

# “Is This Food Healthy?”: The Contextual Influence of Prior Foods on Healthiness Perceptions

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## ABSTRACT

Perceptions of a food’s healthiness are a critical input to consumers’ decision making about what to eat, and therefore understanding factors that influence these healthiness perceptions are important. We examine the role of prior exposure to other foods in impacting healthiness perceptions. We propose and find that the healthiness of foods previously encountered can influence healthiness perceptions and consumption intentions for ambiguously healthy snacks, and importantly, this influence differs based on one’s self-control. Consumers who encounter a healthy food first tend to assimilate healthiness judgments and indicate increased consumption for subsequent, ambiguous foods when their personal self-control is low. This influence of prior healthy foods has implications for consumers and public policymakers since foods are often presented alongside other healthy foods (e.g., in the same grocery store aisle or on the same restaurant menu). Our work establishes the relationship between previously encountered foods and trait self-control as a driver of subsequent healthiness perceptions, and we expect that future work can further explore these patterns.

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*Keywords:* Consumer behavior

IMAGINE two friends enjoying a nice, healthy dinner of grilled fish and steamed broccoli. Afterwards, a wild berry tart is brought out for dessert. One friend

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thinks “Great, what a healthy way to top off our meal!” while the other instead thinks that the relative unhealthiness of the tart places a big red mark on the experience. As suggested in this scenario, perceptions of a food’s healthiness can differ significantly for individuals. People are always told to eat healthy foods, but it is not always clear what constitutes a healthy food. As such, we ask: Can perceptions of the healthiness of foods be influenced by other foods encountered? How do these perceptions differ among individuals? These are two interesting questions at the intersection of context, perceptions, and behaviors that our research addresses.

Many aspects of one’s environment or decision making context can influence perceptions of foods, food choices, and the amount of food consumed. To name a few, recent research has examined the role of plate size and color (Van Ittersum and Wansink 2012), variety (Haws and Redden 2013), timing of courses (Huss *et al.* 2013), presentation format of nutritional information (Dowray *et al.* 2012; McCann *et al.* 2013), food labels (Vadiveloo *et al.* 2013), and so on. The present research examines how the context of a food sequence influences healthiness perceptions, and shows that trait self-control explains systematic differences among individuals. Specifically, we propose that exposure to healthy foods alters evaluations of the healthiness of a food currently under consideration based upon one’s chronic self-control capacity, which is characterized by an ability to exert willpower in the face of competing goals and desires (Hoch and Loewenstein 1991).

Healthiness is a relative concept that often depends on comparisons among foods and contextual cues. For example, the wild berry tart from our previous example may be perceived differently depending on whether it is compared with a serving of fresh fruit or a slice of triple chocolate cake. Such comparative evaluations are critical to our understanding of consumer perceptions and choice (Dhar and Simonson 1999; Fishbach and Zhang 2008). Ambiguous attributes are most susceptible to contextual influence, and many times our choices regarding food consumption involve ambiguity. In this research, we examine exposure to foods that are clearly healthy or unhealthy as a cue that individuals may use to inform evaluations about the healthiness of subsequent, more ambiguous foods. We predict that the healthiness of food previously seen may influence evaluations of an ambiguous focal food. Specifically, individuals lower in trait self-control will rate foods as healthier than those higher in self-control after exposure to another healthy food.

This work has implications for consumers who sequentially encounter foods and food imagery at grocery stores, restaurants, their homes, and in the media. An individual’s awareness of bias in food encounters, particularly if he/she

is motivated to make more health conscious decisions, may lead to efforts to remove the bias and correct subsequent, potentially unhealthy behaviors. Consumers who understand the bias may use more effortful deliberation to separate prior food encounters from the current evaluation. From a public policy perspective, reducing ambiguity through consumer education may be a practical response. Packaging standards that more overtly emphasize negative health attributes or soften positive health claims may lessen bias for subsequently considered foods. In addition, this work may inform public policy related to the choice architecture of menus, store displays, and advertisements.

Across three studies, we examine contextual effects of prior foods and test our prediction that such effects are moderated by trait self-control, resulting in food perceptions that are less conducive to the pursuit of health goals for individuals lower in self-control.

