# When Healthy Food Makes You Hungry

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Do subtle cues for imposed healthy eating make consumers hungry? Imposed healthy eating signals that the health goal was sufficiently met, and thus it increases the strength of the conflicting motive to fulfill one's appetite. Accordingly, consumers asked to sample an item framed as healthy later reported being hungrier and consumed more food than those who sampled the same item framed as tasty or those who did not eat at all. These effects of healthy eating depend on the consumer's perception that healthy eating is mandatory; therefore, only imposed healthy eating made consumers hungrier, whereas freely choosing to eat healthy did not increase hunger.

Externally imposed controls are common and help individuals adhere to their long-term interests. Thus, mandatory retirement savings, seat belt laws, compulsory physical education in college, and cafeterias that offer only healthy alternatives—all are common examples of how external controls help individuals resolve the internal conflict between options that offer larger but delayed benefits and those that offer lesser but immediate benefits. But, when external constraints lead individuals to adhere to their long-term interests, how does this influence the resultant strength of the compromised short-term interest?

We explore this question in the domain of imposed healthy eating. We ask, for example, how having a healthy meal in a cafeteria that offers only healthy alternatives influences the motive to satisfy one's appetite. In particular, we examine how imposed healthy eating influences individuals' experienced hunger. We propose that because adherence to the health goal under externally imposed controls signals that progress has been made without also increasing the sense of personal commitment, it can ironically increase the strength of the competing motive to satisfy one's appetite afterward. Put simply, imposed healthy eating would make people feel hungrier than not eating at all or eating the same food without an emphasis on its healthiness. We further propose that this effect of imposed healthy eating is more pronounced among individuals who are less concerned with watching their diet, because they are more likely to experience making progress without increasing commitment.

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## THEORETICAL BACKGROUND

Selecting food is one of the most common and mundane activities consumers pursue several times each day. Nonetheless it often requires taking into account different objectives or goals (e.g., taste, nutritious value, price), and it may involve a complicated decision-making process directed at satisfying these different goals. Whereas it is generally the case that people eat because they need to fulfill their appetite, another major goal many people hold when selecting food is to maintain good health. Eating healthy poses a constraint on people's food choice: rather than selecting what seems most appropriate to satisfy their appetite, they need to select from a subset of foods that are also healthy or skip an opportunity to eat (e.g., choose small packages to limit their food consumption; Scott et al. 2008).

The desire to eat healthy thus competes with the desire to fulfill one's appetite, such that people experience a self-control conflict between eating healthy and eating freely (Geyskens et al. 2008; Herman and Polivy 1975; Loewenstein 1996; Muraven and Baumeister 2000; Ramanathan and Williams 2007; Stroebe et al. 2008; Vohs and Faber 2007). Not only does healthy eating require certain restrictions, but people's belief that healthy food is generally less fulfilling than unhealthy alternatives further increases the conflict. For example, people estimate the calorie content of fast food meals that are advertised as healthy as lower compared to an unhealthy alternative (e.g., Subway vs. MacDonald's; Chandon and Wansink 2007). We recently conducted a survey in a campus cafeteria where we asked customers to rate how healthy various items were and how many calories each item had. In support of the perceived conflict between eating healthy and eating freely, we found a strong negative relationship between perceived healthiness



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of a food and perceived calorie content ($r = -.59$, $p < .001$). If healthy foods appear less likely to satisfy one's appetite (see also Raghunathan, Naylor, and Hoyer 2006), it is likely that individuals would experience a conflict when making their food choice.

Resolving the conflict between wanting to be healthy and wanting to satisfy one's appetite in favor of the long-term health goal is difficult and often bound to fail, in particular when the person feels hungry and the motive to fulfill her appetite prevails for her food consumption. To help individuals eat healthy, social agents such as governments, schools, or parents intervene by limiting food consumption or banning fatty food. For example, local governments in the United States have recently ordered that restaurants stop serving foods containing trans fats to help residents maintain good health (California State Assembly 2008). These external controls may provide an immediate solution. Obviously, if only healthy food is offered, the individual is more likely to adhere to the long-term interest to eat healthy. However, these controls may also indirectly affect the strength of the conflicting motive to satisfy one's appetite.

## The Impact of External Controls

Controlling social agents wish to assist individuals where self-control attempts may fail, but there are potential downsides for their well-intended intervention. Early research has already documented one such drawback, namely, a reactance response toward social agents who actively eliminate choice options or request the choice of a specific alternative (Brehm 1966). Because people want to resist external controls and maintain their freedom of choice, they often express a preference for the eliminated alternative, that is, they "react." For example, when social agents impose certain regulations that secure consumption of healthy food, individuals react by expressing a stronger desire to eat unhealthy food, overeat, or simply ignore health concerns. Parents who forbid candies at home, for instance, might expect their children to rebel by overeating candies available to them elsewhere.

Indeed, social agents often recognize the potential costs of their intervention and use more subtle means of imposing control that do not evoke the negative reaction that is associated with controlling attempts. That is, rather than actually restricting people from choosing an unhealthy option, they influence consumption more subtly, for example, by handing people samples of healthy foods, increasing the share of healthy options that are available, and reminding people of healthy options. Because these subtle encouragements to eat healthy are aligned with the interests of the individual, people do not experience negative feelings toward the controlling agent and there is no reactance response. However, we argue that these subtle cues or encouragements to eat healthy might nonetheless affect the strength of the competing motive to fulfill one's appetite and evoke a rebound in the desire to eat.

