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How Health Claims Bias Calorie Estimations and Lead to Overeating

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Abstract

Why is America a land of low-calorie food claims yet high-calorie food intake? We suggest an answer to this paradox by showing that health claims can actually increase overeating. In four studies, we find that consumers' calorie inferences are assimilated toward the health claims of the restaurant brand. We further find that these biased calorie estimations lead consumers to choose higher-calorie side orders, drinks, or desserts when the restaurant claims to be healthy (e.g. Subway) compared to when it does not (e.g., McDonald's). Importantly, the halo effects of health claims on calorie estimations and on overeating can be eliminated by asking consumers to consider whether opposite health claims may be true. The studies reported here suggest innovative strategies for consumers, marketers, and policy makers searching for ways to fight obesity.

As the number of healthier menus increases, so does the weight of many Americans. Between 1991 and 2001, the proportion of obese US adults has grown from 23% to 31% of the population, a 3.0% annual compound rate (National Center for Health Statistics 2002). In the same period, the proportion of US adults consuming low-calorie food and beverages grew from 48% to 60% of the population, a 2.3% annual compound rate (Calorie Control Council National Consumer Surveys 2004). In the past five years, fast-food restaurants positioned as healthy (e.g., Subway[1]) have grown at a much faster rate than those not making these claims (e.g., McDonald's) and the proportion of US consumers trying to eat a healthy diet has grown at a 6% annual rate (Barrett 2003; Food Marketing Institute 2005). This parallel increase in obesity rates and in the popularity of healthier foods and restaurants has been noted in consumer research (Seiders and Petty 2004) and in health sciences as "the American obesity paradox" (Heini and Weinsier 1997).

We propose and test a halo-based explanation for the American obesity paradox. We argue that overeating can be exacerbated by the higher number of restaurants positioned as "healthy," because these health claims lead to an underestimation of the number of calories contained in the food. Because consumers like to balance the conflicting goals of health and taste within a single meal (Dhar and Simonson 1999), their calorie underestimation of "healthy" main courses leads them to compensate by choosing higher-calorie side orders, drinks, or desserts. The net effect is a higher likelihood of overeating (defined as undetected excessive calorie intake) when health benefits are claimed than when they are not. Conversely, prompting people to generate reasons why the health positioning of the restaurant may *not* apply to the target food would eliminate the effects of health halos on calorie estimations and on overeating and may provide an alternative to mandatory labeling.

[1] For example, Subway's television commercial starring Jared Fogle showing that Subway's turkey sandwich has only 280 calories, half the 560 calories of a Big Mac, was the most recalled television commercial during the 2004 holidays (Advertising Age 2005).

Studying how health claims influence calorie estimations and the choice of food complements helps bridge the multidisciplinary obesity research efforts in health sciences and consumer research. The Food and Drug Administration has singled out "away-from-home" consumption as a critical contributor to overeating (Food and Drug Administration 2006). Still, biased calorie estimations of restaurant foods are less frequently noted in health sciences than the other factors contributing to overeating, such as the increase in portion size (Ledikwe, Ello-Martin, and Rolls 2005; Nielsen and Popkin 2003), the higher availability of ready-made foods (Cutler, Glaeser, and Shapiro 2003), or the lower prices of calorie-rich, nutrient-poor foods (Hill et al. 2003).

Consumer researchers have extensively studied biased nutrition inferences (e.g., Andrews, Netemeyer, and Burton 1998; Moorman *et al.* 2004), but they have focused their effects on nutrition evaluation and purchase decisions, rather than calorie estimations or consumption decisions. Our health halo results also aim to contribute to the literature on consumer tradeoffs between vice and virtue goals (e.g., Dhar and Wertenbroch 2000; Kivetz and Simonson 2002; Okada 2005; Osselaer *et al.* 2005). They show the limits of a purely motivational perspective, which would have predicted that *un*healthy eaters claim lower calorie estimations because of guilt or because of self-presentation goals. They also provide evidence (based on real choices, rather than on scenarios) that people balance health and taste goals in single consumption episodes.