## Food Perceptions and Self-Control

Numerous positive outcomes, including better performance at work, enhanced relationships, improved psychological adjustment, and better health outcomes, have been linked to high self-control (Hofmann *et al.* 2012; Tangney *et al.* 2004). Goal conflict, poor monitoring, resource depletion, and trait self-control are determinants of self-control failure that have been studied extensively in psychology (Baumeister 2002; Haws 2016). Researchers have shed light on various strategies for improving self-control under different circumstances, such as creating mental budgets for eating behaviors (Krishnamurthy and Prokopec 2010) and bringing negative self-conscious affect to mind in the face of temptation (Giner-Sorolla 2001). Furthermore, recent research has revealed that various approaches to controlling one's eating behavior affect those of higher and lower self-control differently. For example, those higher in self-control were found to be less susceptible to the variety effect, wherein the presence of greater variety increases the amount consumed, than were those lower in self-control (Redden and Haws 2013). Those findings implicated variety as a more precipitous hurdle to healthy eating for those lower in self-control.

In combination, past self-control research suggests great potential for understanding how an individual's self-control interacts with various cues that might influence food decision making. Adding to prior understanding of self-control based differences, the present research proposes that biased healthiness perceptions based on exposure to prior foods are an oft overlooked cause of suboptimal eating decisions. Understanding the role of individual differences in trait self-control can help consumers manage their own eating behavior and facilitate public policies that attend to the most vulnerable populations. In order to study the contextual effects we propose, it is important to first more generally examine conditions under which people rely on contextual cues to form healthiness evaluations.

## Context Effects in Food Perceptions

Prior research offers various theoretical accounts of how contextual information influences food evaluations and choice. With regard to calorie estimation, Chandon and Wansink (2007) find that “health halos” cause consumers to underestimate calories of food choices. Because calories are difficult to estimate, individuals tend to assimilate ambiguous health attributes of menu items to a restaurant’s brand positioning, for example, with the same side dish at McDonald’s being evaluated as less healthy than at Subway (Chandon and Wansink 2007). Furthermore, Chernev and Gal (2010) find paradoxically that adding a healthy item to an indulgent meal will likely reduce the total number of calories estimated by individuals, despite the impossibility that adding more food reduces calories. Chernev (2011) later showed that dieters are the most susceptible to this underestimation of calories for a combined meal of healthy and indulgent foods. This prior research suggests that calorie estimates can be influenced by specific contexts, and that positive perceptions of healthiness are transferable to other foods that are psychologically related: in the same restaurant, on the same plate, and, as our research examines, part of the same sequence. Unlike many past researchers, we do not examine calorie counts that involve numerical anchoring effects, but instead explore the carryover of health perceptions in a more general sense. We feel this is a critical construct, especially given the general consumer’s poor understanding of calories (Krukowski *et al.* 2006; Nestle and Nesheim 2012). Additionally, our work focuses on trait differences in self-control and suggests that vulnerability to unhelpful biases, such as an overestimation of the healthiness of ambiguous food choices, may not affect all individuals in the same way. We highlight trait self-control as one such important discriminator.

Consumers often face scenarios where they are unable or unmotivated to evaluate and estimate the calorie content of foods. In these situations, such as dining out at a restaurant when attributes such as calories or fat content are not always known, consumers rely on cues to infer the overall healthiness of food. We expect prior foods in a sequence to be used as information in making heuristic-based evaluations of the healthiness of a focal food in a manner consistent with consumers’ motivations. Similar to the dieter who is prone to overestimate the healthiness of a combined plate of healthy and indulgent food, we expect the individual low in trait self-control will inflate the healthiness of an ambiguous food in a sequence that contains healthy foods. That is, for those with low self-control, we predict that the perceived healthiness of a food assimilates to previously encountered healthy foods.

