

# Hunger promotes acquisition of nonfood objects

Alison Jing Xu<sup>a,1</sup>, Norbert Schwarz<sup>b,c</sup>, and Robert S. Wyer Jr.<sup>d</sup>

<sup>a</sup>Carlson School of Management, University of Minnesota, Minneapolis, MN 55455; <sup>b</sup>Department of Psychology and <sup>c</sup>Marshall School of Business, University of Southern California, Los Angeles, CA 90089; and <sup>d</sup>Department of Marketing, The Chinese University of Hong Kong, Hong Kong, China

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**Hunger motivates people to consume food, for which finding and acquiring food is a prerequisite. We test whether the acquisition component spills over to nonfood objects: Are hungry people more likely to acquire objects that cannot satisfy their hunger? Five laboratory and field studies show that hunger increases the accessibility of acquisition-related concepts and the intention to acquire not only food but also nonfood objects. Moreover, people act on this intention and acquire more nonfood objects (e.g., binder clips) when they are hungry, both when these items are freely available and when they must be paid for. However, hunger does not influence how much they like nonfood objects. We conclude that a basic biologically based motivation can affect substantively unrelated behaviors that cannot satisfy the motivation. This presumably occurs because hunger renders acquisition-related concepts and behaviors more accessible, which influences decisions in situations to which they can be applied.**

hunger | food vs. nonfood | wanting vs. liking | spillover effect | mindset

Hunger can drive people's responses to food. It makes food seem more attractive (1) and motivates people to spend time and money seeking, acquiring, and consuming it (2). Hunger can also increase people's desire for money that can be exchanged for calories (3). Moreover, it can increase men's preference for heavier women, who presumably have richer calorie resources (4). In contrast, hunger does not influence people's evaluations of calorie-unrelated objects that are irrelevant to the satisfaction of hunger (1). This, however, does not necessarily imply an absence of differences in behavior. Consumption typically includes identification and acquisition of the to-be-consumed object. If hunger focuses a person on food consumption, it may increase the accessibility of concepts and behaviors associated with the overall consumption sequence, which may influence decisions in domains that are unrelated to food.

In many studies, concepts rendered accessible by allegedly unrelated tasks had a profound impact on behavior. For example, using words such as "support" and "share" to construct sentences can activate the concept of cooperation, leading people to sacrifice personal benefits for the public good (5). Merely labeling a game the "Community Game" rather than the "Wall Street Game" is sufficient to elicit differential cooperation (6). Voting at a school can activate school-relevant norms, such as one should support education and care about children, which can increase support for school-funding initiatives (7). Similarly, listening to a political speech by a candidate one opposes can activate a disposition to counterargue and consequently increase counterarguing in response to an unrelated advertisement encountered later (8). We propose that internal states, such as hunger, can have similar effects. By directing attention to the consumption of food, which requires its acquisition as a prerequisite, hunger is likely to activate general concepts and behavioral knowledge associated with acquisition. These acquisition concepts, once accessible in memory, may influence subsequent decisions to acquire objects, even when these objects (say, binder clips) are clearly unable to satisfy the hunger motive. In sum, we assume that hunger induces a desire to consume food (1). This renders consumption-related concepts more accessible, including concepts of acquisition, given

that the acquisition of food is a necessary part of the food consumption sequence. These accessible concepts, in turn, can spill over to influence unrelated decisions to which they are applicable, increasing the likelihood that hungry people acquire not only food items (2) but also nonfood items that cannot satisfy the hunger motive.

The predicted increase in acquisition of nonfood items is not necessarily accompanied by increased liking of these items. The implied dissociation between evaluation and acquisition is compatible with research on the distinction between liking and wanting. Although liking and wanting are often positively correlated, they are processed by different neural substrates (9) and can be independently influenced. For example, being prevented from obtaining a desired outcome can increase the desire to obtain the outcome while reducing its attractiveness (10). Furthermore, imagining oneself consuming a food can decrease one's desire to actually eat it without affecting judgments of its palatability (ref. 11; see refs. 12–14 for further discussion of the complex relationship between wanting and liking food).