To explore the impact of subtle external controls, we refer to the conflict between the motives to eat healthy and to fulfill one's appetite. Pursuing each of these motives should affect the strength of the competing motive. In general, when people experience free choice, there are two possible ways to imbue meaning to pursuit of a goal (e.g., eating healthy) and the meaning that is imbued will determine how pursuing the goal affects the strength of the competing goal: First, individuals can infer that their degree of commitment to a goal is heightened as a result of pursuing congruent actions. Second, they can infer that they have made progress toward the goal (Fishbach and Dhar 2005). Notably, these inferences of commitment and progress do not require that the goal have a clear end state (e.g., when eating healthy, exercising, and undergoing medical checkups). When people infer a greater sense of commitment as a result of investing in a goal, they conclude that the goal must be important for them and that their expectancy of success is sufficiently high (Bem 1972; Cooper and Fazio 1984). Consequently, they will be more likely to prioritize this focal goal over competing motives on a subsequent choice. In contrast, when people infer they have made progress, they experience partial goal fulfillment and relax their effort in pursuing that focal goal, attending to competing motives that were presumably neglected (Carver and Scheier 1998). As a result, pursuing one goal allows for pursuit of competing motives (Fishbach and Zhang 2008; Khan and Dhar 2006; Monin and Miller 2001; Wilcox et al. 2009).

In the domain of food selection, when individuals experience freely choosing their food, healthy eating may accordingly influence the strength of the competing motive to satisfy their appetite in two opposite ways: healthy eating can signal personal commitment to becoming a healthier person, thus increasing the strength of the health goal relative to satisfying one's appetite, but it can also signal that sufficient progress on the health goal was achieved, thus increasing the competing desire to fulfill one's appetite on a subsequent consumption opportunity.

In contrast, in the presence of social controls, inferring a boost in commitment to the health goal following consumption of healthy food is less plausible. People only infer a boost in commitment when they have freely chosen to take an action and imposed actions have little diagnostic value for their priorities and goals (Aronson and Mills 1959; Cialdini, Trost, and Newsom 1995; Elliot and Devine 1994). Therefore, imposed healthy eating should signal progress on the health goal without signaling a boost in commitment to that goal. That is, individuals would experience that they have eaten enough healthy foods without experiencing a boost in their desire to eat healthy foods. As a result, after imposed healthy eating, the motive to fulfill their appetite should be activated, as indicated by an increase in self-reported hunger and food consumption.

Consistent with this analysis, previous work on licensing documented an increase in indulgence after making a virtuous, healthy choice (Khan and Dhar 2006; Wilcox et al. 2009). These researchers attributed individuals' greater interest in indulgent items to their sense of entitlement after making a virtuous choice. However, whereas a licensing model predicts that individuals feel entitled to eat more after

making progress toward the health goal, we predict that imposed healthy eating increases individuals' actual appetite. Consequently, individuals will express higher levels of hunger and will seek means to satisfy their appetite by eating more of a neutral food (e.g., neutral pretzels rather than guilt-provoking chocolate). We test our hypothesis that imposed healthy eating makes people hungrier—rather than that it increases their sense of entitlement to indulge—by measuring self-reported hunger and consumption of neutral food. These variables reflect individuals' need to fulfill their appetite rather than their sense of entitlement to indulge.

Also consistent with our hypothesis, previous research demonstrates that healthy eating can rebound, for example, when individuals increased consumption of (both healthy and unhealthy) food after eating food that was presented as low-fat or as coming from a small-quantity package (Chandon and Wansink 2007; Coelho Do Vale, Pieters, and Zeelenberg 2008; Raghunathan et al. 2006). However, if satisfying the health goal makes people feel hungry, we expect that they should be hungrier than when they do not eat anything. This effect of healthy eating would not reflect a logical inference that eating healthy food has lower calorie content and therefore is less fulfilling (Kozup, Creyer, and Burton 2003; Wansink and Chandon 2006), but rather, this effect would suggest that imposed eating healthy makes people hungrier than not eating anything.

Notably, we predict that the impact of imposed healthy eating on activation of one's appetite is direct and does not involve a concern for guilt and self-presentation. Thus, whereas research on guilt (see, e.g., Giner-Sorolla 2001) could predict that after indulging in tasty foods people experience guilt and reduce indulgence to alleviate their guilt and secure their self-esteem, our focus is on the impact of eating healthy on experienced hunger. To support our hypothesis, we would thus wish to demonstrate the unique effect of healthy eating—that people who are given healthy options (vs. no consumption or consumption of food framed as tasty) will report being hungrier and seek neutral food. In addition, a reduction in guilt cannot account for the unique effect of imposed healthy eating if, as we predict, choosing to eat healthily alleviates guilt even more than imposed healthy eating.

Another potential alternative underlying mechanism would suggest that eating healthy and feeling hungry are directly associated in memory (Förster, Liberman, and Friedman 2007; Neely 1977; Van Osselaer 2008), such that healthy eating inevitably brings to mind thoughts about feeling hungry. If that is the case, we would expect this association to influence the feeling of hunger individuals experience regardless of whether healthy eating is imposed or freely selected and whether their concern with weight watching is low or high. In contrast, as we next elaborate, we expect that the impact of healthy eating depends on these variables.

### When Imposed Healthy Eating Makes You Hungry

We predict that in situations where social controls assign a healthy option, there should be an increase in the motive to satisfy one's appetite. For example, when consumers are assigned to taste a free food sample that is framed as healthy, even if there is no expectation that they will be able to choose to sample the less healthy analog, they will experience a boost in hunger subsequently.

Importantly, we explore situations in which the presence of social controls is expected and normative, yet imposed. In these situations, external controls do not prompt reactance, defensiveness, and emotional arousal (Brehm et al. 1966). Rather, the external controls simply assign an option to the individual. For example, we study situations in which consumers receive free healthy food samples and there is no negative experience involved in receiving the sample. Nonetheless, they are actively encouraged to eat healthy.