Early investigations into assimilation and contrast effects revealed that anchors presented prior to stimuli create an assimilation effect by default because contrast requires more deliberation (Sherif and Hovland 1961; Sherif *et al.* 1958). Assimilation is particularly common when comparisons involve

targets that can be easily compared with a similar standard (Lee and Suk 2010). In this research, the target and anchors are highly comparable as snack foods but the healthiness attribute of the target (e.g., Goldfish crackers) is ambiguous. For instance, consuming a rich piece of chocolate cake may well be a clear violation of health goals, but eating from a bowl of Goldfish crackers is less obviously diet-detrimental. Due to overall suboptimal consumption patterns and greater susceptibility to contextual influencers, we expect consumers lower in self-control to assimilate when ambiguous foods follow healthy foods. Delineating the psychological process underlying this tendency and other potential patterns of healthiness perceptions in sequential food encounters is important, and we next propose a potential mechanism related to motivated categorization.

The healthiness of an ambiguous food is sensitive to boundaries that may vary depending on personal self-control. Consumers lower in self-control are motivated to broaden categories of acceptable options in pursuit of restriction goals (Poynor and Haws 2009). Looser boundaries on the category of healthy foods offer those lower in self-control more latitude to consider ambiguous foods “healthy” when available cues, such as previously encountered foods, are supportive. The more vague the boundaries, the more likely it is that people will assimilate (Kim and Meyers-Levy 2008). People high in self-control, with more rigid boundaries of what is healthy, should be less vulnerable to such cues.

With respect to the presence of multiple foods in a decision context, Fishbach and Zhang (2008) studied the effects of presenting healthy and unhealthy foods together in a unified presentation versus apart as separate choices. Across several studies, participants made choices between healthy or unhealthy food items that were grouped together (e.g., part of the same photograph) or presented apart (e.g., in two separate photographs shown side by side). Their results consistently show that people prefer temptations when foods are presented together, and prefer goal-congruent healthy options when options are presented separately. Although these studies did not present foods sequentially, they have theoretical implications for our research. Foods in a sequence resemble an “apart” presentation, and we thus expect a preference for healthy options and a corresponding mindset that healthy and unhealthy items are competing. The individual lower in self-control, with wider category boundaries of what is acceptably healthy, cognitively reduces the healthiness discrepancy between an unambiguously healthy food and one with ambiguous healthiness. Alternatively, individuals higher in self-control with more restrictive categorizations are guarded against ambiguously healthy foods and view them as relatively less healthy than their low self-control counterparts.

We conducted three experimental studies to test our core prediction that after encountering a healthy food first, individuals lower in self-control evaluate a subsequent ambiguous food as more healthy compared to consumers higher

in self-control. Encountering an unhealthy food first will not affect subsequent evaluations of the same ambiguous foods. The first two studies reveal the key interactive effect between the healthiness of the first food and trait self-control. Study 3 looks at the potential for the differences in healthiness perceptions from studies 1 and 2 to impact intentions regarding the quantity consumed. In all studies, participants are first exposed to either a healthy or an unhealthy stimulus, and are then exposed to a more ambiguous food option.

## Study 1

### *Method*

In our first study, 103 participants (35 female) in an online panel were shown food images one at a time and asked to rate the healthiness of each. The images were sequentially ordered by increasing or decreasing healthiness, depending on random assignment to the two order conditions. The set contained a healthy food (an apple), an unhealthy food (potato chips), and an ambiguous food (Goldfish Crackers). The ambiguous option was always shown as the second item in the sequence. Half of the participants saw the apple, “Goldfish”, potato chips sequence (decreasing healthiness), and the other half saw the potato chips, “Goldfish”, apple sequence (increasing healthiness). As each image appeared, participants indicated how healthy they believed the food to be on a 9-point scale ranging from “not at all healthy” to “very healthy.” After approximately five minutes of unrelated tasks, participants completed the brief 13-item self-control scale (Tangney *et al.* 2004) as a measure of trait self-control. This scale includes items such as “I am good at resisting temptation” and “I refuse things that are bad for me.” This measure has been shown to be quite relevant to food-related issues and less susceptible to some of the biases associated with measures of eating restraint (Haws *et al.* 2015).