In this paper we start by reviewing the inferential and self-regulatory mechanisms that explain how health claims influence calorie estimations and consumers' choices of complementary food and beverages. In one field study, we show that calorie estimations are significantly lower for Subway meals than for comparable meals eaten at McDonald's. These results are confirmed in a within-subjects laboratory study, which also shows that nutrition involvement improves the accuracy of calorie estimations but does not reduce the halo effects

of health claims. A third study shows that health claims lead consumers to unknowingly order bigger meals. The fourth study demonstrates the effectiveness of the consider-the-opposite debiasing strategy. Finally, we discuss the implications of our findings for research and for improving the effectiveness of health claims for both away-for-home and in-home consumption.

CONCEPTUAL FRAMEWORK

How Health Claims Influence Calorie Estimations

Restaurants are exempted from the US 1990 Nutrition Labeling and Education Act, which made calorie and other nutrition information mandatory for packaged goods. In the absence of nutrition information, it is very difficult to estimate calorie content through visual inspection or sensory satiation (Livingstone and Black 2003). Even when consumers know the list of ingredients included in a meal, they have difficulty estimating portion sizes (Nestle 2003). Consumers asked to estimate the number of calories contained in a meal must therefore make inferences based on internal and external cues, such as the health positioning of the restaurant's brand. The ambiguity of sensory experience also increases the chances that calorie estimations are influenced by the activation of specific consumption goals, by feelings of guilt, or by self-presentation motives.

Inferential mechanisms. Consumers frequently draw inferences about missing attributes from the brand positioning or from the attributes of comparable products (for a review, see Kardes, Posavac, and Cronley 2004). For example, Ross and Creyer (1992) found that, if an attribute is missing, consumers rely on the same attribute information from other brands in the same category. This suggests that consumers may make inferences about the number of

calories in a particular food from the health positioning of the restaurant brand, or from other food items on the restaurant's menu.

Selective accessibility is one of the models that can explain the assimilation of calorie estimations toward the health claims of the restaurant. Selective accessibility contends that, unless consumers are specifically asked to consider the opposite, they will spontaneously test whether the target food is similar to the healthy standards, or specific calorie anchor, advertised by the restaurant. This increases the accessibility of standard-consistent information, leading to the assimilation of calorie estimations toward the anchor (for a review, see Mussweiler 2003). Another explanation is provided by a Brunswikian model (e.g., Fiedler 1996), which assumes that consumers normatively aggregate the information provided by the intrinsic and extrinsic cues available. In a noisy environment, extrinsic cues such as health claims can bias calorie estimations even if the information processor is not subject to motivational or memory-based biases (e.g., if consumers perform statistical regression or Bayesian updating). Conversational norms can also contribute to the influence of health claims because consumers typically assume that the advertised information is required by law to be truthful, and would therefore see no reason not to draw inferences from it (Johar 1995).

Self-regulatory mechanisms. Two conflicting goals are salient when making food consumption decisions: the hedonic goal of taste enjoyment and the more utilitarian goal of maintaining good health (Dhar and Simonson 1999; Fishbach, Friedman, and Kruglanski 2003). Many studies have shown that health primes can activate different consumption goals. Priming hedonic goals and concepts, such as sweetness, increases the intensity of desire for hedonic food (e.g., cookies) and leads consumers to choose the better tasting but less healthy option over the less tasty but healthier option (e.g., Ramanathan and Menon in press; Shiv and Fedorikhin 1999). Health primes can also influence guilt and self-presentation goals. Okada (2005) found that restaurant diners were more likely to order "Cheesecake deLite," a

relatively healthy dessert, than "Bailey's Irish Cream Cheesecake," a relatively unhealthy dessert, when they were presented side by side on the menu, but preferred the unhealthy dessert to the healthy one when each was presented alone. She attributes these findings to the fact that joint presentation increases guilt and the difficulty of social justification.