We further predict that the less concerned a person is with eating healthy, the greater the impact of imposed controls on the conflicting motive to fulfill their appetite. Clearly, there are individual differences in concern with weight watching and the emphasis individuals put on healthy eating (Herman and Polivy 1975; Ward and Mann 2000). When healthy eating is imposed, those who are concerned with healthy eating assume that they eat healthy partially because it is a high priority for them and partially because they were requested to. Regardless of social controls, their consumption of healthy food could reflect their commitment to maintaining a healthy diet. However, no such internal attribution is available for those who do not watch what they eat. These latter individuals will be more likely to experience progress without commitment. Overall, then, the drawbacks of social controls (i.e., that they make people feel hungry) should be more pronounced for individuals who are less concerned with watching their weight, because these individuals would not voluntarily choose to eat healthy foods.

## PRESENT RESEARCH

We report four studies that test the hypothesis that healthy eating increases the strength of the motive to fulfill one's appetite, as manifested in a stronger hunger experience and increased food consumption. We predict that the effect of healthy eating will be more pronounced among those who are less concerned with watching their weight and will depend on whether healthy eating is imposed (vs. freely chosen). Across these studies, participants tasted food samples that were presented as healthy versus not. Specifically, in study 1, we examine whether eating food presented as healthy makes one feel hungrier compared to not eating at all or eating the same food presented as tasty. In study 2, we further explore whether eating food presented as healthy (vs. tasty) makes one consume more of another neutral snack subsequently and whether this effect is more pronounced for those who do not watch their weight.

In studies 3 and 4, we test for moderation by the nature of the consumption situation: imposed versus free. In study 3, we examine whether the effect of exposure to healthy options depends on being explicitly reminded of the imposed (vs. free) nature of the choice situation. Finally, in study 4, we test whether more implicit cues of the nature of the consumption situation—imposed versus free—are sufficient to moderate the influence of healthy eating on the motive to fulfill one's appetite.

## STUDY 1: EATING HEALTHY MAKES ONE HUNGRY

Study 1 examines whether sampling healthy food increases people's experience of hunger. We compared hunger ratings between participants who sampled an item framed as "healthy" versus "tasty" and versus a "no sample" condition. We predicted that those who eat a food sample that is labeled as healthy will subsequently indicate they feel hungrier compared to those who eat a food sample that is labeled as tasty or those who do not eat a sample.

### Method

Fifty-one students (13 women) at the University of Chicago volunteered to participate in the study. The study employed a 3 (food sample frame: healthy vs. tasty vs. no-sample) between-subjects design. It took place in a university commons area. Participants in the sampling conditions were recruited to participate in a taste test of a chocolate-raspberry protein bar that was unwrapped and had no identifying information. Participants in the no-sample condition were invited to participate in a marketing study rating the appearance of the bar.

We asked all the participants in the sampling conditions to taste a sample of the same bar. In the healthy frame condition, participants read that they were about to taste "a new health bar containing high levels of protein, vitamins and fiber, and no artificial sweeteners." In the tasty frame condition, participants read that they were about to taste "a chocolate bar that is very tasty and yummy with a chocolate raspberry core." Participants in these conditions then had a 12 gram sample of the bar, which contained 50 calories. Those in the no-sample condition did not complete the taste test. Next, in order to assess the strength of the motive to fulfill their appetite, all participants rated how hungry they were at the present moment (7-point scale; 1 = not at all hungry, 7 = very hungry). Those in the no-sample condition rated their hunger but did not complete the taste test beforehand. After providing their hunger rating, they continued to rate how appealing they thought the bar was.

### Results and Discussion

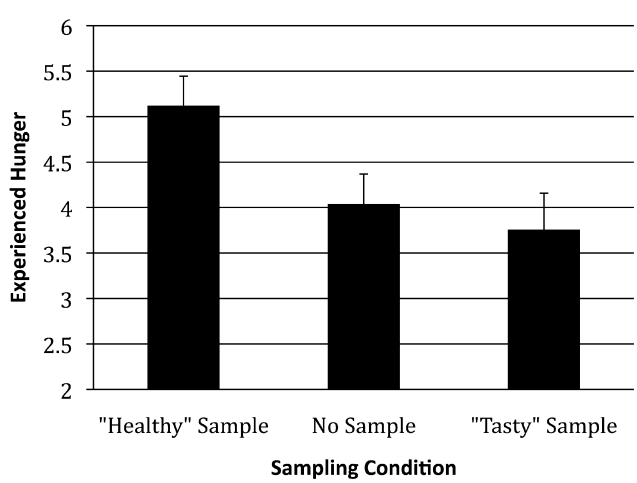
In support of the hypothesis, the ANOVA of hunger ratings yielded an effect for sample frame ($F(2, 47) = 3.84$, $p < .05$, $d = .67$). Participants who tasted the sample framed as healthy ($M = 5.12$, SD = 1.26) subsequently reported feeling hungrier than those who tasted the sample framed as tasty ($M = 3.76$, SD = 1.59; $t(27) = 2.56$, $p < .02$, $d = .70$) and those who did not taste anything ($M = 4.04$, SD = 1.47; $t(35) = 2.35$, $p < .03$, $d = .63$). The hunger ratings for participants who did not taste a sample and those who tasted the sample framed as tasty were similar ($t < 1$; see fig. 1).