### *Results and Discussion*

*Manipulation Check.* The results of a  $t$ -test for independent samples (first food: apple vs. potato chips) showed that participants perceived the apple ( $M = 8.42$ ) stimulus as healthier than the potato chips ( $M = 2.22$ ;  $t(98) = -28.90, p < .001$ ) as expected. Furthermore, although not our focus, the ratings did not vary based on order of presentation as  $t$ -tests indicated no significant differences between the healthiness ratings for the apple ( $M_{\text{first}} = 8.12$ ;  $M_{\text{last}} = 8.42$ ;  $t(98) = -1.65$ , NS) or potato chips ( $M_{\text{first}} = 2.22$ ;  $M_{\text{last}} = 1.96$ ;  $t(98) = 1.19$ , NS) regardless of the appearance order, nor did these health ratings interact with self-control ( $\beta_{\text{apple} \times \text{self-control}} = .08, t = .38$ , NS;  $\beta_{\text{chips} \times \text{self-control}} = -.02, t = .11$ , NS). As such, we conclude that healthiness of the initial food item was successfully manipulated.

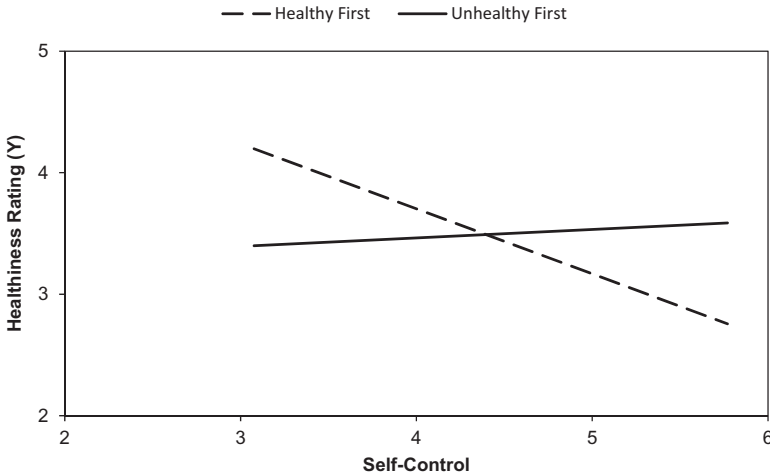


Figure 1: Study 1: Goldfish healthiness rating.

*Goldfish Health Perceptions.* We first created a self-control index by reverse-coding appropriate items and averaging responses from the self-control scale ( $\alpha = .88$ ). A 2(condition: healthy first vs. unhealthy first)  $\times$  continuous self-control ANCOVA on participants' healthiness ratings of the ambiguous option (Goldfish) revealed a significant interaction between order condition and trait self-control ( $F(1, 96) = 4.08, p < .05$ ). To better understand this interaction, we tested the slopes of the self-control effect in the healthy first and unhealthy first conditions. After being exposed to a healthier item (an apple), the slope of self-control on Goldfish healthiness rating was significantly negative ( $\beta = -.53, t = -2.56, p < .02$ ) meaning higher self-control resulted in lower healthiness ratings. This result supports our prediction that after exposure to healthy food, individuals lower in self-control tend to assimilate (rate higher) the healthiness of ambiguous foods relative to people higher in self-control. The effect of self-control on healthiness ratings was not significant when the unhealthy food (potato chips) was shown first ( $\beta = .07, t = .33, p = .75$ ). See Figure 1 for an illustration of the slopes in each condition. We found no significant main effects in the model ( $p > .10$ ).

Study 1 demonstrates the default tendency for individuals low in self-control to perceive an ambiguous food as being more healthy following exposure to another, prototypically healthy food. This influence does not extend to unhealthy food encounters. One possible explanation is that exposure to healthy foods activates different mindsets and motivations for individuals with different levels of self-control, but exposure to unhealthy foods has a less pronounced effect.

## Study 2

In Study 2, we corroborated Study 1's demonstrated associations between the healthiness of the first food in a sequence and perceived healthiness of an ambiguously healthy subsequent food. Here, we used different preliminary foods for generalization, and added a control condition to better assess the nature of our effects. We expected to again find that individuals lower in self-control perceive an ambiguously healthy food as more healthy following exposure to a healthy food.

