volume to be smaller than those who were low in need ( $M_{\text{thirsty}} = 122.98$  mL,  $SD = 18.17$  mL;  $M_{\text{not thirsty}} = 135.42$  mL,  $SD = 23.62$  mL;  $t(104) = 3.05$ ,  $p = .003$ ); in contrast, in the not-mine condition, those who were high in need estimated the volume to be greater than those who were low in need ( $M_{\text{thirsty}} = 130.01$  mL,  $SD = 17.92$  mL;  $M_{\text{not thirsty}} = 120.84$

mL,  $SD = 15.50$  mL;  $t(103) = 2.80$ ,  $p = .006$ ; see Figure 1). Neither main effect was significant (both  $ps > .15$ ).

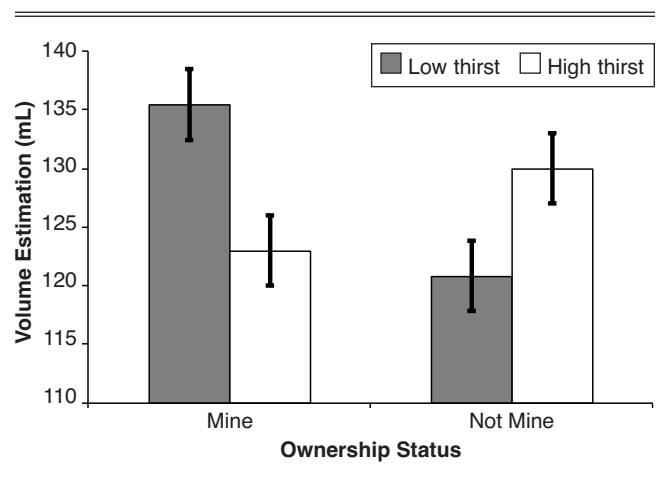
Furthermore, consistent with our hypothesis, in the mine condition, we found a negative correlation between thirst rating and volume judgment ( $r = -.29$ ,  $p = .003$ ), indicating that the thirstier the participants were, the smaller they perceived the volume of the water to be. In contrast, in the not-mine conditions, we found a positive correlation between these variables ( $r = .27$ ,  $p = .006$ ), indicating that the thirstier the participants were, the greater they perceived the volume of the water to be. These two correlations were significantly different from each other ( $Z = 4.05$ ,  $p < .001$ ).

In summary, the results from Experiment 1 provide empirical evidence for our hypothesis. Specifically, people who do not own the target item exhibit wishful thinking (i.e., the hungrier-the-larger effect); people who already own the target item exhibit worryful thinking (i.e., the hungrier-the-smaller effect). Furthermore, the correlation between thirst rating and estimated volume provides additional support for our proposed relationship between need state and judgment.

### EXPERIMENT 2: WEIGHT

We designed Experiment 2 to replicate the results of Experiment 1 in a different context. In Experiment 1, a higher need state led to a preference for a greater value of the target variable, whereas in Experiment 2, a higher need state leads to a preference for a smaller value of the target variable. The experiment followed a 2 (need: high vs. low)  $\times$  2 (ownership: mine vs. not mine) between-participants design. In this study, need was a motivation or desire to avoid a strenuous task (holding a heavy weight), and we manipulated the need through physical tiredness from a previous task. Before the main study, we asked participants either to perform a heavy physical exercise so that they were tired when they entered the main study or to perform a light physical task so that they were not tired when they entered the main study. In the main study, we told participants that they would hold a weight for a period of time. Presumably, those who were already tired were more moti-

Figure 1  
ESTIMATED WATER VOLUME AS A FUNCTION OF THIRST LEVEL (LOW THIRST VS. HIGH THIRST) AND OWNERSHIP STATUS (MINE VS. NOT MINE)



vated to avoid holding heavy weights in the main study than those who were not tired. In other words, the tired participants were in a higher need state for avoiding heavy weights in the main study than the not-tired participants. Then, we asked participants to estimate the heaviness of a weighted disc. We manipulated ownership by telling participants either that the weighted disc to be evaluated was the one they would hold during the main study (mine) or that it was not the one they would hold during the main study (not mine).

We predicted that in the mine condition, worryful thinking would dominate and the hungrier-the-smaller effect would occur; that is, the more tired the participants were, the more they would worry that the to-be-held disc would be heavy, and the heavier they would perceive it to be. Alternatively, in the not-mine condition, we predicted that wishful thinking would dominate and that the hungrier-the-larger effect would occur; that is, the more tired the participants were, the lighter they would want their to-be-held disc to be, and the lighter they would perceive the not-mine disc to be. In other words, tiredness would be positively correlated with the estimated weight of the mine disc and negatively correlated with the estimated weight of the not-mine disc.

