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Research Report

The effect of food toppings on calorie estimation and consumption

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Abstract

In this research we examine the effect of adding a food topping to the base food on consumers' calorie estimation and consumption of the augmented food (base food plus topping). We show that consumers underestimate the calorie content of augmented food with an unhealthy base, especially when the topping is healthy. However, consumers are less likely to underestimate the calorie content of augmented food with a healthy base, regardless of whether the topping is healthy or unhealthy. Further, we show that adding a healthy topping to an unhealthy base makes consumers not only underestimate the calorie content but also eat more of the augmented food.

Keywords: Calorie estimation; Food consumption; Justification; Self-control; Goal pursuit

Introduction

We love to dress up our food with toppings such as rich chocolate sauce and fresh strawberries. Food toppings are common additions to a large variety of food such as drinks, desserts, entrées, and snacks. As toppings are usually small and accessorial, dietitians and health practitioners warn that consumers may easily overlook the calorie content of these toppings (Wilder, Cheskin, & Margolis, 2007). Beyond this warning from health professionals, little is known about whether these seemingly harmless toppings would affect consumers' calorie estimation and consumption of the augmented food (base food plus topping). If weight gain is ultimately caused by a surplus in calorie intake over expenditure (Antonuk & Block, 2006), it is important to accurately estimate the calorie content of food and control consumption volume. Therefore, understanding how food toppings affect calorie estimation and consumption can help consumers avoid common pitfalls in food consumption and aid them in weight management.

Do food toppings bias calorie estimation?

The use of inferential cues in calorie estimation

As obesity is ultimately driven by excessive calorie intake, consumers are educated to keep track of their daily calorie intake (e.g., FDA's Make Your Calories Count Program). Even though the nutritional fact labels are mandatory for packaged food, calorie information is not always available for food made at home or offered in restaurants. In these cases, consumers tend to use food-related cues to infer calories (e.g., Chandon & Wansink, 2007b). One commonly used heuristic is perceived healthiness of food. Specifically, healthy food is perceived to be low in calories, and unhealthy food high in calories (Raghunathan, Naylor, & Hoyer, 2006; Wertenbroch, 1998). In the context of adding toppings to base food, the perceived healthiness of the augmented food would be affected by the (healthy or unhealthy) nature of both the base and the topping. Few studies have examined how consumers evaluate food comprised of multiple (healthy or unhealthy) items. Of the ones that exist, Chernev and Gal (2010) find that consumers estimate fewer calories in a meal consisting of a healthy (e.g., salad) and an unhealthy (e.g., hamburger) item than in the unhealthy item alone. This "averaging bias" (Chernev & Gal, 2010) is also shown

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to be stronger for consumers who are more concerned with managing their weight (Chernev, 2011a). This finding shows that consumers' motivation (e.g., weight management) can affect how they estimate calories. In the context of food with toppings, we expect that the (healthy vs. unhealthy) nature of the base food leads to consumers' different motivations in calorie estimation, affecting their judgment. Below we elaborate on these predictions.

Calorie estimation of augmented food with an unhealthy base

The pleasure of consuming indulgent but unhealthy food often comes with negative feelings (e.g., guilt) as it conflicts with the long-term health goal (Kivetz & Simonson, 2002). In order to alleviate such feelings, consumers are motivated to justify their consumption of indulgent items (e.g., Cheema & Soman, 2006; Hsee, 1995; Okada, 2005). In the context of our research, unhealthy base food determines the overall (unhealthy) nature of the consumption. Thus consumers would be motivated to construct reasons to justify such consumption. One intuitive way is to find reasons to believe that such food is *not very unhealthy*. A healthy topping can help consumers justify the consumption of the unhealthy base food, and thus may draw selective attention in consumers' evaluation of the overall nature of the food. Therefore, unhealthy base food with a healthy topping may be perceived to be healthier than the base food alone, despite the accessorial role of the topping. Meanwhile, research shows that when consumers are motivated to arrive at a conclusion (e.g., the food is not very unhealthy), they are likely to rely on heuristics that help them arrive at the desired conclusion (Chaiken, Liberman, & Eagly, 1989; Eagly & Chaiken, 1993) and ignore those that suggest otherwise (e.g., Kunda, 1990). Given the "healthy equals low-calorie" heuristic, we expect consumers to rely on this heuristic in calorie estimation and estimate fewer calories in the augmented food than in the base food alone. In contrast, an unhealthy topping conflicts with the motivation to justify the consumption of the unhealthy base, and thus may be disregarded in the evaluation of the augmented food. Therefore, we do not expect consumers to estimate more calories in the unhealthy base food with an unhealthy topping than in the base food alone.