Five laboratory and field studies support our predictions. They show that hunger increases the cognitive accessibility of not only hunger-related concepts but also general acquisition-related concepts (study 1) as well as the intention to acquire nonfood objects that are clearly unsuitable to satisfy the hunger motive (study 2). People act on this intention and acquire more nonfood objects (e.g., binder clips) when they are hungry than when they are not, regardless of whether the nonfood objects are freely available (studies 3 and 4) or must be paid for (study 5). Whereas a hunger-induced increase in the intention to acquire foods is accompanied by increased liking of those foods (study 2), the observed increase in the acquisition of nonfood objects is not accompanied by increased liking of those objects (studies 2–4). In all studies, participants' subjective experience of hunger served as the primary predictor; in studies 1, 3, and 5, this experience was measured, and in studies 2 and 4, it was manipulated by testing participants before or after a meal (study 2) or before or after eating following a period of food deprivation (study 4).

## Significance

**Hunger is assumed to motivate eating, which satisfies the caloric needs underlying the motivation. However, hunger's influence extends beyond food consumption to the acquisition of nonfood items that cannot satisfy the underlying need (e.g., binder clips), suggesting that domain-specific motives can influence behavior in unrelated domains that are irrelevant to the motive. This is likely to occur when the domain-specific response includes concepts and behaviors that can also guide decisions in other domains.**

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<sup>1</sup>To whom correspondence should be addressed. Email: alisonxu@umn.edu.

## Experiments

Study 1 examined whether hunger increases the cognitive accessibility of concepts related to acquisition. Native English speakers ( $n = 69$ ) performed a word identification task (15). They saw 22 words and 22 nonwords flashing one at a time on a computer screen at a rate of 50 ms, followed by a series of pound (#) signs. Words and nonwords appeared alternately. In each case, participants typed in the word they saw. If they could not identify what they saw, they could either make a guess or type in “X.” Of the 22 words, nine were semantically related to acquisition (e.g., acquire, want, obtain, gain), four were hunger-related words (e.g., hunger, starve, appetite, famine), and the rest were control words (e.g., speak, close, floor, symbol). Upon completion of the task, participants reported how hungry they were along a scale from 0 (not at all) to 10 (very). The likelihood of correctly identifying hunger-related words increased significantly with self-reported hunger ( $b = 0.024$ ,  $SE = 0.012$ ,  $t = 1.99$ ,  $P = 0.05$ ). This was also true for acquisition-related words ( $b = 0.023$ ,  $SE = 0.010$ ,  $t = 2.30$ ,  $P < 0.03$ ). However, hunger had no impact on the likelihood of identifying control words ( $b = 0.013$ ,  $SE = 0.010$ ,  $t = 1.28$ ,  $P > 0.20$ ).

Does the accessibility of acquisition concepts influence people’s intention to acquire nonfood items? To answer this question, participants in study 2 ( $n = 77$ ) were recruited during lunch time (between 11:30 AM and 2:00 PM) either when they were entering a campus café or when they had eaten and were about to leave. They reported their mood along a scale from  $-5$  (sad) to  $5$  (happy) and completed two parts of an attitude survey in counterbalanced order. In the acquisition part, they reported how much they would like to have each of 10 products and experiences along a scale from 0 (not at all) to 10 (very much). In the evaluation part, they evaluated the favorableness of 10 different products or experiences along a scale from  $-5$  (unfavorable) to  $5$  (favorable). Each set of 10 targets included five food items (e.g., sandwich, pasta, cookie) and five nonfood products or services (e.g., USB flash drive, wireless mouse, spa visit). Finally, participants reported how hungry they were along a scale from 0 (not at all) to 10 (very).