#### Method

Two hundred twenty participants (112 women) from a large university in Hong Kong took part in the study for course credit. The study included two stages. In the first stage, participants performed an ostensibly unrelated exercise study and then answered a few questions about the exercise. Half the participants simply performed some light body-movement exercises. The other half repeatedly lifted a dumbbell weighing 15 kilograms (kg). The purpose of this task was to induce either a low or high need to avoid holding heavy weights. The duration of both tasks was ten minutes, after which participants answered several questions about their exercise experience. The questions included (1) how challenging the task was, (2) how tired they felt after the exercise task, (3) how positive or negative they felt, and (4) how physically exhausted they felt. They answered these questions on seven-point scales, with greater numbers indicating more challenging, more tired, more positive, and more exhausted.

After answering these questions, participants moved on to the second stage of the study. All participants were then told that the next task would be a weight-holding task in which they would have to hold a weight (either a weighted disc or a dumbbell) with their hands stretched out horizontally for five minutes, a difficult task for most.

We then asked participants to estimate the heaviness of a weighted disc (weighing 3.01 kg). We told half the participants that the weighted disc was for them to use in the subsequent task and told the other half that this weighted disc was for other participants to use and that they would lift a dumbbell (different from the one they used in the previous task). Participants then directly estimated the weight of the disc (in grams).

#### Results

**Manipulation check.** First, no reported mood difference was present between the two exercise conditions ( $p > .59$ ).

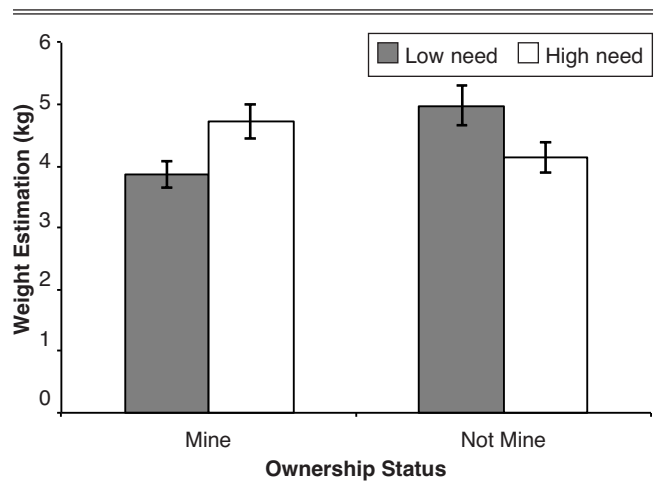
Second, participants in the weight-lifting condition thought that their task was more challenging and felt more tired and physically exhausted than participants in the body-movement condition (challenging:  $M_{\text{weight-lifting}} = 4.97$ ,  $SD = 1.44$ ;  $M_{\text{body movement}} = 2.23$ ,  $SD = 1.12$ ;  $t(218) = -15.85$ ,  $p < .001$ ; tired:  $M_{\text{weight-lifting}} = 4.74$ ,  $SD = 1.44$ ;  $M_{\text{body movement}} = 2.80$ ,  $SD = 1.29$ ;  $t(218) = -10.57$ ,  $p < .001$ ; exhausted:  $M_{\text{weight-lifting}} = 4.62$ ,  $SD = 1.41$ ;  $M_{\text{body movement}} = 2.49$ ,  $SD = 1.11$ ;  $t(218) = -12.46$ ,  $p < .001$ ).

**Main results (weight estimate).** An ANOVA with weight estimation as the dependent variable and need and ownership as the independent variables yielded a significant interaction ( $F(1, 216) = 9.90$ ,  $p = .002$ ). Neither need nor ownership had a significant effect (both  $ps > .32$ ). More specifically, when the target weight was for the participant to hold, higher need (to avoid heavy weights) led to heavier estimations ( $M = 4.72$  kg,  $SD = 2.05$  kg) than did lower need ( $M = 3.87$  kg,  $SD = 1.64$  kg;  $t(110) = 2.41$ ,  $p = .018$ ). Conversely, when the target weight was for others to hold, higher need (for avoiding heavy weights) led to lighter estimations ( $M = 4.14$  kg,  $SD = 1.88$  kg) than did lower need ( $M = 4.98$  kg,  $SD = 2.35$  kg;  $t(106) = 2.07$ ,  $p = .04$ ; see Figure 2).