The effects of health primes on goal activation and guilt predict a contrast effect for calorie estimation, rather than the assimilation effect predicted by inferential mechanisms. To reduce their feelings of guilt and to justify their activated hedonic goal, consumers should report lower calorie estimations in the unhealthy prime condition than in the healthy prime condition. Supporting this argument, studies in nutrition and epidemiology have found that the individual trait of fear of attracting a negative evaluation is correlated with the tendency to underreport calories (Tooze *et al.* 2004).

Hypotheses. Support for the inferential arguments can be found in the many studies showing that consumers generalize health claims inappropriately (Balasubramanian and Cole 2002; Garretson and Burton 2000; Keller *et al*. 1997; Moorman 1996). For example, Andrews, Netemeyer, and Burton (1998) found that consumers believe that foods low in cholesterol are also low in fat. These halo effects also apply to restaurant menus. Kozup, Creyer and Burton (2003) found that adding a "heart-healthy" sign on a menu reduced the perceived risk of heart disease when objective nutritional information was absent, even though it was placed next to an objectively unhealthy menu item (lasagna).

In contrast, the few studies attempting to manipulate motivational factors have found little impact on calorie estimations. Muhlheim *et al.* (1998) directly manipulated guilt and self-presentation motives through a "bogus pipeline" procedure, which consisted of warning some of the study participants that the accuracy of their calorie estimations would be objectively assessed. They found that the bogus pipeline manipulation only slightly increased self-reported consumption, from 55% to 61% of actual food intake. McKenzie *et al.* (2002)

manipulated guilt and self-presentation motives by using either an obese interviewer or one with a normal weight to conduct in-person food intake interviews. They found that the body mass of the interviewer had no impact on food intake estimations. Given these results, we expect that calorie estimations are primarily driven by inferential mechanisms. Specifically, we expect lower calorie estimates when the restaurant claims to be healthy (e.g., Subway) than when it does not (e.g., McDonald's).

How Health Claims Influence Complementary Food Decisions

Complementary food decisions are those pertaining to the choice of side orders, drinks, or desserts ordered following one's choice of a main course (Dhar and Simonson 1999). Existing research has only examined the effects of health claims on the choice and consumption of the advertised food, and its evidence is mixed. Kozup, Creyer and Burton (2003) found that adding a "heart-healthy" claim to a menu increased consumers' intentions to order the food. On the other hand, Raghunathan, Walker, and Hoyer (in press) found that labeling food as "healthy" reduced the likelihood that it would be chosen because of negative taste inferences. Other studies have found that the preference for healthy foods depends on the degree of ego depletion (Baumeister 2002), cognitive load (Shiv and Fedorikhin 1999), guilt and the need for justification (Okada 2005), and individual differences in the accessibility of chronic hedonic goals (Ramanathan and Menon in press; Ramanathan and Williams in press).

In contrast, the evidence regarding the effects of health claims on complementary food decisions is more consistent. In a series of vignette studies, Dhar and Simonson (1999) found that consumers predict that people prefer to balance a unhealthy main course with a healthy dessert, or a healthy main course with an unhealthy dessert, rather than choosing two healthy or unhealthy main courses and desserts. Fishbach and Dhar (2005) found that increasing perceived progress toward the goal of losing weight activates the hedonic taste goals and

increases the likelihood that people choose a chocolate bar over an apple. Guilt is one of the explanations why consumers like to balance health and taste goals within a single consumption episode. Ramanathan and Williams (in press) found that some consumers are able to launder the guilt created by their choice of an indulgent cookie by choosing the utilitarian option in a subsequent choice. We therefore expect that, once the choice of the main course has been made, consumers choose side orders, desserts, and beverages containing more calories if the main course is positioned as healthy than if it is not.

Moderating Factors

Clearly, not all consumers base their food consumption decisions on health or nutrition considerations. One might expect that consumers highly involved in nutrition would be more knowledgeable about it, and less likely to be influenced by health claims. Yet past research suggests that nutrition involvement may not moderate the effects of health claims. Moorman (1990) found that nutrition involvement increases the self-assessed ability to process nutrition information but does not improve nutrition comprehension or the nutrition quality of food choices in two product categories. Two studies (Andrews, Burton, and Netemeyer 2000; Andrews *et al.* 1998) found that objective nutrition knowledge improves the accuracy of some nutrition evaluations but does not significantly reduce erroneous inferences across nutrients or the effectiveness of objective nutrient information in reducing these over-generalizations.

