Interventions to Get School Children to Eat More Vegetables

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Three field experiments in school cafeterias tested interventions to increase vegetable intake. In study 1, a 50% larger portion increased carrot intake 12%. Study 2 created norms by placing photos on trays and increased vegetable intake 178%. Study 3 increased carrot intake 430% by serving carrots before kids got into line.

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Of Carrots, Candy, & Self-Control: Decreasing and Increasing Food Consumption

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Paper #1: Interventions to Get School Children to Eat More Vegetables
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Paper #2: In Control of Variety: How Self-Control Reduces the Effect of Food Variety
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Paper #3: Red, Ripe, and Ready: Effect of Food Color on Consumption
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Paper #4: Mortality Threat Can Increase or Decrease Women’s Caloric Intake Depending on Their Childhood Environment
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SESSION OVERVIEW

Each year Americans spend $700 billion on food. Whether it’s in a store, restaurant, school cafeteria, or at home, each day consumers are confronted with myriad food options. The choices that people make, both about what to eat and how much to eat, play a large role in determining their health, obesity, and well-being. But while people generally recognize the importance of their diet, they often don’t appreciate the drivers of eating behavior.

In this proposed session, we consider various factors that shape food choices and consumption. Two of the papers focus on how food choices are influenced by environmental factors such as social norms and food color. The two other papers focus on person variables, including self-control and childhood environment. All four papers provide insight into how these factors influence food preferences. Importantly, each paper goes beyond mere measures of food liking and presents findings for the actual quantity of food consumed. It is only with measures of intake that we can make stronger claims about subsequent effects on health and well-being.

In the first paper, Redden and colleagues present three field experiments in elementary school cafeterias testing different interventions for increasing kids’ consumption of vegetables. They find that placing photos of specific vegetables on lunch trays increased carrot and green bean intake by 178%. They also show that serving school children carrots at the table as they waited to be called to enter the cafeteria line increased carrot intake by 430%.

In the next paper, Haws examines how individual differences in self-control influence the “variety effect” – the notion that the presence of variety leads people to eat higher quantities of food. In a series of experiments, she shows that trait self-control plays a critical role in how variety influences eating. For people low in trait self-control, for example, the presence of variety increased snack consumption by 73%. But for people high in trait self-control, the presence of variety increased snack consumption by only 14%.

The third paper by Cantu and Griskevicius investigates how food color affects consumption. Drawing on the idea that the color red has reliably served as an indicator of a food’s (e.g., fruit and berries) ripeness, sweetness, and adaptive value, they present three experiments testing how cues to redness affect consumption. They find that people eat about twice as many chocolates when the candies are wrapped in red wrappers.

In the final paper, Hill and colleagues investigate how mortality stressors influence women’s food consumption. Drawing on theory in biology, they propose that mortality stress should have different effects depending on women’s childhood environment. Across three experiments, they show that whereas mortality cues increase food consumption for women who grew up poor, mortality stress decreases food consumption for women who grew up wealthy.

The papers in this session highlight two types of factors driving food consumption: the person and the situation. Across the four research projects, there is consistent evidence that both types of factors play a central role in what people eat and how much they consume. By using a diversity of perspectives (behavioral economics, evolutionary psychology, consumer traits), and a variety of methods (lab studies and field experiments), this session delivers a rich understanding of factors driving food consumption. This approach and the importance of the core topic of food will appeal to a wide range of audiences, including those interested in food preferences and consumption, consumer health, public policy interventions, variety, self-control, and evolutionary approaches.

Interventions to Get School Children to Eat More Vegetables

EXTENDED ABSTRACT

Childhood obesity remains a significant public health concern in the United States, especially among minority populations. Eating behaviors that include low intakes of fruits and vegetables and high intakes of energy-dense foods are risk factors for childhood obesity. According to national dietary intake data (NHANES 2007-2008), approximately 90% of children 8 years-old and older do not meet the current recommendation for total daily vegetable intake. In this research, we test the effectiveness of three interventions to increase vegetable intake at an elementary school cafeteria with approximately 800 students.