Study 1 provides initial evidence for our hypothesis that eating healthy food makes one hungry. We propose that when an external agent provides healthy food, people infer that they have made progress on their health goal and subsequently activate the competing motive to satisfy their appetite. Notably, hunger ratings were similar among those who sampled an item framed as tasty compared to those in the no-sample condition, which suggests that tasty food did not intensify the motive to fulfill one's appetite (as in research on reverse-alliesthesia; Wadhwa, Shiv, and Nowlis 2008), nor did it activate the goal to restrict one's appetite (as in research on actionable temptations; Geyskens et al. 2008). We did not state any prediction for imposed tasty eating, and because tasty eating had no impact relative to not sampling anything, we can conclude that imposed healthy sampling drives the increase in participants' appetite.

In study 1, we intentionally measured participants' experienced hunger rather than their consumption of unhealthy food (as in Khan and Dhar 2006; Wilcox et al. 2009), since unhealthy food consumption might reflect other variables, such as one's sense of entitlement to eat, regardless of how hungry one is. However, when individuals perceive that healthy eating is imposed and therefore feel hungrier, they should subsequently seek means to satisfy their hunger by consuming foods available to them in their environment. To complement study 1's findings, in study 2 we seek to dem-

**FIGURE 1**

EXPERIENCED HUNGER AS A FUNCTION OF THE FRAMING OF THE FOOD SAMPLE



onstrate that imposed healthy eating increases consumption of a neutral snack.

The second objective of study 2 is to test for the moderating role of individual differences in concern with weight watching. We attribute the effect of imposed healthy eating to participants' experience of progress on, without commitment to, their health goals. This experience should be more pronounced for participants who feel less internally motivated to watch their weight. When eating healthy is not a priority in the first place, it is not diagnostic of one's commitment. Thus, the less concerned people are with watching their weight, the greater the impact healthy eating should have on making them hungry.

## STUDY 2: FOOD CONSUMPTION

Study 2 examines how initial consumption of healthy foods influences the subsequent consumption of a neutral snack. If sampling an item framed as healthy makes people feel hungrier, than we should expect that participants who sampled an item framed as healthy will subsequently consume more of an available snack compared with participants who sampled the same item framed as tasty. We predict that this effect will be more pronounced for individuals who are less concerned with watching their weight as these individuals are more likely to attribute their consumption to an external agent.

### Method

Sixty-two students (34 women) at the University of Chicago participated in the study for monetary compensation. The study employed a 2 (food sample frame: healthy vs. tasty) between-subjects design. Participants were recruited for a food tasting study. Their task was to eat a quarter slice of low-calorie bread, containing roughly 15 calories. We switched from a health bar (in study 1) to a bread sample to ensure that our effects are not driven by certain properties of the health bar, for example, that it is associated with exercising and subsequently feeling hungry or that it serves as a reward. Unlike the health/chocolate bar in study 1, a piece of bread does not have the qualities of a vice for most individuals.

Depending on the experimental condition, participants read that they were assigned to eat a bread sample that was "nutritious, low-fat, and full of vitamins" (healthy frame) or that it was "tasty, with a thick crust and soft center" (tasty frame). All participants tasted the same food sample and completed a short survey on their tasting experience. To reinforce the framing manipulation, participants in the healthy frame condition first rated how healthy their sample tasted while participants in the tasty frame condition rated how tasty their food sample was. These ratings were not analyzed but were rather used to emphasize the manipulation of the item as being healthy or not. Participants than completed several filler items, including demographic information. Upon completion of these ratings, the experimenter announced that the first study was finished.

Next, to assess hunger we measured consumption of pretzels in a supposedly unrelated study. We used pretzels because our pilot study indicated that most people perceive this snack as neither healthy nor unhealthy; hence, they eat pretzels mainly to satisfy their appetite rather than to improve their health (e.g., by consuming vegetables) or to obtain hedonic pleasure (e.g., by consuming chocolate). Specifically, in our pilot study participants ($n = 24$) had to categorize pretzels as (*a*) a healthy food, (*b*) a neutral food, or (*c*) an unhealthy food. As expected, 58% of participants rated pretzels as being a neutral food, compared to 21% of participants who rated pretzels as being a healthy food ($\chi^2(1) = 4.26$, $p < .05$) or 21% of participants who rated pretzels as being an unhealthy food ($\chi^2(1) = 4.26$, $p < .05$).

Upon completion of the taste test, an experimenter directed participants to a different room for a purportedly unrelated study. The experimenter gave participants a short questionnaire about student habits and told them that there were snacks left over from another study and that they could have some while completing the survey. Pretzels were precounted and placed in a bowl near the questionnaire so that participants could grab a few while completing the questionnaire. We used large pretzels: each one weighed 5 grams and contained roughly 20 calories. The variable of interest was how many pretzels participants consumed.

We assessed participants' concern with weight watching following the consumption task. In that final survey, participants rated how important it was for them to watch their weight (7-point scale, 1 = not at all important, 7 = very important). We purposely asked this question after participants completed the study because an earlier reminder of one's weight-watching goal could interfere with the effect of imposed healthy eating.

### Results and Discussion

In support of the hypothesis, participants who sampled bread that was framed as healthy consumed more pretzels subsequently ($M = 2.97$, SD = 2.50) than those who sampled the same bread framed as tasty ($M = 1.78$, SD = 1.90; $t(60) = 2.35$, $p < .03$, $d = .61$).

To assess whether concern with weight watching moderates the effect of imposed healthy eating, we regressed the number of pretzels consumed on the sample frame, concern with weight watching, and the interaction between these variables. The regression replicated the above main effect for sample frame, indicating that participants who sampled healthy consumed more pretzels than those who sampled tasty ($\beta = .79$; $t(58) = 3.05$, $p < .01$; note that here and after we report standardized $\beta$'s) as well as a main effect of concern for watching one's weight, indicating that concern with weight watching decreased consumption of pretzels ($\beta = .53$; $t(58) = 3.02$, $p < .01$).