We averaged the three tiredness measures into a composite measure of need (Cronbach's  $\alpha = .91$ ). Consistent with our expectations, in the mine conditions, need and weight judgment were positively correlated ( $r = .30$ ,  $p = .002$ ), suggesting that the stronger a participant's need to avoid heavy weights, the heavier the participant perceived the weight of the disc to be. In contrast, in the not-mine conditions, these variables were negatively correlated ( $r = -.26$ ,  $p = .008$ ), indicating that the stronger the need was to avoid heavy weights, the lighter the participant perceived the weight to be. These two correlations were significantly different from each other ( $Z = 4.21$ ,  $p < .001$ ).

As in Experiment 1, the current experiment provides support for the two-process hypothesis but in a context in which the stronger the need, the smaller the desired value of the target variable. In the next two experiments, we aim to test the underlying processes.

Figure 2  
ESTIMATED DISC WEIGHT AS A FUNCTION OF NEED STATES  
(HIGH VS. LOW) AND OWNERSHIP STATUS (MINE VS. NOT  
MINE)



## EXPERIMENT 3: ROPE

The purpose of Experiment 3 is twofold: to replicate the results of the first two experiments and to provide more support for our hypothesis. For the latter objective, we asked participants to indicate their desired level for the target variable—that is, the value that they would ideally like to have. On the basis of our hypothesis, we propose that participants' estimations of the actual value of the target variable should be either positively or negatively correlated with this desired level, depending on whether they were in the wishful- or worryful-thinking mode. If participants were in the wishful-thinking mode, their estimation of the actual value of the target variable should be positively correlated with this desired level, because wishful thinking will bias the estimation toward the desired direction. If participants were in the worryful-thinking mode, their estimation of the actual value of the target variable should be negatively correlated with this desired level, because worryful thinking will bias the estimation away from the desired direction.

The experiment adopted a 2 (need: high vs. low)  $\times$  2 (ownership: mine vs. not mine) between-participants design. Here, need was the need for safety, and we manipulated it by asking participants to imagine either a cliff-climbing experience or a jumping-rope experience, both with a rope. Unlike imagining jumping rope, imagining cliff climbing induces a sense of fear and thus a stronger need for safety and a greater need for a thick rope. We then asked participants to estimate the thickness of a rope. We manipulated ownership by telling participants either that the rope they were going to judge was the rope that they would be using in the imagined task (mine) or that the rope they were going to judge was a different rope (not mine).

Note that the evaluation of a target rope was relevant both in the mine and not-mine conditions because the participants needed to use a rope for the activity. We predicted that for people judging a rope they would be using, the higher their need for it to be thick (and thus safe), the smaller they should perceive it to be. For the judgment of a rope they would not use in the activity, the reverse pattern should be true. We further predicted that as a demonstration of the underlying processes, the desired-level measure mediates the effect of need states on judgments for both mine and not-mine conditions, but in the opposite direction. Specifically, higher levels of need for safety (and thus, for a thick rope) in both mine and not-mine conditions will lead to higher levels of desired rope thickness, which in turn will lead to a thinner rope-thickness judgment in the mine condition and a greater rope-thickness judgment in the not-mine condition.

## Method

Two hundred seventy-six undergraduate students (188 women) from a large U.S. university participated in this study. Participants first took part in an imagination study, which served as our need manipulation. Participants in the high-need conditions saw a picture of a person hanging from a rope while trying to climb to the top of a high cliff. These participants then read the following: "Suppose that you are climbing to the top of a high cliff. The cliff is about 500 feet high. There is a strong gust of wind that knocks you off-balance. If the rope breaks, you will fall to the bottom of the gully and..." Participants in the low-need conditions saw a picture of people jumping rope. They read the follow-

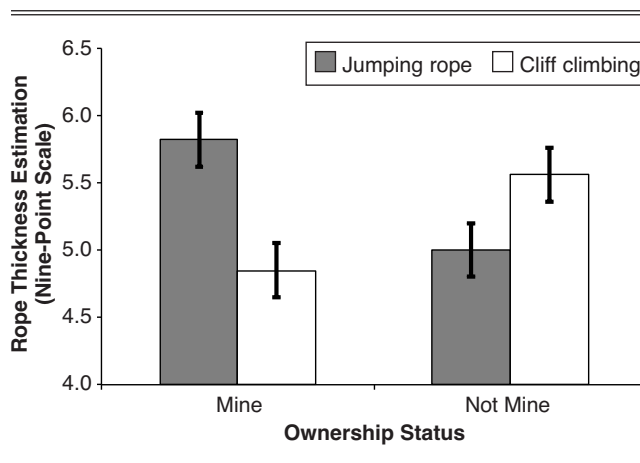
ing: "Suppose that you are jumping rope in the playground and are having lots of fun. If the rope breaks, you will not be able to play."