More generally, studies have found that association-based errors, such as those resulting from priming, cannot be corrected by increasing incentives and the degree of elaboration (Arkes 1991). In fact, Johar (1995) found that highly-involved consumers are more likely to be deceived by implied advertising claims because involvement increases the likelihood of making invalid inferences from incomplete-comparison claims, such as "this brand's sound quality is better." Chapman and Johnson (1999) showed that cognitive elaboration, one of the

consequences of involvement, actually enhances anchoring effects because it facilitates the selective retrieval of anchor-consistent information. For these reasons, we expect that nutrition involvement increases the overall accuracy of calorie estimations but does not moderate the effects of health claims on calorie estimations and on complementary food decisions.

How can health halos be reduced? If calorie inferences are caused, at least in part, by priming and selective activation, one solution is to encourage consumers to question the validity of the health prime. Drawing attention to the priming source reduces priming effect even if the activation of information in memory occurred non-consciously (Strack *et al.* 1993). The effectiveness of the debiasing strategy is enhanced if people are asked to consider evidence inconsistent with the prime. Mussweiler, Strack, and Pfeiffer (2000), working on the estimation of the value of a used car, showed that instructing people to consider whether a claim opposite to the one primed may be true increases the accessibility of claim-inconsistent knowledge, and therefore reduces selective-accessibility biases.

In summary, we predict that health claims reduce calorie estimations and lead consumers to order high-calorie complementary food or drinks. We test these predictions in one field study and in three laboratory experiments. In Study 1, we examine whether meals purchased at Subway are perceived to be lower in calories than meals purchased at McDonald's (which contain the same number of calories). In Study 2, we ask consumers to estimate the number of calories in four Subway and McDonald's sandwiches and test whether nutrition involvement moderates health halo effects. In the last two laboratory experiments we test the effects of health claims on consumption. The first shows that health claims lead to lower calorie estimations but higher-calorie meals. The second establishes the effectiveness of the consider-the-opposite strategy in debiasing the effects of health claims on calorie estimation and on the choice of complementary foods.

STUDY 1: CALORIE ESTIMATIONS BY SUBWAY AND MCDONALD'S DINERS

Method

We asked consumers who had just finished eating at McDonald's or Subway to estimate the number of calories contained in their meal, and compared their estimates to the actual calorie content of the meals. Study 1 was conducted on nine weekdays in three medium-sized Midwestern US cities. As they completed their meal, every fourth person was systematically approached and asked if they would answer some brief questions for a survey. No mention was made of food at that point. During this process, the interviewer unobtrusively recorded the type and size of the food and drinks from the wrappings left on the person's tray. In case of uncertainty (e.g., to determine if the beverage was diet or regular), the interviewer asked for clarification from the respondents.

Nutrition information provided by the restaurants was then used to compute the actual number of calories of each person's meal. Of the 392 people who were approached while they were finishing a Subway meal, 253 (65%) agreed to participate. Of the 379 people who were approached while they were finishing a McDonald's meal, 265 (70%) agreed to participate.

Results

To pre-test the health positioning of McDonald's and Subway, we asked 49 regular customers of both restaurants who were eating at Subway or McDonald's to indicate their agreement with the sentence: "The food served here is healthy" on a nine-point scale anchored at 1 = "strongly disagree" and 9 = "strongly agree". As expected, Subway meals were rated as significantly more healthy (M = 6.2) than McDonald's meals (M = 2.4), $F(1, 49) = 80$, $p < .001$.