Participants reported being hungrier when they walked into the café (mean = 7.38,  $SD = 2.20$ ) than when they walked out [mean = 1.53,  $SD = 2.70$ ,  $F(1, 75) = 107.68$ ,  $P < 0.001$ ]. Four dependent variables—desire to acquire food, desire to acquire nonfood, liking for food, and liking for nonfood—were calculated by averaging over responses to the respective items. Participants liked the food items more before eating (mean = 2.86,  $SD = 1.28$ ) than after eating [mean = 2.15,  $SD = 1.43$ ,  $F(1, 75) = 5.30$ ,  $P < 0.03$ ], but eating did not significantly affect their liking for nonfood items [mean = 2.12,  $SD = 1.12$  vs. mean = 1.67,  $SD = 1.67$ , respectively,  $F(1, 75) = 1.97$ ,  $P > 0.10$ ]. In contrast, participants’ desire to acquire both food and nonfood items was greater when they were hungry than when they were not [in the case of foods, mean = 6.62,  $SD = 1.94$  vs. mean = 5.50,  $SD = 2.58$ ,  $F(1, 75) = 4.55$ ,  $P < 0.04$ ; in the case of nonfood items, mean = 6.34,  $SD = 1.38$  vs. mean = 5.42,  $SD = 2.15$ ,  $F(1, 75) = 4.93$ ,  $P < 0.03$ ]. Hunger had little impact on participants’ mood [mean = 2.95,  $SD = 1.37$  vs. mean = 2.48,  $SD = 1.66$ ,  $F(1, 75) = 1.82$ ,  $P > 0.10$ ] and including mood as a covariate in the model did not change the influence of hunger on either liking or acquisition judgments.

The preceding analyses showed that hunger increases the accessibility of general acquisition-related concepts (in addition to hunger-related concepts) and the intention to acquire nonfood objects, without affecting liking for these objects. Study 3 tested whether these intentions translate into actual acquisition behavior. Eighty-nine participants examined a binder clip (size 3/4 inch) from Staples and decided how many clips they wanted to receive for use on a trial basis. Then, after answering three filler

questions, they rated how much they liked the binder clips along a scale from  $-5$  (dislike very much) to  $5$  (like very much) and how hungry they were along a scale from 0 (not at all hungry) to 10 (very hungry). At the end of the study, participants received the number of binder clips they asked for. Participants’ self-reported hunger was unrelated to their evaluation of the binder clips ( $b = -0.018$ ,  $SE = 0.059$ ,  $t = -0.30$ ,  $P > 0.70$ ). However, it was positively related to the number of binder clips they acquired ( $b = 0.223$ ,  $SE = 0.098$ ,  $t = 2.28$ ,  $P < 0.03$ ).

Study 4 replicated these findings under conditions in which hunger was experimentally manipulated rather than assessed. Participants ( $n = 63$ ) were instructed to deprive themselves of food for at least 4 h before the experiment, which was allegedly concerned with taste testing. Upon arriving, participants assigned to the satiation condition first took part in a blind taste test of a loaf cake produced by a local bakery. They were encouraged to eat the whole cake to make accurate judgments. Then, after performing a 25-min filler (embedded figures) task, participants completed the binder clip study as in study 3. Participants assigned to the hunger condition completed the same three tasks, but the taste test was conducted after the embedded figures tasks and the binder clip study. Participants’ self-reported hunger was significantly greater before eating the cake (mean = 7.72,  $SD = 2.33$ ) than after eating the cake [mean = 2.91,  $SD = 2.86$ ,  $F(1, 59) = 51.51$ ,  $P < 0.001$ ]. Hunger did not affect participants’ evaluation of the binder clips [mean = 2.76,  $SD = 1.27$  and mean = 2.41,  $SD = 1.70$ , before and after eating cake, respectively,  $F(1, 59) = 0.83$ ,  $P > 0.30$ ]. Nevertheless, hungry participants took more binder clip samples (mean = 3.93,  $SD = 2.95$ ) than satiated participants did [mean = 2.31,  $SD = 2.07$ ,  $F(1, 59) = 6.24$ ,  $P < 0.02$ ]. Thus, as in study 3, hunger led participants to acquire more binder clips without affecting their liking of binder clips.