We then asked all participants to elaborate on the imagined activity in a few sentences, after which they proceeded to the evaluation study. They all saw a picture of the diameter of a rope on a 1:1 scale. We told participants in the mine condition that this rope was the one they used in the imagined activity (either cliff climbing or jumping rope). We told participants in the not-mine condition that this rope was not the one they used in the imagined activity. They then moved to the next page, and we asked them to recall and select, from a set of nine diameters increasing from small to large (the actual diameter was seven on this scale), the exact diameter of the rope that they had just seen, without looking at the previous page. To test the process of our hypothesis, we then asked all participants to choose from a set of nine diameters (with a much wider range than the set for the estimation question) the ideal diameter (i.e., the desired level) of a rope for the imagined activity. This choice constituted our measure of the desired level of the target variable. Finally, participants answered a few questions about demographics, and then we debriefed and dismissed them.

## Results and Discussion

**Main results (thickness estimate).** An ANOVA with rope-thickness estimation as the dependent variable and need and ownership as independent variables showed a significant interaction ( $F(1, 272) = 14.92, p < .001$ ). Specifically, in the mine condition, participants who imagined a cliff-climbing activity estimated the rope thickness to be smaller than those who imagined a jumping-rope activity ( $M_{\text{cliff-climbing}} = 4.85, SD = 1.59$ ;  $M_{\text{jumping-rope}} = 5.82, SD = 1.61$ ;  $F(1, 135) = 12.59, p = .001$ ), whereas in the not-mine conditions, those who imagined a cliff-climbing activity estimated the rope thickness to be greater than those who imagined a jumping-rope activity ( $M_{\text{cliff-climbing}} = 5.56, SD = 1.40$ ;  $M_{\text{jumping-rope}} = 5.04, SD = 1.78$ ;  $F(1, 136) = 3.63, p = .059$ ; see Figure 3). Neither main effect was significant (both  $ps > .20$ ).

Figure 3  
ESTIMATED ROPE THICKNESS AS A FUNCTION OF NEED STATES (JUMPING ROPE = LOW NEED FOR SAFETY VS. CLIFF CLIMBING = HIGH NEED FOR SAFETY) AND OWNERSHIP STATUS (MINE VS. NOT MINE)



*Desired level and its mediating effect.* As we expected, participants in the high-need condition (cliff-climbing activity) expressed a much higher desired level of rope thickness ( $M = 7.57$ ,  $SD = 1.79$ ) than those in the low-need condition ( $M = 3.12$ ,  $SD = 1.80$ ;  $F(1, 271) = 423.35$ ,  $p < 0.001$ ). Next, we examined the relationship between desired level and estimation. In the not-mine condition, desired level of thickness was positively correlated with rope-thickness estimation ( $r = .23$ ,  $p = .008$ ), whereas in the mine conditions, desired level was negatively correlated with rope-thickness estimation ( $r = -.32$ ,  $p < .001$ ). The two correlations were significantly different from each other ( $Z = 4.64$ ,  $p < .001$ ).

We tested whether the desired level mediated the effect of need on rope-thickness estimation. Because the relationships between thickness estimation and the desired level were in opposite directions in the two routes of processes, we tested mediations for mine and not-mine conditions separately. We first examined the relationships among need state, desired level, and thickness estimation in the mine conditions. High (vs. low) need state directly decreased thickness estimation ( $\beta = -.29$ ,  $p = .001$ ). In addition, high (vs. low) need state increased the desired level of rope thickness ( $\beta = .82$ ,  $p < .001$ ), which in turn decreased thickness estimation ( $\beta = -.35$ ,  $p < .001$ ). Using bootstrapping procedures (MODMED procedure; Preacher, Rucker, and Hayes 2007), we next examined whether the indirect effect through the desired level was significant. These procedures (based on 5000 bootstrapping samples) generated a 95% confidence interval (CI) (95% CI =  $-1.325$  to  $-.152$ ;  $SE = .286$ ) that excluded zero, suggesting significant mediation. Similar results emerged in the not-mine conditions. High- (vs. low-) need directly increased thickness estimation ( $\beta = .16$ ,  $p = .059$ ). In addition, high (vs. low) need increased the desired level of rope thickness ( $\beta = .73$ ,  $p < .001$ ), which in turn increased thickness estimation ( $\beta = .23$ ,  $p = .008$ ). Bootstrapping procedures (based on 5000 bootstrapping samples) generated a 95% CI (95% CI =  $.155$  to  $1.206$ ;  $SE = .279$ ) that excluded zero, again indicating that the desired level mediated the effect of need when the rope was not the one used in the activity.