### *Method*

Three hundred forty-eight (203 female) undergraduate students completed this study in exchange for course credit. Participants were randomly assigned to one of three experimental conditions: healthy food (baby carrots) presented first, unhealthy food (chocolate truffles) presented first, or a control with no food presented before the focal stimulus. Subsequently, all participants were shown Goldfish Crackers as an ambiguously healthy snack food. After being presented with the ambiguous snack, participants were asked to rate the healthiness of the crackers on a 1 (Not at all healthy) to 9 (Extremely healthy) scale. Following approximately five minutes of unrelated tasks to separate the measurement of our dependent variable and individual differences, we again measured self-control tendencies using the brief Tangney *et al.* (2004) scale.

### *Results and Discussion*

*Manipulation Check.* We tested whether the healthiness perceptions of baby carrots and chocolate truffles differed significantly in the non-control conditions. Consistent with our prediction, a *t*-test for independent samples (first food: baby carrots vs. chocolate truffles) revealed greater perceived healthiness for baby carrots ( $M = 8.17$ ) compared to chocolate truffles ( $M = 2.40$ ;  $t(229) = -36.18, p < .001$ ).

*Goldfish Health Perceptions.* We analyzed the data using the healthiness rating of the ambiguous option (Goldfish Crackers) as our dependent variable with the experimental condition, trait self-control, and their interaction as independent variables in an ANCOVA model. To estimate the model with a multicategorical experimental design, we used the three-category moderator procedure recommended by Hayes (2015). As such, we treated experimental condition as a moderator by applying indicator coding. In this coding scheme, a dummy variable for "healthy" was set to 1 whenever participants saw a healthy snack first and 0 otherwise. The same approach was taken for the "unhealthy" snack first condition. With this indicator variable scheme, the control condition served as our reference group. In the model, the dummy



variables were treated as two moderators which allowed us to interpret and compare all theoretically meaningful coefficients and significance tests for our three experimental conditions.

After properly coding the items, we created a self-control index by averaging responses to the self-control scale ( $\alpha = .86$ ). With Goldfish healthiness ratings as a dependent variable, a 3 (condition: control vs. healthy first vs. unhealthy first)  $\times$  continuous self-control ANCOVA revealed a significant interaction, as predicted ( $F(2, 341) = 3.91, p < .03$ ). To probe the interaction, we assessed the conditional effect of self-control on the healthiness ratings of ambiguous Goldfish snack for each condition (see Figure 2 for an illustration). In the control condition, we found no significant effect. That is, when participants were not shown another snack prior to evaluating Goldfish, individuals with low and high self-control did not differ significantly in their perceptions of Goldfish healthiness ( $\beta = -.08, t = -.56, p = .57$ ). The slope of the self-control effect after exposure to a healthy snack first was significantly negative ( $\beta = -.31, t = -2.22, p < .03$ ), indicating that lower (vs. higher) self-control corresponded to perceptions of greater healthiness following a healthy snack. This pattern of results suggests that people with lower self-control tend to assimilate judgments of ambiguously healthy snacks to foods they were exposed to previously relative to those higher in self-control. Prior exposure to an unhealthy snack yielded a marginally positive slope ( $\beta = .23, t = 1.70, p < .10$ ). We also assessed pairwise comparisons of the experimental conditions and found that while neither healthy nor unhealthy snack exposure differed significantly from the control condition ( $p > .10$ ), the healthy and unhealthy conditions differed significantly from one another ( $\beta = .54, t = 2.78, p < .01$ ). Directionally comparing each condition with the control, we do observe that low self-control evaluations of healthiness are higher than the control in the healthy-first condition and nearly equal in the unhealthy first condition. For high self-control, the healthy-first condition yielded slightly lower evaluations of healthiness while unhealthy first was higher relative to the control. We found no significant main effects in the model ( $p > .10$ ).

After exposure to healthy foods, people with low self-control rated ambiguous foods to be healthier, as predicted. In this study, unhealthy food encounters produced a marginally significant, positive effect in which higher self-control corresponded to perceptions of greater healthiness. Furthermore, when there was no prior food exposure, healthiness perceptions of an ambiguous food did not differ based on level of self-control.