Will the acquisition effect of hunger still be evident when people have to pay for their acquisitions? To address this question, we conducted a field study with 81 consumers who had just completed shopping at a large department store. The store mainly carried nonfood products such as clothes, shoes, and electronic products and had a very small collection of snacks. All participants had either shopped by themselves or in a group but paid for their own purchases individually. The shoppers allowed us to scan their receipts. In addition, they completed a short questionnaire, reporting their mood, how hungry they were, and how much time they spent in the department store. Only one participant purchased a snack; all other participants purchased only nonfood products. The number of the nonfood products purchased and the amount of money spent were calculated on the basis of the receipts and served as dependent variables. Regression analyses indicated that hungry shoppers purchased a greater number of nonfood products than less hungry shoppers did ( $b = 0.156$ ,  $SE = 0.067$ ,  $t = 2.34$ ,  $P < 0.03$ ). This remained true when participants’ mood and how much time they spent in the store were controlled for ( $b = 0.136$ ,  $SE = 0.064$ ,  $t = 2.11$ ,  $P < 0.04$ ). Analyses of the amount of money spent on nonfood products confirmed these conclusions. Hunger increased the amount of money spent ( $b = 4.660$ ,  $SE = 2.034$ ,  $t = 2.29$ ,  $P < 0.03$ ), and this observation held after controlling for mood and shopping time ( $b = 4.262$ ,  $SE = 2.029$ ,  $t = 2.10$ ,  $P < 0.04$ ).

## Meta-Analysis

To further confirm the differential impact of hunger on the acquisition and liking of nonfood items, we conducted a meta-analysis of our studies to compare the effect size of the acquisition effect with that of the liking effect. We first estimated the summary effect sizes (Hedges’  $g$ ) for acquisition and liking separately by using random-effects models and a 95% confidence interval (CI). We then compared the effect size for acquisition with the effect size for liking and estimated the heterogeneity of these effects.

Across the four studies with acquisition measures, hunger significantly increased the intended or actual acquisition of nonfood items [Hedges'  $g = 0.533$ ,  $SE = 0.118$ , 95% CI (0.302, 0.765),  $Z = 4.512$ ,  $P < 0.00001$ ]. However, across the three studies with liking measures, hunger did not significantly affect liking of the nonfood items [Hedges'  $g = 0.144$ ,  $SE = 0.133$ , 95% CI (-0.116, 0.404),  $Z = 1.085$ ,  $P = 0.278$ ]. Finally, a test of heterogeneity confirmed that hunger's influence on the acquisition of nonfood items significantly exceeds its influence on the liking of these items ( $Q = 4.793$ ,  $P < 0.03$ ).

## Discussion

Hunger is one of the most basic and primitive drives of human behavior. Although previous research has extensively explored the influence of hunger on nutrition supply and food consumption, little is known about its influence on behavior in other domains. Five studies provided consistent evidence that hunger increases the accessibility of acquisition-related concepts (study 1) as well as people's intention to obtain not only food but also nonfood items (study 2). Moreover, hungry people act on this intention and acquire more nonfood objects, both when they are available for free (studies 3 and 4) and when they must be paid for (study 5). These acquisition effects are not accompanied by reports of increased liking of the nonfood items (studies 2–4).

Even in affluent societies, episodes of mild hunger are not uncommon. According to a recent national survey, more than 10% of US consumers skipped breakfast, and the percentage peaked at 28% among males in the age group of 18–34 (16). Another survey revealed that 33% of Australians in the workforce ate lunch in midafternoon and 27% sometimes skipped lunch altogether (17). Moreover, millions of Americans are dieters who deliberately deprive themselves of calories every day (18, 19). The present findings suggest that such behaviors are likely to lead to unplanned purchases in nonfood domains. Future research could address how unplanned purchases of nonfood items are affected by habitual dieting, obesity, and other variables that are likely to influence the frequency of thinking about food consumption. It is also conceivable that the relationship between acquisition-related thoughts and motivation to eat is bidirectional. Much as hunger gave rise to the acquisition of nonfood items in the present studies, a desire to acquire nonfood items may lead to the unplanned acquisition of food when the opportunity arises. If so, craving an inedible luxury good may turn into a risk to people's waistlines, just as an empty stomach may open their purse strings for binder clips.

## Materials and Methods

### Experiment 1.

**Participants.** Sixty-nine native English speakers at a university in North America participated in exchange for course credit.

**Procedure and materials.** Participants were run in groups of up to 16 participants. They first worked on a word identification task (15) individually on computers. Participants were informed that the purpose of the study was to learn whether they were able to identify some words that would be flashed very quickly on the computer screen. They were asked to focus on the center of the screen, where those words would appear followed by a series of pound (#) signs. They were instructed to type in the word they saw and hit "Enter," after which the next word would appear. All words would be presented very briefly, and they would need to pay attention. If they were not sure what they saw, they could either make a guess or type in "X."