#### EXPERIMENT 4: CAKE

Whereas Experiment 3 tested the mediating role of the desired level with imagination-induced need, we designed Experiment 4 to test the hypothesis with physiologically induced need. Previously, we argued that judgment in the mine conditions is potentially due to worryful thinking about not having enough of something to satisfy a person's needs, which in turn leads to a comparison between the target item and the desired level. To test this possibility, in this experiment, we further tapped participants' immediate feelings of whether, on seeing the target item, it would be enough to satisfy their needs.

The experiment followed a 2 (need: high vs. low)  $\times$  2 (ownership: mine vs. not mine) between-participants design. In this experiment, need was the need for food, which we manipulated by making participants either hungry (high need for food) or full (low need for food) before the main study. We then asked the participants to estimate the size of a cake. We manipulated ownership by first either telling them that this cake was theirs to eat (mine) or telling them it was not theirs to eat (not mine).

#### Method

One hundred nine students (52 women) from a large university in Hong Kong participated in the study for course credit. All participants took part in the study in the morning (between 8:30 A.M. and 11:00 A.M.). Participants registered to participate in the study through an online system. We instructed half the participants by e-mail not to have breakfast before the experiment (high hunger). We instructed the other half to have breakfast before the experiment, preferably within one hour of their experiment sessions (low hunger). Upon arriving at the lab, the participants first took part in a food-evaluation study with a cover story of investigating the effect of consumption quantity on product evaluation. We asked those in the low-hunger conditions to eat three large slices of bread and asked those in the high-hunger conditions to eat a small piece of bread with salty butter, which has been shown to increase hunger (Markman, Brendl, and Kim 2007). All participants then completed a food-evaluation questionnaire. They also evaluated their hunger level on a seven-point scale (1 = "not at all," and 7 = "very much").

Participants then moved on to the second part of the experiment. They were first asked, "If there is a cheesecake for you to eat now, how large do you wish it to be?" We provided them with a 30-point scale of weights ranging from 0 to 600 grams from which to choose. On the same page, we informed them that they would be presented with two cheesecakes, one for themselves and the other for another participant performing the task at the same time. The purpose of this two-cake design was to strengthen the dichotomy between mine and not-mine products. We then presented participants with the first cheesecake (a square-shaped cake that weighed 113 grams). We told half the participants that this cake was theirs to eat, whereas we informed the other half that this cake was for another participant to eat. We then asked participants to estimate the weight of the cake using a 30-point scale (1 = "0 grams," and 30 = "600 grams"). After they saw the cake and before they estimated its size, we asked participants in the mine condition to answer the following additional question on a nine-point scale (1 = "definitely not enough," and 9 = "definitely enough"): "Given how hungry/full you feel now, do you think it's large enough for you?"

After this estimation task, participants proceeded to the evaluation of the other piece of cake (we did not score data from this task). Finally, participants answered a few questions, including their general liking of the cheesecake on a nine-point scale (1 = "not at all," and 9 = "very much"), whether they followed our instructions of having or not having food before the experiment (i.e., when they last had food), and their demographic information. We then debriefed and dismissed participants.

#### Results

*Manipulation check.* First, on the basis of participants' reports at the end of the study, we removed from our analysis three participants in the low-hunger conditions (in which we instructed participants to have breakfast before the experimental session), because they reported not having had food within the past 12 hours. Participants in the high-hunger conditions reported an average of 10.36 hours ( $SD =$

3.20) of not having any food. This statistic was much lower in the low-hunger conditions ( $M = 1.68$ ,  $SD = 1.85$ ;  $t(104) = 17.23$ ,  $p < .001$ ). Reported hunger ratings showed the same pattern. Participants in the high-hunger condition were indeed hungrier than those in the low-hunger condition ( $M_{\text{high hunger}} = 5.27$ ,  $SD = 1.34$ ;  $M_{\text{low hunger}} = 2.42$ ,  $SD = 1.52$ ;  $t(104) = 10.21$ ,  $p < .001$ ).