To increase the comparability of McDonald's and Subway meals, we restricted the analysis to the meals consisting of a sandwich, a soft drink, and a side order. This yielded a total of 320 meals (193 for McDonald's and 127 for Subway). To test the hypothesis that calorie estimations are lower for Subway than for McDonald's meals containing the same number of calories, we estimated the following regression via OLS:

(1) $ESTCAL = \alpha + \beta*HEALTHCLAIM + \delta*ACTCAL + \lambda*HEALTHCLAIM*ACTCAL + \varepsilon$

Where ESTCAL is the estimated number of calories, HEALTHCLAIM is a binary variable taking the value of ½ for Subway meals and -½ for McDonald's meals, ACTCAL is the mean-centered actual number of calories of the meals, and ε is the error term. We included ACTCAL as a covariate to control for the fact that McDonald's meals tend to be bigger than Subway meals.

As expected, the coefficient for HEALTHCLAIM was negative and statistically significant ($\beta = -151$, $t = -3.6$, $p < .001$). These participants believed the meals from Subway contained an average of 151 fewer calories than a same-calorie meal at McDonald's. The regression parameters enable us to predict that, for a meal containing 1,000 calories, the mean calorie estimation will be 744 calories for someone eating at McDonald's and only 585 calories (21.3% lower) for someone eating at Subway. The coefficient for ACTCAL and for the interaction (respectively, $\delta = .29$, $t = 4.7$, $p < .001$; and $\lambda = -.12$, $t = -.9$, $p = .34$), indicated that consumers tended to underestimate calories more significantly for large meals than for small meals, but that the effect of meal size is similar for both Subway and McDonald's meals. The same results were obtained when using the percentage deviation ((estimated – actual)/actual) as the dependent variable ($\beta = -19.2$, $t = -3.9$, $p < .001$; $\delta = -.06$, $t = -7.8$, $p < .001$; and $\lambda = -.03$, $t = -1.8$, $p = .07$), indicating that the mean percentage deviation is more negative (more biased) for Subway meals than for McDonald's meals containing the same number of calories.

--- Insert Figure 1 about here ---

To illustrate the effects of health claims on calorie estimations for comparable meals, we computed the mean calorie estimate for small, medium, and large meals (categorized on the basis of actual number of calories). As shown in Figure 1, mean calorie estimates were lower for Subway meals than for comparable McDonald's meals in each size tier (for small meals: 473 vs. 563 cal, $F(1, 106) = 4.0$, $p < .05$; for medium meals: 559 vs. 764 cal, $F(1, 105) = 9.1$, $p < .01$; and for large meals: 646 vs. 843 cal, $F(1, 103) = 4.1$, $p < .05$).

Discussion

Study 1 examines the general health halo that leads people to believe that Subway meals contain 21.3% fewer calories than same-calorie McDonald's meals. It also shows that calorie estimations are not primarily driven by guilt or by self-presentation goals, as this would have predicted lower calorie estimations by McDonald's customers than by Subway customers. These results nonetheless raise two important questions that need to be addressed in subsequent studies. First, the results of Study 1 might be caused by intrinsic differences between self-selected Subway and McDonald's diners. To explore this, we recontacted 58 participants who provided their telephone number. Although we found no difference in the body mass index (BMI = weight in kilograms/squared height, $M = 23.4$ kg/m² for McDonald's customers vs. $M = 23.6$ kg/m² for Subway customers, $F(1, 56) = .1$, $p = .76$), the groups may have differed on other dimensions.

A second issue is that participants in Study 1 evaluated only one McDonald's or Subway meal. Their estimations might have been better calibrated if they had been asked to make multiple estimates or asked to compare meals instead of estimating a single meal. This is because consumers pay more attention to hard-to-evaluate attributes (such as calories) in joint evaluations than in separate evaluations (Hsee 1996).

We address these issues in Study 2 by using a within-subjects design in which respondents estimate the calories contained in experimenter-selected Subway and McDonald's sandwiches containing the same number of calories. Study 2 also enables us to examine whether nutrition involvement can mitigate the biasing effects of Subway and McDonald's health claims for calorie estimations.

STUDY 2: CAN NUTRITION INVOLVEMENT MITIGATE THE HALO EFFECTS OF HEALTH CLAIMS ON CALORIE ESTIMATIONS?