Upon reading the instructions, participants hit a "YES" button to start the study. Twenty-two words and 22 nonwords were flashed one at a time and stayed on the screen for 50 ms. A string of pound (#) signs then appeared after each flash, and participants typed in the word they saw. Words and nonwords were presented alternately. The 22 words were from three categories: Nine were semantically related to acquisition (acquire, want, get, have, own, obtain, desire, gain, and possess), four to hunger (hunger, starve, appetite, and famine), and the rest were control words (chair, painting, speak, ladder, brand, close, floor, bicycle, and symbol). After completing this word identification task, participants reported their sex, mood [along a scale from -5 (sad) to 5 (happy)], how relaxed they were [along a scale from 0 (not

at all) to 10 (very)], and how hungry they were [on a scale from 0 (not at all) to 10 (very)], among other filler questions, and confirmed that English was their first language.

Self-reported hunger had no influence on either mood or how relaxed they were ( $P_s > 0.60$ ).

**Coding.** Responses to all words were coded as "1" if participants correctly identified the flashed words (responses were coded as correct if participants typed the words in a different tense or in a different part of speech) and "0" otherwise. These responses were averaged for words in each of the three categories (i.e., hunger-related, acquisition-related, and control) to form the measure of identification rate. Responses to nonwords were not analyzed.

**Additional analyses.** Additional analyses highlight the coactivation of hunger and acquisition concepts. After controlling for participants' base rate performance on word identification as indexed by the residual of regressing their identification of control words on self-reported hunger, the influence of self-reported hunger on the accessibility of both hunger concepts ( $b = 0.024$ ,  $SE = 0.009$ ,  $t = 2.66$ ,  $P < 0.01$ ) and acquisition-related concepts ( $b = 0.023$ ,  $SE = 0.008$ ,  $t = 3.09$ ,  $P < 0.005$ ) became stronger and the accessibility of both types of concepts correlated  $r = 0.342$ ,  $P < 0.005$ .

### Experiment 2.

**Participants and design.** Seventy-seven students and staff members at a university in North America participated in this study. They were approached by research assistants during lunch time between 11:30 AM and 2:00 PM in a café on campus and received a coupon of three Canadian dollars for participating. They were randomly assigned to one of two conditions of a two-level single-factor (hunger vs. satiation), between-participants design.

**Procedure and materials.** Some participants were approached when they walked into the café (hunger condition), and others were approached when they finished lunch and were about to leave the café (satiation condition). They were asked whether they would like to participate in a survey in which products and experiences would be judged. Upon consent, they received a questionnaire attached to a clipboard.

First, participants reported their sex, their mood [along a scale from -5 (sad) to 5 (happy)], and how relaxed they were and how active they were [both along scales from 0 (not at all) to 10 (very)]. Then, they completed a personal attitude survey that was composed of two parts. In the acquisition part, participants were informed that the purpose of this survey was to understand how much consumers would like to own different types of objects or to have different types of experiences. Then, they were presented with one set of 10 objects and experiences. In each case, they indicated how much they would like to have the object or experience by circling a number along the scale provided [0 (not at all) to 10 (very much)]. In the evaluation part, participants were informed that the purpose of the survey was to understand consumers' reactions to different kinds of objects or experiences. Then, they saw a second set of objects and experiences. In each case, they indicated the favorableness of their reactions to the object or experience described by circling a number along the scale provided [-5 (very unfavorable) to 5 (very favorable)]. Each set included five food items and five nonfood products or services that were presented in a mixed order (see Table 1 for the items). We counterbalanced the sequence of administering the acquisition part and the evaluation part, as well as the sequence of presenting the two sets of items. As a result, four versions of questionnaires were created and used. Finally, participants reported how hungry they were [along a scale from 0 (not at all) to 10 (very)] and when they ate the last time before participating in the study.