**Main results (weight estimate).** An ANOVA with weight estimation as the dependent variable and need and ownership as independent variables yielded a significant interaction ( $F(1, 102) = 15.90$ ,  $p < .001$ ; see Figure 4). Neither need nor ownership had a significant effect ( $ps > .56$ ). More specifically, when the cheesecake was for the perceiver's consumption, high hunger led to lighter estimation ( $M = 10.42$ ,  $SD = 4.27$ ) than low hunger ( $M = 14.70$ ,  $SD = 5.73$ ;  $t(49) = 3.00$ ,  $p = .004$ ). Conversely, when the cheesecake was for another person's consumption, high hunger led to heavier estimation ( $M = 13.89$ ,  $SD = 4.99$ ) than low hunger ( $M = 10.68$ ,  $SD = 4.13$ ;  $t(53) = 2.61$ ,  $p = .01$ ).

**Process measures.** First, consistent with our hypothesis, those in the high-hunger condition expressed a greater desired level of cake to consume than those in the low-hunger condition ( $M_{\text{high hunger}} = 15.27$ ,  $SD = 6.71$ ;  $M_{\text{low hunger}} = 11.45$ ,  $SD = 7.03$ ;  $t(104) = 2.86$ ,  $p = .005$ ). Desired level was also highly correlated with hunger ratings ( $r = .37$ ,  $p < .001$ ).

Next, we examined the relationship between desired level and estimation. In the not-mine condition, desired level was correlated positively with estimated weight ( $r = .36$ ,  $p = .007$ ), whereas in the mine conditions, desired level was correlated negatively with estimated weight ( $r = -.39$ ,  $p = .005$ ). The two correlations were significantly different from each other ( $Z = 3.93$ ,  $p = .0001$ ).

Finally, we examined whether participants in the mine condition believed their cake was large enough to satisfy their hunger. First, we found that compared with those in the low-hunger condition, those in the high-hunger condition believed more strongly that their cake was not large enough

to satisfy their hunger ( $M_{\text{low hunger}} = 7.30$  and  $M_{\text{high hunger}} = 5.54$ ,  $SDs = 2.55$  and  $2.48$ , respectively;  $t(49) = 2.48$ ,  $p = .017$ , with small numbers indicating stronger feelings of not enough). Second, we found that this feeling of the cake not being large enough to satisfy participants' hunger was correlated with the weight estimation ( $r = .28$ ,  $p = .044$ ).

**Mediation analysis.** We tested whether the desired level mediated the effect of need states on cake-weight estimation. Again, we tested mediations for mine and not-mine conditions separately. In Experiment 3, we only manipulated need and did not measure each participant's actual need; therefore, in our mediation analysis, we could only use the two manipulated-need levels (high vs. low) as predictors. In the current experiment, we not only manipulated need but also measured each participant's actual need; therefore, in our mediation analysis, we could use each individual participant's actual need as the predictor, thus adding precision to the analysis. We first examined the relationships among need states (i.e., hunger rating), desired level, and weight estimation in the mine conditions. Hunger rating directly decreased weight estimation ( $\beta = -.32$ ,  $p = .023$ ). In addition, hunger rating increased the desired level of the cake weight ( $\beta = .37$ ,  $p = .008$ ), which in turn decreased weight estimation ( $\beta = -.39$ ,  $p = .005$ ). Using bootstrapping procedures, we next examined whether the indirect effect through the desired level was significant. These procedures (based on 5,000 bootstrapping samples) generated a 95% CI (95% CI =  $-.878$  to  $-.040$ ;  $SE = .172$ ) that excluded zero, suggesting significant mediation. Similar results emerged in the not-mine conditions. Hunger rating directly increased weight estimation ( $\beta = .29$ ,  $p = .034$ ). In addition, hunger rating increased the desired level of the cake weight ( $\beta = .47$ ,  $p < .001$ ), which in turn increased weight estimation ( $\beta = .36$ ,  $p = .007$ ). Bootstrapping procedures (based on 5,000 bootstrapping samples) yielded a 95% CI (95% CI =  $.003$  to  $.907$ ;  $SE = .170$ ) that excluded zero, again indicating significant mediation. However, following the same procedure, we did not find a significant mediation of the feelings of not enough for the effect of need states on judgment (bootstrapping procedure yielded a 95% CI:  $-.107$  to  $.126$ , n.s.), probably because this feeling measure itself was not powerful enough.