Method

Study 2 used a two (health claims: Subway vs. McDonald's) by two (actual number of calories: 330 vs. 600) within-subjects design. It was conducted among university students and staff members, who were given the opportunity to win a series of raffle prizes in exchange for their participation. We asked 316 of these consumers who had eaten at least three times at Subway and McDonald's in the previous year to estimate the number of calories contained in two Subway sandwiches (a six-inch ham and cheese sandwich containing 330 calories and a 12-inch turkey sandwich containing 600 calories) and in two McDonald's burgers (a cheeseburger containing 330 calories and a Big Mac containing 600 calories). The ordering of the restaurants was counterbalanced across participants.

To measure their nutrition involvement, we used a five-item scale and asked respondents to indicate their agreement with these statements: "I pay close attention to nutrition information," "It is important to me that nutrition information is available," "I ignore nutrition information" (reverse coded), "I actively seek out nutrition information," and "Calorie levels influence what I eat" on a nine-point scale anchored at 1 = "strongly disagree" and 9 = "strongly agree". After verifying the reliability (α = .85) and uni-dimensionality of the scale (62% of the variance extracted by the first principal component), we averaged the

responses to the five items and categorized respondents into a low or high nutrition involvement group via a median split.

Results

We used a repeated-measure ANOVA with two within-subjects factors and one between-subject factor. The two within-subject factors were HEALTHCLAIM (which indicates whether food was from Subway or McDonald's) and ACTCAL (which measured the actual number of calories of the food—330 or 600 calories). The between-subject factor was NUTINV, which indicates whether respondents belonged to the high or low nutrition involvement group (similar results were obtained when using the continuous scale). We included all two-way and three-way interactions. Because the order of estimations had no effect on calorie estimations and did not interact with any of the other factors, we excluded this factor from the analysis reported here.

--- Insert Figure 2 about here ---

The main effects of HEALTHCLAIM and ACTCAL and their interactions were all statistically significant (respectively, $F(1, 314) = 158$, $p < .001$; $F(1, 314) = 468$, $p < .001$; and $F(1, 314) = 72.5$, $p < .001$). As shown in Figure 2, calorie estimations were lower for Subway sandwiches than for McDonald's sandwiches containing the same number of calories and the halo effects of health claims were stronger for the sandwiches containing 600 calories ($M = –200$ calories, a 33% underestimation) than for smaller sandwiches containing 330 calories ($M = –80$ calories, a 24% underestimation). In addition, the main effect of nutrition involvement and its interaction with ACTCAL were both statistically significant (respectively, $F(1, 314) = 9.8$, $p < .01$ and $F(1, 314) = 6.1$, $p < .05$), indicating that respondents highly involved in nutrition had higher (more accurate) calorie estimations, especially for the larger sandwiches. As expected, however, the interaction between NUTINV

and HEALTHCLAIM and the three-way interaction were not statistically significant (respectively $F(1, 314) = .9$, $p = .34$ and $F(1, 314) = .4$, $p = .55$). This indicates that nutrition involvement did not reduce the biasing effects of the restaurant brands' health positioning on consumers' calorie estimations.

Discussion

Study 2 shows that even consumers familiar with both restaurants estimate that Subway sandwiches contain significantly fewer calories than McDonald's sandwiches containing the same number of calories. Study 2 therefore replicates the findings from Study 1 in a repeated-measure context. The within-subjects design of Study 2 allows us to rule out the alternative explanation that the results of Study 1 were caused by self-selection or by unobserved differences in the type of meals consumed in the two restaurants. Study 2 also shows that, although nutrition involvement improves the quality of calorie estimations, it does not reduce the halo effects of the restaurant brand's health positioning.