**Additional analysis.** Including mood as a covariate in the model did not change the influence of hunger on either liking or acquisition judgments; although

**Table 1. Items used in experiment 2**

Set	Food items	Nonfood items
1	Fried chicken	Self-winding watch
	Pasta	Swissgear backpack
	Cookies	Spa visit
	Candies	Wireless mouse
	Pizza	40" widescreen HDTV
2	Cake	Video camera
	Sandwich	Binder clips
	Potato chips	8GB USB flash drive
	Hamburger	iPad Mini
	French fries	Printer

mood was positively related to evaluations of foods [ $b = 0.204$ ,  $SE = 0.101$ ,  $t = 2.03$ ,  $P < 0.05$ ] and nonfood items [ $b = 0.205$ ,  $SE = 0.106$ ,  $t = 1.93$ ,  $P < 0.06$ ], it had no impact on participants' desire to acquire either foods or nonfood items ( $P_s > 0.30$ ). Furthermore, the hunger manipulation did not influence how active or relaxed participants felt ( $P_s > 0.50$ ).

### Experiment 3.

**Participants.** Eighty-nine undergraduate students at a university in North America participated in this study in exchange for course credit.

**Procedure and materials.** Participants were run in groups of up to eight participants. They were seated at individual desks and completed a consumer survey that was allegedly assessing their attitudes toward store brand binder clips. Each participant received a sample of binder clips (size 3/4 inch) produced by Staples. They were instructed to examine the product and answer the questions on the questionnaire. The questionnaire informed them that they could take home some Staples binder clips for use and participants indicated how many binder clips they wanted to receive at the end of the session. After that, participants responded to three filler questions. Two questions measured their attitudes toward store brand stationery [i.e., "How much do you like store brand stationery in general?" along a scale from -5 (dislike very much) to 5 (like very much); "can you tell the difference between store brand binder clips and manufacturer brand binder clips?" along a scale from 0 (definitely cannot) to 10 (definitely can)], and one measured whether the binder clip they got was easy to use ["Do you think this binder clip is easy to use?" along a scale from 0 (no) to 10 (yes)]. These filler questions were used to separate the two main dependent variables. Finally, participants reported how much they liked this binder clip [along a scale from -5 (dislike very much) to 5 (like very much)]. Upon completing the major questions, participants reported additional information such as sex, mood, how hungry they were, and how relaxed they were, among other filler questions. At the end of the study, participants received the number of binder clips they asked for.

**Additional analysis.** Participants' mood did not influence the number of binder clips they acquired ( $b = 0.004$ ,  $SE = 0.194$ ,  $t = 0.02$ ,  $P > 0.90$ ). Including mood as a covariate in the regression model did not change the positive influence of self-reported hunger on the number of binder clips acquired ( $b = 0.225$ ,  $SE = 0.099$ ,  $t = 2.28$ ,  $P < 0.03$ ). Mood also had no influence on evaluation of the binder clips ( $b = 0.079$ ,  $SE = 0.112$ ,  $t = 0.70$ ,  $P > 0.40$ ).

### Experiment 4.

**Participants and design.** Sixty-three undergraduate students at a university in North America participated in this study in exchange for course credit. They were randomly assigned to one of two conditions of a two-level, single-factor (hunger vs. satiation), between-participants design.

**Procedure and materials.** Participants were requested not to have any food (drinks were allowed) for 4 h before the experiment because the study would involve a blind taste test. All experiment sessions were conducted between 9:00 AM and 1:00 PM or 4:00 PM to 6:00 PM to facilitate participants to meet this requirement.

Participants were run in groups of up to eight participants. In both conditions, participants completed three ostensibly unrelated tasks. One task was a blind taste test of a loaf cake produced by a local bakery. They were encouraged (but not required) to eat up the cake to make accurate judgments. Participants were asked to skip this task if they had any concerns about potential food allergies. Then, each participant was served a loaf cake on a plate, a bottle of water, and napkins. They could get knives, forks, and hand sanitizers upon request. In the taste test questionnaire, participants answered 10 questions regarding the cake they tasted, such as how much they liked the sweetness of the cake, how fluffy the cake was, how much they liked the size of the cake, and so forth. A second task was an embedded figures task, which was a filler task used to introduce a delay and to separate the blind taste test and the dependent task in the satiation condition. In this task, participants were asked to identify small hidden pictures in three big pictures. Participants were given 25 min to work on this task. A third task, a consumer survey on store brand binder clips introduced the dependent variables; this task followed the procedures of study 3. The sequence of administering these three tasks varied across the two conditions. In the satiation condition, participants first took part in the blind taste, followed by the embedded figures task and the dependent task. In the hunger condition, however, participants started with the embedded figures task, then they worked on the binder clip task, and finally they completed the blind taste test.