Calorie estimation of augmented food with a healthy base

Since healthy base food is compatible with the long-term health goal, consumers do not need to construct reasons to justify the consumption (Giner-Sorolla, 2001). Instead, eating healthy food makes consumers believe that they are pursuing the health goal at the moment of consumption.[3] This feeling of temporary goal achievement signals that the goal is desirable and feasible, motivates goal commitment, and promotes goal-consistent behaviors (Fishbach, Friedman, & Kruglanski, 2003; Koo & Fishbach, 2008). When consumers commit to the health goal, they may be cautious of their calorie intake and try to be accurate in calorie estimation. Research suggests that consumers are familiar with the concept of calories and the consequences of excess calorie intake (Chernev & Gal, 2010). Some consumers even keep track of and set a limit on their daily calorie intake (Kruger, Blanck, & Gillespie, 2006; Serdula et al., 1994). When consumers are motivated to be accurate in a task, they would consider task-relevant information more carefully and apply more complex judgment rules (e.g., Kunda, 1990). For example, instead of simply relying on the heuristic of perceived healthiness, consumers may incorporate other information (e.g., the ingredients and size of the food) to arrive at a more accurate estimate. Therefore, we expect a higher calorie estimate in the healthy base food with toppings, regardless of whether the topping is healthy or unhealthy.

Method

Study 1

The objective of study 1 is to examine consumers' calorie estimation of food with different combinations of healthy and unhealthy base and topping. Two hundred and eleven undergraduate students were randomly assigned to a 2 (base food: healthy vs. unhealthy) × 3 (topping: healthy vs. unhealthy vs. no topping) between-subjects design. Green salad and chocolate cake were selected as the healthy and unhealthy base food respectively based on focus group discussions. Fresh fruit was selected as the healthy topping for both cake and salad; whipped cream and buttermilk ranch dressing were the unhealthy topping for cake and salad, respectively. The participants in healthy base food conditions were first shown the picture of a reference green salad labeled to contain 80 cal, and those in the unhealthy base food conditions were shown the picture of a reference chocolate cake labeled to contain 300 cal (see Pictures of food stimuli in study 1). To minimize the possible priming effect of calorie information on consumers' health consciousness, the participants were asked to answer five filler questions about the reference cake (e.g., quality of the picture, freshness of the cake, a suggestive name for the cake). Next, the participants were asked to imagine that they were in a restaurant having dinner and ordered a cake or a salad. Then they were presented with the description and picture (see Pictures of food stimuli in study 1) of either the base food alone, or the base food with either the healthy or unhealthy topping, and were asked to estimate the calories. Finally we also measured food attractiveness in different conditions to control for its effect on calorie estimation ("How tempting is this [food] to you?" "How appealing is this [food] to you?" and "How enjoyable would this [food] be if you were to eat it?" 7 = tempting/appealing/enjoyable) (Cronbach's alpha = .92).

Results

The results of an ANOVA showed a significant interaction between base food and topping on calorie estimate ($F(2, 205) =$

[3] We acknowledge that research suggests that achieving a focal goal (e.g., health) may stimulate the pursuit of the alternate goal (e.g., pleasure) (e.g., Fishbach and Dhar, 2005). However, this tendency of goal balancing is said to happen for sequential consumption tasks where, for example, an individual consumes the main course and the dessert in sequence. In this research, we examine consumers' behavior (calorie estimation) at the time of the consumption.