Taken together, Studies 1 and 2 show converging evidence that Subway and McDonald's health claims bias consumers' calorie estimations. In Study 3, we examine the effects of these claims on consumers' complementary food decisions. This also allows us to test the alternative explanation that the results of Studies 1 and 2 are caused by simple response scaling biases, i.e., that the health positioning of Subway and McDonald's influenced only consumers' calorie ratings, not their internal estimation of the healthiness of the food. This would predict that health claims would have no impact on the decision to choose low- or high-calorie side orders and drinks. Finally, by collecting calorie estimation data after the consumption decision task, Study 3 tests whether they mediate the effects of health claims on complementary food decisions.

STUDY 3: CAN HEALTH CLAIMS LEAD CONSUMERS TO UNKNOWINGLY CHOOSE HIGHER-CALORIE SIDE ORDERS AND DRINKS?

Method

Forty-six undergraduate students were recruited on campus and were paid $2 to participate in this and another unrelated study. Half the participants were given a coupon for a McDonald's Big Mac sandwich and the other half were given a coupon for a Subway 12-inch Italian BMT sandwich. To provide a more conservative test of the effects of health claims on consumption decisions, the "healthy" food used in Study 3 has actually 50% more calories than the "unhealthy" food (a 12-inch Subway Italian BMT sandwich has 900 calories and a Big Mac has 600 calories).

We then gave the participants a menu and asked them to indicate what they would like to order with their sandwich, if anything. The menu included a small, medium, or large regular fountain drink (containing 155, 205, and 310 calories respectively); a small, medium, or large diet fountain drink containing no calories; and one or two chocolate chip cookies (containing 220 calories per cookie). These items were chosen because they are the only side orders common to both McDonald's and Subway. We then asked participants to estimate the number of calories contained in their sandwich, beverage, and cookies. Finally, we measured how important eating healthily is to them by asking them to indicate their agreement with three sentences ("Eating healthily is important to me," "I watch how much I eat," and "I pay attention to calorie information") on a nine-point scale anchored at 1 = "strongly disagree" and 9 = "strongly agree".

Results

We first looked at the total number of calories contained in the beverages and cookies that were ordered in the Subway and McDonald's coupon condition. Compared to those who had received a Big Mac coupon, participants who received the Subway coupon were less likely to order a diet soda, more likely to upgrade to a larger drink, and more likely to order cookies. As a result, participants receiving a Subway coupon ordered side items containing more calories (M = 111 cal) than participants receiving a McDonald's coupon (M = 48 cal), $F(1, 44) = 4.0$, $p < .05$ (see Figure 3). Because the Subway sandwich also contained more calories than the McDonald's sandwich, participants in the virtue condition ended up with a meal containing 56% more calories (M = 1,011 cal) than participants in the vice condition (M = 648 cal), $F(1, 44) = 132.9$, $p < .001$.

--- Insert Figure 3 about here ---

We now examine whether participants receiving the Subway coupon realized they were ordering calorie-rich side orders and ended up with a much larger meal than participants receiving the McDonald's coupon. As shown in Figure 3, calorie estimations for the side orders were similar for participants with the Subway coupon (M = 48 cal) and for participants with the Big Mac coupon (M = 43 cal), $F(1, 44) < .1$, $p = .43$. Similarly, calorie estimations for the main sandwich were similar in both conditions (M = 439 calorie for the 12-inch Subway sandwich vs. M = 557 calories for the Big Mac, $F(1, 44) = 2.4$, $p = .13$). As a result, calorie estimations for the total meal were similar in the healthy prime condition (M = 487cal) and in the unhealthy prime condition (M = 1,011), $F(1, 44) = 1.9$, $p = .17$. Because the actual number of calories of the meal was significantly higher in the Subway (healthy prime) condition than in the McDonald's (unhealthy prime) condition, the calorie underestimation was significantly larger in the healthy prime condition ($M_{(estimated - actual\ calories)}$ = –524 cal, a 52%

underestimation) than in the unhealthy prime condition ($M_{(estimated - actual\ calories)}$ = –48 cal, a 7% underestimation), $F(1, 44) = 29.9$, $p < .001$. These results indicate that the actual increase in calories between the Subway and McDonald's coupon conditions was not captured by consumers' calorie estimations.