**Exclusions.** One participant in the hunger condition requested 50 binder clip samples, which was more than 7 SDs away from the sample mean (mean =

3.90,  $SD = 6.48$ ). One participant did not follow the instructions to complete the binder clip survey. The data from these two participants were excluded from further analyses. One participant reported a potential food allergy and skipped the blind taste test. However, because this participant was in the hunger condition and the taste test was introduced after the binder clip survey, the responses to the binder clip survey were unaffected. Therefore, the data from this participant were included in the analyses.

**Additional analyses.** The hunger manipulation had no significant influence on mood [mean = 2.86,  $SD = 1.73$  vs. mean = 2.28,  $SD = 1.55$ , before and after eating cake, respectively,  $F(1, 59) = 1.92$ ,  $P > 0.10$ ]. Mood did not influence the acquisition of binder clips ( $b = -0.048$ ,  $SE = 0.208$ ,  $t = -0.23$ ,  $P > 0.80$ ) or their evaluation ( $b = 0.058$ ,  $SE = 0.119$ ,  $t = 0.49$ ,  $P > 0.60$ ). Finally, the positive influence of the hunger manipulation on acquisition held after including mood as a covariate [ $F(1, 58) = 6.61$ ,  $P < 0.02$ ].

### Experiment 5.

**Participants.** Eighty-one consumers who had just completed their shopping trip at a department store in a metropolitan area in North America were recruited to participate in this study. Participants were paid 10 Canadian dollars in compensation for their participation.

**Procedure and materials.** The department store mainly carried nonfood products such as clothes, shoes, personal care products, and electronic products. It also had a very small collection of snacks. Participants who had made purchases in the store (as identified by the store-specific shopping bags they carried) were approached as they walked out of the main entrance of the department store. When asked, all participants verbally indicated that they had either shopped by themselves or shopped in a group but paid for their own products individually.

Upon consent, participants submitted their shopping receipts for scan and also completed a consumer survey attached to a clipboard. First, participants reported their mood [along a scale from -5 (sad) to 5 (happy)]. Then they indicated how hungry they were [along a scale from 0 (not at all) to 10 (very)] and when and what they ate last time. Moreover, they reported how much time they spent in the department store and answered demographic questions such as sex and age. To make sure that the receipts they submitted included only items that they personally purchased, they additionally indicated whether they were shopping alone or with others. If they shopped with others, they reported how many other people there were in the group and whether they paid separately or paid together. Finally, participants recorded the current time. Upon completing the survey, participants were thanked and paid.

**Exclusions.** We matched the time recorded on the shopping receipts with the last time participants ate as well as the time they completed the survey. Two participants ate after shopping and before taking part in the study. One participant indicated that he shopped with two others and they paid together. Three participants did not follow the instructions to complete the survey. The data from these six participants were excluded from further analyses.

**Meta-analysis.** Four studies (studies 2–5) in which either acquisition intentions/behaviors and/or liking served as dependent variables were included in the meta-analysis. Specifically, in study 2, hunger was manipulated; both acquisition intentions and liking of nonfood items were recorded. In study 3, hunger was self-reported; both acquisition behavior and liking of the paper clip were recorded. In study 4, hunger was manipulated; both acquisition behavior and liking of the paper clip were recorded. In study 5, hunger was self-reported; the number of products purchased reflected the acquisition behavior. In two studies in which hunger was manipulated, group means, SDs, and sample sizes were used to calculate effect sizes. We used Hedges'  $g$  value as the measure of standardized effect size. The  $g$  value is the difference between two means divided by the pooled within-groups  $SD$  and is corrected for sample size biases (20, 21). In the other two studies in which hunger was self-reported, the  $t$  values for correlation and sample sizes were used to calculate the effect sizes, which were measured by Fisher's  $z$  values and then converted to Hedges'  $g$ . Analyses were conducted with Hedges and Olkin's (1985) (20) approach using the Comprehensive Meta-Analysis software.

The test of heterogeneity assumed independence between acquisition and liking measures. This is a conservative test of heterogeneity. Assuming that the correlation between these two measures is higher than 0 will reduce variance and result in an estimate with a smaller  $P$  value (21).

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