### Study 3

Finding that differences in the healthiness of previous foods influences perceptions of healthiness for a current food being evaluated, as we demonstrated

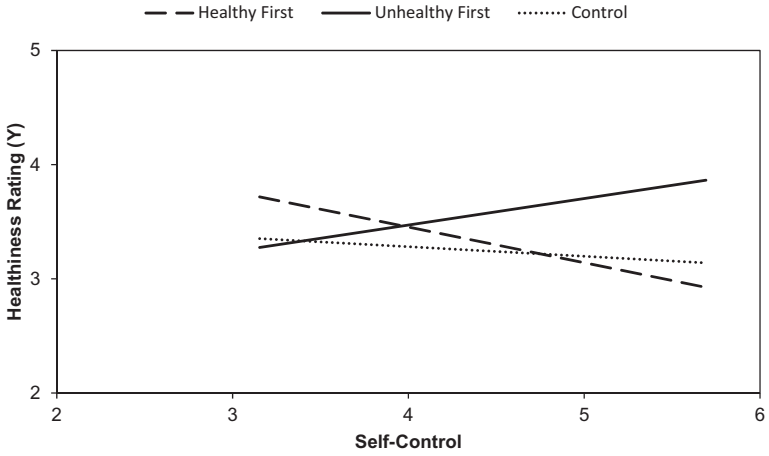


Figure 2: Study 2: Goldfish healthiness rating (with control).

in Studies 1 and 2, is quite important in further understanding food-related decision making. Building further on these differences in healthiness perceptions, we ask what impact might this have on the quantity one intends to consume.

In this study, rather than drawing attention to perceptions of healthiness of the foods, we had participants indicate how much of an ambiguous snack they intended to consume after being previously exposed to either a healthy or an unhealthy food. We suggest that if the ambiguous food is perceived to be healthier, participants will eat more in keeping with prior literature showing that low-fat labels (Chandon and Wansink 2006) and “healthy” claims (Vadiveloo *et al.* 2013) lead to increased consumption. Therefore, for those lower in self-control, biased perceptions of healthiness arising from the previous presentation of healthy foods will lead to increased consumption of this ambiguous food.

**Method**

Participants were 182 (86 female) undergraduate students who received course credit for completing this and other studies. For this study, the healthy food stimulus was celery sticks while the unhealthy food was potato chips. Following exposure to an image of one of these snacks, participants all viewed a “fruit and frozen yogurt smoothie,” which was presented as an ambiguously healthy snack, similar to the “mango lassi” drink study by Raghunathan *et al.* (2006) in which healthiness perceptions were manipulated. Participants were next shown images of the smoothie in a glass with various portions to consume (0%, 20%, 40%, 60%, 80%, and 100%), and asked to indicate the percentage

they would consume. We later measured participants' preference for the fruit smoothie as a covariate to control for liking. "Please indicate how much you like Fruit and Frozen Yogurt Smoothies" was assessed on a scale from 1 (do not like at all) to 9 (like very much). We next asked participants to rate the healthiness of celery and potato chips on a scale from 1 ("not at all healthy") to 7 ("extremely healthy"). Following an unrelated task, participants responded to the brief 13-item Tangney *et al.* (2004) self-control scale. Finally, demographic information was collected.

### **Results and Discussion**

*Manipulation Check.* A *t*-test for independent samples (first food: celery vs. potato chips) revealed significantly different healthiness perceptions for celery ( $M = 5.31$ ) and less healthy potato chips ( $M = 1.93$ ;  $t(174) = -13.64, p < .001$ ).