Importantly, this analysis further revealed the predicted sample frame × concern with weight watching interaction ($\beta = .57$; $t(58) = 2.04$, $p < .05$), indicating that the effect of sample frame was more pronounced the less concerned with weight watching participants were. For the sake of clarity, we divided participants into those who are less versus

more concerned with watching their weight, based on a median split. Supporting our hypothesis, those who were relatively less concerned with watching their weight consumed more pretzels when they sampled the bread framed as healthy ($M = 4.46$, SD $= 1.76$) compared to when they sampled the bread framed as tasty ($M = 2.40$, SD $= 1.99$; $t(26) = 2.57$, $p < .02$, $d = 1.10$). In contrast, those who were highly concerned with watching their weight consumed a similar number of pretzels regardless of whether they consumed the bread framed as healthy ($M = 2.77$, SD $= 1.82$) or tasty ($M = 2.09$, SD $= 1.88$; $t(32) < 1.3$, NS; see fig. 2).

Study 2 yields support for our hypothesis that imposed healthy eating increases the strength of the motive to satisfy one's appetite, as indicated by actual food consumption. Concern with weight watching moderates the effect; participants who were less concerned with watching their weight were more likely to consume pretzels after sampling the bread framed as healthy versus tasty.

Together studies 1 and 2 demonstrate that imposed healthy eating makes people hungry. We attribute this pattern to participants' inferences that they made progress on the health goal but were not more committed to it, because they did not freely choose to eat healthy but rather were given free samples of healthy food to eat. In study 3, we more closely study the impact of imposed controls by manipulating the experience of healthy eating, whether it is imposed as opposed to freely chosen. We predict that only imposed healthy eating (vs. chosen healthy eating) increases feelings of hunger.

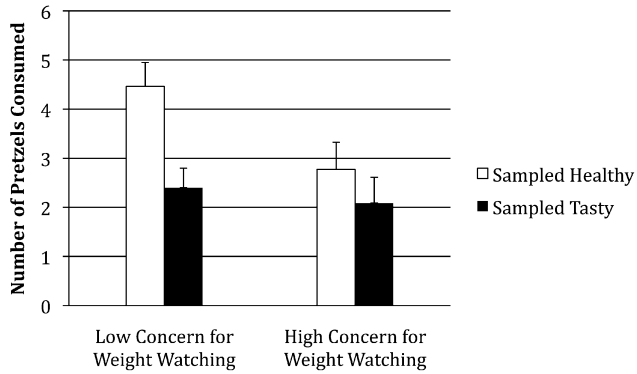
## STUDY 3: IMPOSED VERSUS FREE CHOICE

Study 3 explores how the nature of the consumption situation, imposed versus free, moderates the influence of healthy eating on the strength of the motive to fulfill one's appetite. We assume that this is because when healthy eating is imposed, people infer that they have made progress toward their health goals but are unable to also infer greater commitment to their health goals. However, if people perceive healthy eating is freely chosen, they have two competing inferences available to them, one of commitment and one of progress, and these cancel each other out.

We conducted a pretest ($n = 238$) to confirm these inferences from imposed and freely chosen consumption. Depending on the experimental condition, participants read that they were either given or chose to consume a sample of either a health bar or a candy bar. They then rated whether consuming the bar indicates they have made progress toward their health goal (progress inference) or, in another condition, whether it indicates they were committed to the health goal (commitment inference; see Fishbach and Dhar [2005] for similar measures). An ANOVA of progress ratings on consumption mode × food sample revealed a main effect of food sample ($F(1, 135) = 24.62$, $p < .001$), indicating that participants who read they had a health bar inferred they had made more progress toward their health goal (imposed eating: $M = 2.63$, SD $= 1.61$; free eating: $M = 2.99$, SD $= 1.35$) than participants who read they had a candy bar (imposed eating: $M = 1.90$, SD $= .90$; free eating: $M = 1.65$, SD $= .84$). No other effect emerged in this analysis.

**FIGURE 2**

CONSUMPTION OF PRETZELS AS A FUNCTION OF CONCERN FOR WEIGHT WATCHING (MEDIAN SPLIT) AND THE FRAMING OF THE FOOD SAMPLE




A second ANOVA of commitment ratings revealed a consumption mode (imposed vs. free) × food sample (healthy vs. tasty) interaction ($F(1, 95) = 6.21$, $p < .02$). Specifically, participants who read that they had freely chosen to eat a health bar reported feeling more committed to the health goal ($M = 4.04$, SD $= 1.71$) than those who read they freely chose to eat a candy bar ($M = 2.02$, SD $= 1.09$; $t(55) = 5.33$, $p < .04$, $d = 1.41$). In contrast, participants who read that they were assigned to sample a health bar reported feeling similar levels of commitment ($M = 3.03$, SD $= 1.44$) as those who read they were assigned to sample a candy bar ($M = 2.41$, SD $= 1.18$; $t(40) = 1.53$, NS). Additionally, consistent with our analysis, those who read that they freely chose to sample a health bar reported feeling more committed to the health goal than those who read that they were assigned to sample a health bar ($t(47) = 2.19$, $p < .04$, $d = .64$).

Confirming that imposed healthy eating leads to inferences of progress on, without commitment to, the health goal, we next turn to test the implications of these consumption modes (imposed vs. free) for activation of the competing motive to fulfill one's appetite. Specifically, in study 3, we test whether participants who perceive that healthy eating is imposed will experience a boost in the strength of the competing motivation to fulfill their appetite and feel hungrier compared to those who are given tasty foods. Conversely, participants who perceive that they have chosen to eat a healthy food sample will show no increase in hunger.