These results provided further support for our two-process hypothesis of the effect of need state on judgment. Unlike Experiment 3, this experiment tested the predictions and the underlying processes with physiologically induced need states. We also examined participants' feelings about whether the target item was enough to satisfy the current need (in the mine condition) to provide additional support for the proposed process.

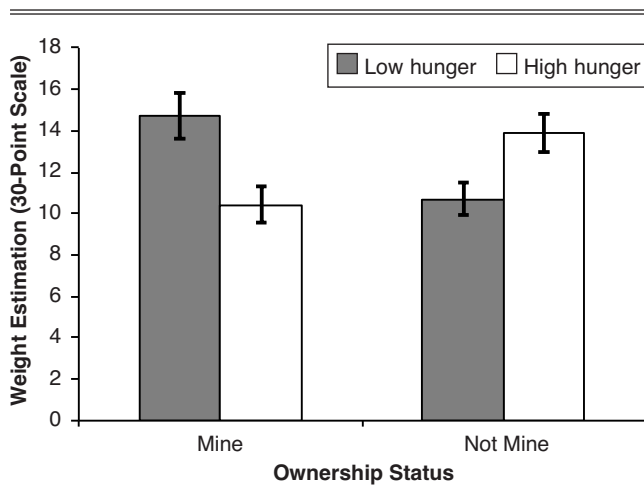
### GENERAL DISCUSSION

In this article, we propose a two-process hypothesis to study the effect of need state on judgment. In four experiments using volume, size, and weight judgments, we found empirical support for our proposals. Experiments 1 and 2 provide evidence for the predicted judgment results, and Experiments 3 and 4 further test the psychological processes underlying the effects of need state on judgment.

Many studies in psychology literature support results of the hungrier-the-larger effect. Our article is the first to show the opposite effect—that is, the hungrier-the-smaller effect.

Figure 4

ESTIMATED CAKE WEIGHT AS A FUNCTION OF NEED STATES (HIGH HUNGER VS. LOW HUNGER) AND OWNERSHIP STATUS (MINE VS. NOT MINE)



We have offered a two-process hypothesis to provide an explanation for both effects. Compared with the extant literature, our results depict a richer picture of how need state influences perception and judgment. We consider ownership a key moderator of the relative prevalence of the hungrier-the-larger effect versus the hungrier-the-smaller effect. Although we propose that ownership status affects people's motivational focus, we did not measure or manipulate motivational focus *per se*. Conceptually, if our two-process hypothesis is correct, directly manipulating motivational focus (e.g., focusing on the possibility of getting an object, focusing on the risk of not getting it) should lead to the same judgment results without manipulating ownership status. In addition, if wishful thinking and worriful thinking are indeed the underlying reasons, further research should measure the extent to which participants feel wishful or feel worried and test whether these variables mediate the relationship between need and ownership on the one side and judgment on the other.

As we mentioned previously, in addition to our two-process hypothesis, other processes may also be able to explain our findings. One possible alternative account pertains to social comparison. People in a high-need state may have a stronger tendency to engage in unfavorable social comparison than people in a low-need state. For example, relative to satiated people, hungry people are more likely to think that others' cakes are bigger and their own cakes are smaller. Thus, if a perceiver is called on to judge the size of somebody else's cake, due to social comparison, he will perceive the cake to be larger (relative to his own cake) if he is hungry than if he is satiated. In contrast, if he is called on to judge the size of his own cake, then also due to social comparison, he will perceive it to be smaller (relative to others' cakes) if he is hungry than if he is satiated. Although this explanation involves social comparison and is different from ours, it predicts similar effects. The main contribution of this research is that it demonstrates the interactive effects of need and ownership on judgment; further research is required to identify the exact underlying process for this effect.

We note that the dependent variables in our studies are all objective measures of the judgmental targets rather than subjective ratings. Therefore, it is unlikely that our findings are a result of scale recalibration, a measurement artifact more applicable to subjective ratings than objective estimates (Hsee and Tang 2007).