The relatively new field of behavioral economics has increased awareness of the effectiveness of small environmental changes to alter behavior. These so-called “nudges” have been effective in a range of settings (Thaler and Sunstein 2010), with the notion that people are more likely to engage in behaviors they feel like they “freely” chose. We propose that interventions will be more effective when they make children actively choose and consume the vegetables for themselves (i.e., without being coerced). Specifically, we test how much the following three small interventions (or nudges) will increase vegetable intake at an elementary school cafeteria: (1) increasing the portion size, (2) providing photos on lunch trays to suggest that taking vegetables is the norm, and (3) serving vegetables before the rest of the meal.

Prior research has shown that the quantity people consume increases as they are served larger servings of food (Wansink 2004). People tend to infer from the portion size what a typical person eats. People then subsequently follow this consumption norm, leading to a positive relationship between portion size and quantity consumed.
People have a tendency to finish the entire serving in front of them (Siegel 1957), suggesting that portion size largely determines the quantity consumed.

Study 1 tested whether increasing the portion size for a vegetable (carrots) and a fruit (oranges) by 50% would increase intake in an elementary school cafeteria. Compared to a control day with an identical menu, school children ate 12% more carrots and 24% more oranges. However, a limiting factor of this intervention for vegetables was that less than 10% of the school children placed carrots on their school tray (versus 33% for oranges). Therefore, the consumption norm for vegetables could not have any effect for 90% of the children.

In Study 2, we developed an intervention to more directly address the fact that very few school children would take the necessary first step of putting carrots on their plate. Here, we employed a nudge based on social norms, which have long been recognized as a particularly powerful way to shape behavior. Norms reflect both what most people think should be done and what most people actually do (Cialdini, Reno, and Kallgren 1990; Deutsch and Gerard 1955), and people often use them as a cue to infer the best course of action (Cialdini 2001). In the school cafeteria setting, we created a norm to eat vegetables by adhering a photo of green beans and a photo of carrots in two separate compartments on the lunch tray. We expected these photos would indicate that others typically select and place vegetables into those compartments and that they should do so too. Compared to a control day with an identical menu, this intervention increased the percentage of students taking green beans from 6% to 15%, and the percentage taking carrots from 12% to 37%. More importantly, those putting the vegetables on their trays subsequently ate them as overall consumption per student in the cafeteria increased by 133% for green beans and 178% for carrots. Furthermore, this intervention required minimal time and cost (about 20 minutes and $0.03 per 100 trays).

In Study 3, we tested how we could make children willingly choose to consume vegetables by making them more attractive. Given that liking depends on how a stimulus compares to a reference point (Helson 1964; Parducci 1995), a vegetable will generally be unappealing when compared to more tasty unhealthy foods like pizza and chicken nuggets. To combat these contrast effects in liking, we propose that healthy foods will be more appealing when eaten in isolation. This would give a moderately liked healthy food a “fight or an appeal” that helps explain the effect of Portion Size on Food Intake, Psychological Science, 17 (6), 521-25.


In Control of Variety: How Self-Control Reduces the Effect of Food Variety

EXTENDED ABSTRACT

Variety typically leads to increased consumption. A recent review refers to this phenomenon as the variety effect (Remick, Polivy, and Pliner 2009). Using a meta-analytic approach, Remick et al. (2009) conclude that while situational factors influence the variety effect, internal factors including gender, BMI, and dietary restraint do not. This work proposes that an overlooked moderator of the variety effect is general self-control.

Self-control has been linked with numerous long-term positive life outcomes, including better grades and job performance, healthier interpersonal relationships and higher self-esteem (Tangney, Baumeister, and Boone 2004). Given the pervasiveness of variety in our daily food options, I anticipate that the long-term nature of self-control will influence patterns of consumption in a healthy way, in this case through reducing the variety effect, consistent with the tendency of those higher in self-control to better monitor their behavior and be less susceptible to environmental influences. In a series of three studies, I examine the impact that variety has on preferences for various types of foods as well as the resulting influence on the quantity consumed.