### Method

Fifty-three students (20 women) at the University of Chicago volunteered to participate in the study. The study em-

ployed a 2 (consumption mode: imposed vs. free) × 2 (food sample frame: healthy vs. tasty) between-subjects design. Participants were recruited in the university commons area to take part in a taste test.

We used two food samples: the same chocolate-raspberry protein bar from study 1 and honey-peanut protein bars, both 12 grams and both containing 50 calories. The two types of protein bars were displayed on the sample table at the same time. Participants were invited to take part in a taste test. Once each participant approached the sample table, an experimenter asked him or her to read the descriptions of both products on display. Participants either read that both bars on display were health bars or that both bars on display were candy bars. Specifically, in the healthy frame condition, participants read that they were about to taste "a new health bar, containing high levels of protein, vitamins and fiber, and no artificial sweeteners." In the tasty frame condition, participants read that they were about to taste "a chocolate bar that is very tasty and yummy with a chocolate raspberry (or, depending on the sample, honey peanut) core." As a result of this manipulation, participants either read that the item they were going to sample was one out of two health bars or one out of two candy bars.

Next, to manipulate the perception of the consumption situation as imposed or free, the experimenter looked at a clipboard with an annotated printout on it and noted that for that particular day's taste test, people were either assigned to taste a specific bar (randomly assigned, in the imposed condition) or that they should feel free to choose which sample they would like to taste (free choice condition). Thus, those in the free choice conditions chose from a set of two health bars or a set of two candy bars. Using this procedure (adopted from Khan and Dhar 2006), participants in the free choice condition experienced freely choosing what they would sample, healthy or tasty food, even though the choice set was biased to solicit this particular choice. Hence, we were able to randomly assign participants to choose to eat healthy or regular items. Participants then sampled the item they were assigned to taste (imposed condition) or that they had chosen to taste (free choice condition).

To assess experienced hunger, after tasting the food sample, participants rated how hungry they were at the present moment (7-point scale; 1 = not at all hungry, 7 = very hungry). This subjective hunger rating was embedded among other questions (e.g., how tired and how thirsty the participant felt at that moment). Finally, as a manipulation check, participants rated the extent to which they versus the experimenter chose the sample they tasted (7-point scale; 1 = I chose, 7 = the experimenter chose for me).

## Results and Discussion

In support of the manipulation, participants in the imposed consumption condition indicated that the experimenter played a greater role in choosing the sample they tasted ($M = 6.47$, SD = 1.60) compared to those who freely chose which item they would like to sample ($M = 1.09$, SD = .30; $t(51) = 18.08$, $p < .01$, $d = 4.71$).

In support of our hypothesis, an ANOVA of hunger ratings on choice mode and food sample frame yielded the predicted consumption mode × food sample frame interaction ($F(1, 48) = 5.10$, $p < .03$). No main effects were significant. Specifically, participants in the imposed condition who sampled healthy reported being hungrier ($M = 5.65$, SD = 1.12) than those who sampled tasty ($M = 4.23$, SD = 1.48; $t(28) = 2.99$, $p < .01$, $d = 1.08$). In contrast, participants in the free choice condition who sampled healthy showed no difference in hunger ($M = 4.45$, SD = 1.97) compared to those who sampled tasty ($M = 4.91$, SD = 1.38; $t < 1$; see fig. 3). In addition, consistent with our prediction, participants who sampled healthy reported being hungrier in the imposed versus free choice condition ($t(26) = 2.05$, $p = .05$, $d = .75$).

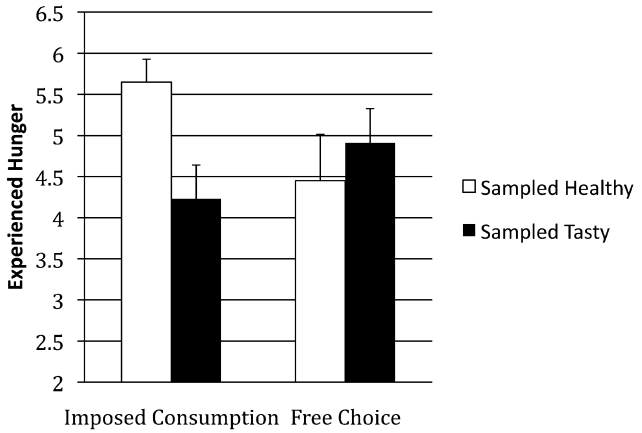
Study 3 provides evidence for our hypothesis that it is the nature of the consumption situation—imposed or free—that influences the strength of the motive to satisfy one's appetite. When consumption was imposed, participants who sampled the item framed as healthy reported feeling hungrier than participants who sampled the item framed as tasty, and there was no such effect among those who felt they were freely choosing to eat healthy. However, unlike in our study 3, social agents often use more subtle means to employ external controls. In our final study, we explore a more subtle manipulation of imposed versus free choice.

# STUDY 4: SUBTLE MEANS OF EXTERNAL CONTROLS

Study 4 examines how a subtle manipulation of the consumption situation (imposed vs. free) influences the effect of healthy eating on the strength of the motive to fulfill one's appetite. We manipulated the nature of the consump-

**FIGURE 3**

EXPERIENCED HUNGER AS A FUNCTION OF THE FRAMING OF THE FOOD SAMPLE AND THE NATURE OF THE CONSUMPTION SITUATION



tion situation by presenting a set of two food alternatives and either instructing participants that "their job" was to taste a specific alternative (imposed condition) or asking if they "would like" to try a specific alternative (free choice condition). Using this imposed consumption manipulation, we were able to alleviate an experience of denying one's choice (e.g., reactance theory; Brehm 1966) because there was no norm in place that participants should choose their sample and tasting free samples was a desirable activity in all conditions.