Readers may also ask how accurate the participants' judgments were. To answer this question, we compared participants' judgments with the true values in each of the four experiments. Table 1 summarizes the analyses. No consistent pattern seems to be present across the experiments. However, if we focus on the two experiments that involved basic survival needs (Experiment 1 about thirst and Experiment 4 about hunger), we observe a noteworthy pattern: Judgments were quite accurate in the mine/high-need and the not-mine/low-need conditions and yet were inflated in the mine/low-need and the not-mine/high-need conditions. Taking the low-need state as a default, these results suggest that people generally overestimate their own items, but they correct this positivity bias when they are in high need, which potentially motivates them to acquire more. Alternatively, they are accurate in their judgments of target items

Table 1  
JUDGMENT ACCURACY ACROSS EXPERIMENTS

|              | <i>Mine</i>     |                  | <i>Not Mine</i> |                  |
|--------------|-----------------|------------------|-----------------|------------------|
|              | <i>Low Need</i> | <i>High Need</i> | <i>Low Need</i> | <i>High Need</i> |
| Experiment 1 | +16.91***       | +4.69            | +2.55           | +11.72***        |
| Experiment 2 | +.86***         | +1.71***         | +1.97***        | +1.13***         |
| Experiment 3 | -1.18***        | -2.15***         | -1.96***        | -1.44***         |
| Experiment 4 | +3.05**         | -1.23            | -.97            | +2.24*           |

\* $p < .05$ .

\*\* $p < .01$ .

\*\*\* $p < .001$ .

Notes: The scores are the difference between mean judgments and true values (mean judgment – true value). For each score, numbers with asterisks are significantly different from zero.

that do not belong to them but overestimate when they are in high need, which potentially motivates them to acquire the target item. These results are consistent both with our two-process hypothesis and with the social psychological literature on self-enhancement (e.g., Sedikides, Gaertner, and Toguchi 2003; Swann, Chang-Schneider, and McClarty 2007).

We want to highlight the distinction between our findings and two apparently related findings: the endowment effect (Kahneman, Knetsch, and Thaler 1990; Thaler 1980) and the mere-ownership effect (Beggan 1992; Sen and Johnson 1997). Both the endowment and the mere-ownership effects imply that ownership leads to more favorable evaluations, which seems contradictory to our research, thereby implying that ownership leads to less favorable evaluations. However, a closer investigation suggests otherwise. The endowment effect represents a situation in which separation (or simply considering the possibility of separation) from a target increases a person's valuation of it. Previous research has attributed this effect to loss aversion (Kahneman, Knetsch, and Thaler 1991; Novemsky and Kahneman 2005) or an aversion to bad deals (Isoni 2011; Weaver and Frederick 2012). In our propositions, we consider a situation in which no losses or bad deals occur. The mere-ownership effect also differs from our findings. Heider (1958) posits that merely possessing an object induces a greater liking for it, which is a hot, emotional response toward the object. Our hypothesis, in contrast, depicts a cold, cognitive assessment of the object. People may have more positive feelings toward an object they own but at the same time may believe that the object is not big enough or good enough to satisfy their needs. Moreover, the mere-ownership effect might occur because people perceive what they own as part of the extended self or as something diagnostic of self-identity (Beggan 1992; Belk 1988). In the situations described in our hypothesis, even though the perceiver owns the target item, that item says little about the perceiver. Our hypothesis has important implications for understanding everyday behaviors and decision processes. Next, we discuss two examples.

#### *The Grass Is Greener on the Other Side*

In daily life, many people have the illusion that "the grass is greener on the other side," so to speak. Our proposition can help us understand why people have this misperception. "Grass" represents what people value. Literally speaking, people want their own grass to be as green as possible—or at least to be very green. When they look at their own grass,

they may worry that it is not green enough; their perception of other people's grass does not suffer from such worryful thinking. At the same time, seeing other people's grass induces some wishful thinking. As a consequence, even if their grass is objectively as green as that of their neighbor, people may perceive their neighbor's grass to be greener.

#### *Prepurchase Versus Postpurchase Perceptions*

Many people experience the following phenomenon: While window-shopping, a product excites them, and they cannot resist the temptation to buy it. Later, they find that the product is not exciting, and because they never use it, they greatly regret their decision to purchase it. One possible reason for such an inconsistency lies in the consumer's different perceptions before and after purchasing the item. Before a person checks out at the cash register, he does not yet own the product. In line with our proposition, at this time, wishful thinking dominates his perception; he thus perceives the item as more attractive when his desire for it is stronger. However, when he has paid for the item, wishful thinking disappears and is replaced by worryful thinking; he may worry it is not good enough given what he has paid. Such changes in perception thus lead to the discrepancy that people may experience in pre- versus postpurchase evaluations of products.

The example we gave at the beginning of this article represents a situation in which the perceiver does not own the desirable product. From the results of our experiments, we predict that people will judge the size of the cake to be greater when they are hungry than when they are not. In summary, our proposed two-process hypothesis can help researchers comprehend many real-world phenomena and inspire further research to better our understanding of the relationships between need state, judgment, and decision making.

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