In Study 1, 266 participants were asked how many candies they wanted to eat for an afternoon snack. In the variety condition, participants were shown a variety of snacks (Hershey’s, Kit Kat, and/ or Reesees miniatures), whereas the single snack condition offered only one of the three snacks. We later assessed general self-control. Consistent with prior research, the variety effect emerged such that participants who saw the various snacks indicated they wanted more overall. However, an interaction between the variety condition and self-control also emerged (p < .01), such that the effect of self-control on quantity desired was more than four times larger in the variety condition than in the single snack condition. As well, self-control matters in the variety case (p < .01), as low self-control people showed a 40% higher quantity than those with high self-control in a spotlight analysis.

REFERENCES


Study 2 used consumption of assorted snacks as the dependent measure. As in the first study, participants were either in a variety or no-variety condition, with each group receiving 3 separate servings of miniature cookies (Chips Ahoy, Nutter Butters, and/or Oreos). Participants received these snacks in three rounds, with the order of snacks randomized in the variety condition. They performed unrelated, but timed tasks after receiving each snack in order to allow time for consumption. Following the study, consumption was measured and recorded. As in study 1, there was again evidence of the variety effect overall, but also the interaction with self-control. For those low in self-control, the variety effect led to about 73% more consumption than a single snack whereas this increase was only 14% for those high in self-control. As such, this study demonstrates the interaction between variety and self-control by extending our findings to differences in actual consumption.

In Study 3, all participants actually consumed a variety of snacks. Specifically, participants were given a plate with small samples of nine common snack foods representing three each of healthy, medium, and unhealthy snacks. Participants rated their enjoyment of each snack in random order. Participants then received a plate with five chocolate chip cookies and were told to enjoy them while watching a video. Our purpose was to create a level of satiation with unhealthy snacks to see how this satiation would impact subsequent liking for the variety of snacks. Participants then rated the same nine snacks again, and separately completed the general self-control scale. I predict that people high in self-control would show a greater drop in liking across all of the snacks, demonstrating that their satiation spread further, thereby reducing the appeal afforded by variety. This would provide additional evidence of a weakening of the variety effect. The drop in liking ratings for each of the three food types were submitted to a repeated-measures ANCOVA with the snack type as a within-subjects factor, and trait self-control as a continuous covariate. I found the predicted interaction between food type and trait self-control, such that those with high trait self-control seem to satiate spontaneously on all of the foods while those with low trait self-control satiated little on the other food types (especially on the unhealthy foods), suggesting that the variety increased satiation across the board for those high in self-control but not for those low in self-control.

Overall, three studies using different approaches, including actual food consumption, to demonstrate an important factor in understanding the influence of variety on patterns of preference and consumption. Specifically, this work identifies general self-control as an internal factor that moderates the variety effect, which may help explain positive health outcomes over time as those with higher self-control are less susceptible to dramatically increasing their consumption of or preference for foods in the presence of variety.

REFERENCES

Red, Ripe, and Ready:
Effect of Food Color on Consumption

EXTENDED ABSTRACT
People are faced with multiple food choices every day. How do they decide which foods to eat – and how much to consume? Building on past research showing that environmental cues can influence food consumption (Wansink 2004), we examine how food color influences food desirability and consumption.

All of our ancestors successfully solved the challenge of determining which foods to eat. As omnivorous generalists, humans can obtain nutrients from a wide variety of foods. However, some foods have always been more adaptive than others. For example, our ancestors would have benefitted more from consuming foods that were calorie-rich and easy to digest rather than eating foods that contained few calories and were difficult to digest (Rozin 1999).

We propose that an important cue that helps determine a food’s adaptive value is its color. Research in biology shows a link between a species’ diet and the nature of that species’ vision (Smith et al. 2003). Specifically, meat-eating carnivores such as dogs and tigers tend not to have trichromatic color vision and often see in black and white. By contrast, omnivores such as humans and other primates have trichromatic color vision that differentiates between green and red colors. Biologists have argued that because omnivores consume plants (e.g., fruits and berries), color vision may have evolved to help determine the adaptive value of food (Dominy & Lucas 2000). For example, the color of fruits and berries, which universally vary on a green-to-red spectrum, reliably serves as an indicator of their adaptive value, whereby redness is associated with high adaptive value: Redness tends to signal ripeness, a desirable sweet taste, easy digestibility, and higher nutritional value (Goff & Klee 2006).