*Smoothie Consumption Intentions.* We first created a self-control index by appropriately coding then averaging responses to the self-control scale ( $\alpha = .86$ ). We next ran a 2 (condition: healthy first vs. unhealthy first)  $\times$  continuous self-control ANCOVA on the amount of smoothie participants intended to consume. The liking rating for fruit smoothies was included as a covariate, and as expected, it was significant and positive ( $\beta = .26, t = 4.93, p < .001$ ), indicating that those who like fruit smoothies intend to consume more. However, neither the experimental condition nor self-control had significant main effects ( $p > .10$ ). More importantly, the interaction between healthiness condition and trait self-control was significant ( $F(1, 178) = 4.71, p < .04$ ). We decomposed the interaction by assessing the effect of self-control for each experimental condition (see Figure 3 for an illustration). We found a significant negative slope for the prior healthy exposure ( $\beta = -.32, t = -2.10, p < .04$ ), indicating intent to consume more of the smoothie for those lower in self-control. This finding extends the assimilation effect of Studies 1 and 2 by showing a greater propensity to consume. The slope for the unhealthy first condition was not significant ( $p > .30$ ).

Interestingly, examining the correlations between self-control and smoothie liking shows that those relatively lower in self-control tended to like smoothies less ( $r = .35, p < .01$ ), and yet, the healthy food prime leads to increased intended consumption. The healthiness perception effects exhibited throughout the present studies may actually lead those low in self-control to increase consumption of less preferred, ambiguously healthy foods.

The results of this study extend our findings to include differences in the quantity of intended consumption. Specifically, after exposure to a healthy food, a more ambiguous food is selected in greater quantity for those lower in self-control, but lesser quantity for those high in self-control. Assuming that healthier smoothies would seem appropriate to consume in larger quantities

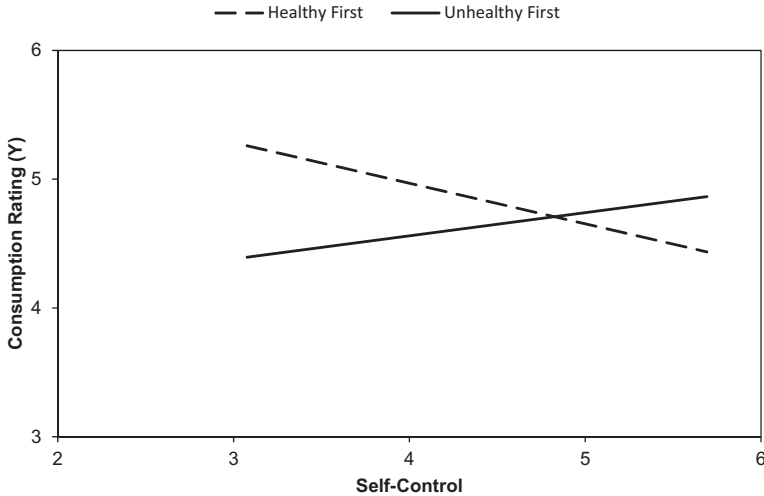


Figure 3: Study 3: Mean smoothie consumption rating.

(consistent with previous research suggesting that people eat larger quantities of food when they are perceived to be healthier, (Chandon and Wansink 2006)), this pattern again underscores effects of prior healthy foods increasing healthiness perceptions of subsequent foods for those lower in self-control relative to those higher in self-control.

## General Discussion

How stable are the healthiness perceptions of a food such as Goldfish crackers? Perhaps it is no surprise that such judgments of Goldfish crackers depend on whether they are compared with chocolate candy or apple slices. After all, healthiness, like many other attributes, is certainly a relative evaluation (Chernev 2011; Vadiveloo *et al.* 2013; Wilcox *et al.* 2009). Unlike much past research, which focuses on lack of willpower as a critical driver of self-control failure, we examine situations in which perceptions of what is healthy are biased by surrounding foods.

Food researchers have found that when there is ambiguity associated with an eating experience, people often rely on situational and environmental cues to determine how much they eat (Wansink *et al.* 2010). As such, the present research has expanded our understanding of self-control and food consumption, specifically related to contexts where individuals are exposed to different foods over time. We often assume that self-control failures are deliberate and

understood by the individual to be such. However, in the present research we proposed that individuals may be subject to biases in judgment that lead to differential perceptions of healthiness for ambiguous foods following exposure to other foods that are either healthy or unhealthy. Our findings point to perceptions that can work against people with low self-control as they pursue goals to eat healthier.