As in study 3, we predict that participants who perceive that healthy eating is imposed will experience a boost in the strength of the competing motivation to fulfill their appetite and feel hungrier compared to those who are given tasty foods. Participants who perceive that they have freely chosen to eat a healthy food sample should not show this effect.

## Method

Sixty-four students (26 women) at the University of Chicago volunteered to participate in the study. The study employed a 2 (consumption mode: imposed vs. free choice) × 2 (food sample frame: healthy vs. tasty) between-subjects design. Participants were invited to participate in a taste test.

We used two food samples: chocolate-raspberry and honey-peanut protein bars, both 12 grams and both containing 50 calories. The two types of protein bars were displayed on the sample table at the same time. Once participants approached the table, they received information about only one of the samples, the one which they were about to taste. An experimenter presented that option (randomly selected) as either a health bar (healthy frame condition) or a candy bar (tasty frame condition). Specifically, the experimenter informed those in the imposed choice condition that "your job is to taste our health bar (or 'candy bar' in the tasty frame condition)" or asked those in the free choice condition, "Would you like to try our health bar (or 'candy bar' in the tasty frame condition)?" The experimenter said nothing about the other option on display.

Participants then read similar information about the bar they were about to sample as in study 3. They did not read any information about the bar that they did not taste. The second bar served to emphasize the special features of participants' assigned bar, either that they would have a healthy bar or a candy bar.

Using this procedure, although participants across conditions freely chose to participate in the study, those in the imposed consumption condition had no choice regarding what item they would sample whereas those in the free choice condition had the illusion that they were freely choosing, although in reality, none of them turned down the request to have a specific protein bar. The experimenter alternated several times what type of protein bar participants ate to ensure that any feature of a particular bar did not drive hunger ratings.

As our dependent variable, we used subjective ratings of experienced hunger. After tasting the food sample, participants rated how hungry they were at the present moment (7-point scale; 1 = not at all hungry, 7 = very hungry), which corresponds to the strength of the motive to fulfill their appetite. This item was embedded among other filler items.

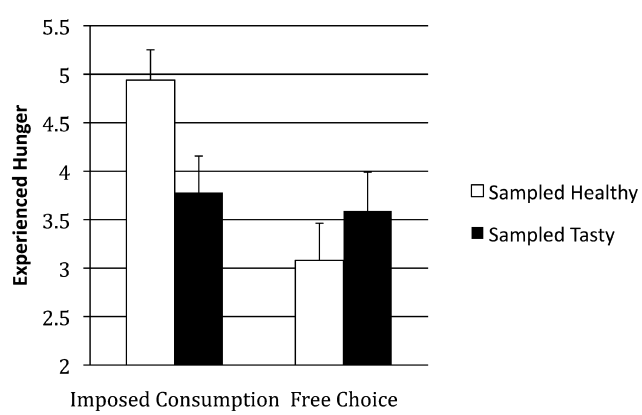
## Results and Discussion

An ANOVA of hunger ratings on consumption mode and food sample frame yielded a main effect of consumption mode, ($F(1, 60) = 7.97$, $p < .01$, $d = .79$), indicating that participants in the imposed consumption condition reported feeling hungrier ($M = 4.36$, SD = 1.49) than participants in the free choice condition ($M = 3.34$, SD = 1.47). There was no main effect of food sample frame ($F < 1$). More importantly, this analysis yielded the predicted consumption mode × food sample frame interaction ($F(1, 60) = 5.29$, $p < .03$). Specifically, participants in the imposed consumption condition who sampled healthy reported feeling hungrier ($M = 4.94$, SD = 1.25) than those who sampled tasty ($M = 3.78$, SD = 1.51; $t(33) = 2.47$, $p = .02$, $d = .67$). In contrast, participants in the free choice condition who sampled healthy showed no difference in experienced hunger ($M = 3.08$, SD = 1.43) compared to those who sampled tasty ($M = 3.59$, SD = 1.50; $t < 1$; see fig. 4). In addition, consistent with our prediction, participants who sampled healthy reported being hungrier in the imposed versus free choice condition ($t(27) = 3.70$, $p < .01$, $d = 1.38$).

Study 4 provides further evidence for our hypothesis that it is the nature of the consumption situation—imposed or free—that influences the strength of the goal to satisfy one's hunger. We posit that when people experience imposed healthy eating, they infer that the strength of their hunger increases. Indeed, even when we used a more subtle manipulation of the consumption situation, participants who sampled the item framed as healthy were hungrier than participants who sampled the item framed as tasty, and there was no such effect among those who felt they were freely choosing to eat healthy.

**FIGURE 4**

EXPERIENCED HUNGER AS A FUNCTION OF THE FRAMING OF THE FOOD SAMPLE AND THE NATURE OF THE CONSUMPTION SITUATION (SUBTLE CONTROLS)



## GENERAL DISCUSSION

Having a small portion of food can potentially increase one's appetite. In four studies we find that the impact of sampling increases for healthy foods compared with unhealthy, tasty foods. When a consumption experience is framed as healthy, it signals progress on the health goal, which increases the strength of the competing motive to fulfill one's appetite.