Given the association between the color red and the adaptive value of food, we examined how the color red relates to food psychology and consumption. We hypothesized that the color red in the context of food should be associated with (1) automatic tendencies to approach red-colored foods, and that (2) people should consume higher quantities of red-colored foods.

Experiment 1 tested people’s automatic tendencies to physically approach the color red versus the color green. We used an established behavioral task, in which people made physical movements using a joystick to approach stimuli presented on a computer screen, whereby the speed of the movements was the dependent measure (Chen and Bargh 1999). The experiment had two within-subjects conditions that manipulated the context in which people saw the color red and green: Colors were presented either in a food context or in a non-food context (control). Context was manipulated by priming people either with food-related thoughts or with neutral control thoughts before assessing the speed at which people approached the color green and the color red.

Results showed that in the control condition people were slightly (non-significantly) slower to approach the color red than green. However, when people were first primed with food-related thoughts, they were significantly faster to approach the color red, F(1,57)=8.94, p=.004; M<sub>Control</sub>=778 ms, M<sub>Food</sub>=687 ms. Thus, in the context of food, people were faster to approach the color red.

Experiment 2 tested how food color influenced the quantity of actual food consumption. The study had two within-subjects conditions, whereby all participants watched a video, but they were provided with one of two different types of snacks (chocolate candies): The candies were either wrapped in red wrappers or in green wrappers. We measured the quantity of candies eaten during the movie. Results showed that participants who were given snacks wrapped in

Adapted from Wansink, Brian (2004). *Food and Nutrition Behavior: How We Eat and What We Can Do About It.* New York: W. W. Norton & Company.
red ate nearly twice as many candies as participants who were given snacks wrapped in green, t(93)=-2.707, p=.008; $M_{\text{green}}=1.84$ candies, $M_{\text{red}}=3.46$ candies.

Experiment 3 sought to identify a condition when the color red exerts the strongest effect on food consumption by testing a theoretically-derived moderator of the effect. Because the color red has been a reliable indicator of food ripeness and sweetness throughout evolutionary history (Goff & Klee 2006), we hypothesized that the color red would have the strongest effect for the consumption of sweet foods rather than non-sweet foods (e.g., salty foods). Experiment 3 therefore had a 2 (food color: red vs. green) X 2 (food type: sweet vs. salty) between-subjects design. All participants watched a video and were given either candies or tortilla chips as snacks. However, the foods were either red or green. We measured the quantity of food eaten. Findings showed an interaction ($p < .05$). Conceptually replicating Study 2, people ate more candies in the red than in the green condition. However, color did not influence the consumption quantity of salty foods.

Across three studies, we find the consistent pattern that consumers have a natural attraction to red foods. We attribute this behavior to the adaptive value of food signaled by the color red: it has ripened and can be enjoyed when eaten. Therefore, when encountering an ideally sweet food, consumers approach the food faster and subsequently consume more of it when it is red (versus green). Our research establishes these basic effects, and it highlights the importance of color for food palatability. We believe this knowledge can assist food marketers in making their products more attractive and more importantly more enjoyable.

REFERENCES

Mortality Threat Can Increase or Decrease Women’s Caloric Intake Depending on Their Childhood Environment

EXTENDED ABSTRACT
Why do some women obsess over calories and go to extreme measures to prevent weight gain, while others eat without thought, having little concern for how their food choices affect their body weight? In this research, we draw on an evolutionary perspective on eating, which suggests that women’s caloric intake is related to fertility. Importantly, because female fertility across animal species is known to be regulated by environmental conditions indicating high mortality, we propose that women’s eating behavior might be influenced by perceptions of mortality dangers. In three experiments, we examine if, when, and why mortality dangers influence women’s eating psychology and food consumption.