Understanding that low self-control can lead people astray in assimilating healthiness can help consumers, public policymakers, and marketers in configuring purchasing and eating environments. Malleable healthiness perceptions may lead to rationalization of eating certain foods or consuming greater quantities of food, as Study 3 results suggest. As promising areas of intervention, marketers and public policymakers may consider exploring labeling techniques and the visual categorization of healthy and unhealthy products on menus and store displays to reduce potentially harmful ambiguity for consumers low in self-control. Information alone is unlikely to reduce healthiness ambiguity, so policies must provide useful facts and also capture consumers' scarce attention and motivate deliberation. Revising the standard and limiting the presentation of health claims may facilitate better decision making in the immediate future.

Our findings contribute to literature on context effects by exploring the role of previous food exposure in self-control decision making through the impact on healthiness perceptions. Prior research revealed the importance of categorizations of alternatives in goal pursuit (Poynor and Haws 2009). Here, we identify trait self-control as a factor that moderates order effects, showing that low self-control individuals tend to be influenced by prior healthy food options. On the other hand, individuals with higher self-control are not susceptible to the same biases. These findings help explain variant outcomes of people with low and high self-control in pursuing goals based upon simple effects that exposure to prior foods has on perceptions of the healthiness of other food items. Our work also highlights trait self-control as a critical moderator of context effects, which should prove useful in understanding past findings as well as directing future findings.

We utilize unhealthy first conditions in all of our studies which demonstrate the boundaries of our effects to perceptions following exposure to healthy foods (the types of foods almost always advocated for consumption on any plan for healthy eating or weight loss). However, our results also suggest that healthiness perceptions of ambiguous foods following exposure to unhealthy foods may vary. Future research may further investigate situations when prior exposure to unhealthy foods affects perceptions and behaviors.

From these studies, we cannot be sure whether increases or decreases in perceived healthiness are driving the behavior. A more fundamental question here is what exactly does exposure to healthy and unhealthy food prime? We suggest that our results provide some level of clarity for healthy foods: such foods prime the idea of health for individuals of all levels of self-control.

However, the relative goals and context effects found speak to the differences in how those of varying levels of self-control respond to a healthiness prime. Those low in self-control wish to be consistent with the idea of health and do so by enhancing perceptions of the healthiness of the ambiguous snack. Those high in self-control demonstrate consistency with the healthy mindset by evaluating the ambiguous snack as less healthy, again suggesting the expansion or contraction of goal-consistent alternatives (Poynor and Haws 2009). The effects of presenting individuals with an unhealthy food are less clear. Future research should more carefully examine the goals primed by unhealthy foods, and the impact on subsequent food evaluations and consumption.

We note that some of our results, particularly for the intended quantity of consumption, may seem related to licensing effects (Khan and Dhar 2006). Specifically, in the case of those low in self-control, exposure to a prior healthy stimulus may create a sense of licensing to indulge. However, Wilcox *et al.* (2009) find that adding healthy items to a choice set with relatively unhealthy items results in vicarious health goal fulfillment for individuals high in self-control. Essentially, the mere presence of healthy items may satisfy a goal and license the individual to choose unhealthy foods. However, the sequential effect we find influences those low in self-control to a greater extent, and our studies measure not only choice and intended consumption but also health perceptions.

Future research should attempt to more clearly understand the processes underlying our interactive effect. Possibilities may include similarity and dissimilarity testing, concreteness or abstractness of healthiness properties, affective versus cognitive responses, numeric and conceptual interpretation of the prior foods, and others. In the present research, we focused on the effects of previous food exposure on ambiguous food options. However, it is possible that the individual self-control trait might influence perceptions of healthier or unhealthier foods following initial exposure as well. In other words, future research should examine the boundaries of the malleability of perceptions of food healthiness based on contextual order effects.

Many subtle environmental factors that influence food perceptions, decision making, and consumption have been studied in prior literature. This research adds novel insights by demonstrating that prior exposure to a certain food can influence perceptions of the next food, and that the nature of this effect is determined by one's level of self-control. Such patterns can have a significant impact on eating patterns and create previously unknown backfire effects for healthy foods for those most susceptible to self-control failure.

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