We identify two moderators for the effect of healthy eating: individual differences in concern for weight watching and the nature of the consumption situation (imposed vs. free). First, individuals who are concerned with watching their weight can potentially infer that they prefer to eat healthy. However, those who are less concerned with watching their weight attribute healthy eating to an external agent. Consequently, they are likely to infer that they have made progress toward the health goal and to experience a boost in the competing motive to fulfill their appetite. Second, individuals who freely choose to eat healthy infer that they value healthy eating and that they made progress on the health goal. In contrast, imposed consumption does not allow for inferences of value or commitment since it is not diagnostic of a person's priorities (Cialdini et al. 1995; Elliot and Devine 1994; see pilot data in study 3). Thus, individuals who experience imposed healthy eating infer that they have made progress toward the health goal and experience a boost in their appetite. We conclude that healthy eating makes one hungry when it is imposed, and in particular, for those who are less concerned with watching their weight.

Four studies support our analysis. In study 1, we find that sampling food framed as healthy makes one feel hungrier than not eating at all or sampling the same food framed as tasty. In study 2, we find that individuals who sample an item framed as healthy consume more than those who sample an item framed as tasty. Further, we find that this effect is more pronounced the less concerned individuals are with watching their weight. Finally, in studies 3 and 4, we find that eating healthy food makes individuals hungry only when it is imposed (vs. freely chosen), although subtle cues for imposed healthy eating were proven sufficient to elicit the experience of hunger.

These findings have implications for understanding the relationship between competing goals (Kruglanski et al. 2002), in particular, when these goals pose a self-control conflict (Loewenstein 1996; Muraven and Baumeister 2000). Exposure to healthy food labels could either activate the associated health goal (Shah and Kruglanski 2003) or satisfy and inhibit that goal (Liberman, Förster, and Higgins 2007). If the health goal is activated, we would expect people should seek other means to pursue the health goal. Indeed, we find that individuals who are concerned with watching their weight do not show an increase in the competing motive to fulfill their appetite when they experience imposed healthy eating. In contrast, for those who report being less concerned with watching their weight, exposure to imposed healthy options does not activate the health goal but partially satisfies and inhibits it, and the experience of goal fulfillment allows those individuals to attend to competing, short-term motives, such as the motive to fulfill their appetite. Possibly one factor that determines the direction of the influence (activation vs. inhibition) is the extent of goal pursuit, where a brief experience activates the health goal and an extensive experience satisfies it. For example, an appetizer would open the appetite whereas an entire meal would satisfy it. However, as this research demonstrates, even the same (relatively small) portion of healthy food can either activate or satisfy the health goal. We can thus conclude that the impact of healthy eating depends on variables other than extent of exposure: the presence of social control and one's concern with weight watching.

These findings have implications for reactance theory (Brehm 1966) and the notion that when social agents actively eliminate choice options, or request the choice of a specific alternative, people experience a rebound in preference for the eliminated alternative. We find a similar rebound effect when healthy food is imposed, although we find this effect under circumstances when the interests of the individuals are aligned with the interests of the controlling agent and in situations when there is no negative experience of choice restriction involved in assigning an option. We can thus conclude that imposed controls can affect consumers' subsequent actions even in the absence of a negative reactance response, as long as the external controls change the meaning of one's actions to reflect goal attainment rather than strengthen the sense that the goal is important for the consumer.

Can this pattern reflect a logical inference that healthy food has lower calorie content than regular food? Previous research attests that people make logical inferences that low-calorie food is less fulfilling than high-calorie food and thus overcompensate by eating too much of both healthy and unhealthy food. For example, participants who sampled foods labeled as "low fat" consumed more food, regardless of the food's healthful properties, than when they sampled foods labeled as "regular" (Chandon and Wansink 2007; Wansink and Chandon 2006). Whereas logical inferences of this type account for differences in consumption between healthy and unhealthy foods, they are not the underlying mechanism for the effect of healthy food on experienced hunger. Specifically, they cannot account for the effect that healthy food makes people feel hungrier than not eating anything (study 1) and that it makes them feel hungrier only when it is imposed (studies 3 and 4). Whereas the present studies demonstrate the impact of imposed healthy eating on activating the motive to fulfill one's appetite, other studies demonstrated the impact of logical inferences and future research would need to more closely distinguish between these underlying processes—activation of a competing motive and logical inferences—to explain why healthy eating at times rebounds.

### Marketing Implications

Marketers often use sampling to promote their product, especially in the food categories (e.g., Wadhwa, Shiv, and Nowlis 2008). The drawback in giving away food samples

is that these samples can potentially make consumers feel less hungry and therefore reduce subsequent purchases. For example, the grocery shopper might satisfy her hunger by sampling foods along the shopping trip and subsequently buy less food to take home with her. Accordingly, marketers would like to understand when food samples decrease, increase, or bear no influence on consumption.

We find that one variable that influences the direction of the impact is the perceived healthfulness of the sampled food. Consumers who sample an item framed as healthy show an increase in their appetite and are subsequently more likely to eat. It follows that healthy food samples can potentially encourage food purchases rather than inhibit the desire to shop for food. Moreover, because healthy food sampling increases consumers' actual appetite (rather than perceived entitlement to eat), we would predict that the impact of healthy sampling is not limited to the context of the sampling, for example, consumption within the food store. Indeed, future research can explore the role of time proximity on consumption of items in another store and a different category. We would predict that healthy sampling can increase consumption of foods in another store and in a different category, as long as there is time proximity. That is, because the increase in appetite depends on consumers' inferences, it may be relatively short lived, such that a grocery store that gives consumers healthy food when they enter the store might experience a boost in consumer purchases from that store more than from a subsequent one.

Policy implications of these findings are clear. When social agents take actions to help consumers meet their long-term objectives, such as banning fatty foods or imposing mandatory exercise classes on undergraduates, these agents need to ensure that consumers can infer that they are more committed to the long-term goal of being a healthy person. For instance, in order to avoid the rebound effects of imposed controls increasing the desire to eat excessively, social agents should make people feel that the choice to consume healthy foods was partially theirs.

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