From an evolutionary perspective, all organisms, including humans, vary on whether they follow a ‘Fast’ or a ‘Slow’ evolutionary strategy (Ellis et al. 2009). Fast strategies are associated with more rapid sexual development, earlier ages of reproduction, and higher quantity of offspring. Slow strategies, by contrast, are associated with slower sexual development, later ages of reproduction, and lower quantity of offspring. This means that whereas fast strategists behave in ways to facilitate immediate reproduction, slow strategists delay reproduction.

Whether organisms, including humans, adopt fast versus slow strategies depends on the stressfulness of their early-life environment (Ellis et al. 2009). For example, whereas people growing up in stressful low-SES environments tend to adopt faster strategies, people growing up in less-stressful high-SES environments tend to adopt slower strategies. Importantly, research shows that behavioral tendencies associated with fast versus slow strategies are especially prominent when individuals are facing mortality dangers (Griskevicius et al. 2011). Specifically, mortality threat leads people from low-SES background to exhibit fast strategy behaviors such as wanting to start a family sooner. In contrast, the same mortality threat leads people from high-SES background to exhibit slow strategy behaviors such as delaying reproduction.

Because fast and slow strategies differ in the timing of reproductive activity, these strategies also directly relate to women’s caloric consumption. This is because women’s ability to reproduce depends on having substantial amounts of body fat (Anderson and Crawford 1992). Because female reproductive timing and capacity depend on body fat, this means that reproductive timing and capacity can be sped up or slowed down by adjusting body fat levels (Salomon et al 2008, Wasserman and Barash 1983). That is, whereas increasing caloric intake increases the likelihood that a woman is physically able to reproduce, decreasing caloric intake suppresses female reproduction.

Because fast strategies are associated with immediate reproduction, they might be associated with increased caloric intake to facilitate this immediate reproduction. By contrast, because slow strategies are associated with delaying reproduction, they might be associated with decreased caloric intake to delay reproduction. Given that behavioral tendencies associated with fast versus slow strategies is most prominent under mortality threat (Griskevicius et al. 2011), in three experiments we investigated how mortality threat influences women’s eating psychology and behavior. Building on past research, we predicted that mortality cues should have different effects on depending on whether women grew up in low-SES versus high-SES environments. Whereas those from low-SES backgrounds should respond to mortality by increasing fatty food intake to facilitate body fat accumulation (consistent with a fast strategy), women from high-SES childhoods should respond to mortality by decreasing fatty food intake to hinder body fat accumulation (consistent with a slow strategy).

In Study 1, we experimentally manipulated mortality cues by having people read a news article about increasing rates of violent crime or having them read a control article. We then examined women’s (and men’s) desire for food by measuring the size of their drawing of cookies, which were drawn from memory viewed earlier in the session. Results revealed that for women growing up in more stressful, lower SES environments, the mortality news articles increased desire for food. In contrast, among women growing up in
In Study 2, mortality cues were manipulated by having women view a slideshow with visual images of escalating violent crime or control images. Women were then offered snacks (cookies and pretzels) that they could take with them when leaving the laboratory. Findings conceptually replicated the results of Study 1. Specifically, women who grew up in more stressful, lower-SES environments, mortality cues significantly increased the number of food items taken. Among women growing up in more advantaged environments, however, these same cues significantly decreased the number of food items taken.

Study 3 examined whether mortality cues would influence women’s beliefs about calorie regulation and desire to prevent weight gain. Consistent with the results from Studies 1 and 2, Study 3 found that for women growing up in lower SES environments, mortality cues significantly decreased desire to restrict calories and prevent weight gain. Among women growing up in more advantaged environments, however, these cues significantly increased desire to restrict calories and prevent weight gain. Additionally, the changes in calorie restriction were found to be fully mediated by the changes in weight regulation desires.

These studies provide important new insights into the complex relationship between environmental cues and women’s food regulation behavior and have important implications for understanding women’s consumption behaviors.

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