We also examined whether the effects of health claims on complementary food decisions are mediated by biases in the estimation of the number of calories of the main sandwich. When entered alone in a regression of the actual number of calories contained in complementary food choices, the parameter of the binary variable capturing the coupon manipulation was statistically significant (B = 63.3, $t = 2.0$, $p < .05$). However, this parameter becomes insignificant when the calorie estimation bias, measured as the difference between the actual and estimated number of calories in the sandwich, is entered in the regression as a covariate (B = 23.7, $t = .6$, $p = .56$). A Sobel test shows that the mediation effect is statistically significant ($z = 2.32$, $p < .05$). In contrast, the health claim manipulation did not activate the goal of eating healthily. Respondents were as likely to agree with the three sentences ("Eating healthily is important to me," "I watch how much I eat," and "I pay attention to calorie information") in both conditions (respectively, $F(1, 44) = .4$, $p = .53$; $F(1, 44) < .1$, $p = .94$; and $F(1, 44) < .1$, $p = .86$). This shows that the effects of health claims on complementary food decisions are not mediated by the activation of healthy eating goals.

Discussion

Although the "healthy" Subway sandwich contained 50% more calories than the "unhealthy" Big Mac, consumers ordered higher-calorie drinks and cookies when they received a coupon for the Subway sandwich than when they received a coupon for the Big Mac. Study 3 contributes to Studies 1 and 2 because its finding that health claims influence complementary food decisions, and not just calorie estimations, rules out the hypothesis that

health halos are simple response biases. A second contribution is that consumption effects were found even when consumers were not explicitly asked to estimate calories. This supports the finding of Study 2 that health halo effects are robust, regardless of consumers' nutrition involvement. Third, Study 3 shows that the effects of health claims on complementary food consumption are mediated by the calorie estimations for the main sandwich and by the activation of healthy eating goals.

In Study 4, we examine whether instructions to consider the opposite can reduce the effects of health halo on calorie estimations and on complementary consumption decisions. Study 4 addresses some of the remaining issues raised by the results of Studies 1–3. First, we manipulate health claims by changing the name of the restaurant and the menu while keeping the target food constant. Second, we test whether the results of Studies 1–3 regarding estimations are driven by the lack of familiarity with calories by asking respondents to estimate the amount of meat contained in the sandwiches in ounces, a more familiar unit. Finally, we examine whether the parallel findings of Study 3 for calorie estimations and complementary consumption decisions hold in a between-subjects design in which some participants are asked to choose complementary food while the others are asked to estimate the number of calories of the meal.

STUDY 4: CORRECTING THE EFFECTS OF HEALTH CLAIMS ON CALORIE ESTIMATIONS AND ON CHOICE OF COMPLEMENTARY FOOD

Method

Study 4 used a two (claims: healthy vs. unhealthy) by two (debiasing instructions: none or consider the opposite) by two (decision task: calorie estimation for the main meal or choice of complementary foods) between-subjects design. We recruited 214 students on campus and

gave them a typical fast-food menu including the target sandwich and eight other food choices. The menu provided a short description of the food, prices, and calorie content (except for the target food). The target food was described as "Our famous Classic Italian Sandwich, with Genoa salami, pepperoni, and Bologna". In the healthy prime condition, the name of the restaurant was "Good Karma Healthy Foods" and the menu included healthy choices such as cream of carrot soup (90 calories) or an organic hummus platter (280 calories). In the unhealthy prime condition, the name of the restaurant was "Jim's Hearty Sandwiches" and the menu included high-calorie foods such as "Beef on a Wick" (800 calories) or a "Sausage Sandwich" (760 calories).

In the questionnaire, we indicated that we were interested in food preferences and we emphasized that there were no right or wrong answers. To ensure that participants studied the menu, we first asked them to rate the average price of the restaurant's food. The participants then went to a location in the room where a six-inch Italian Bologna sandwich was on a plate along with a 20 oz glass of Coca-Cola Classic (clearly labeled). This meal contained 660 calories and was presented as having been ordered from "Good Karma Healthy Foods" restaurant or from "Jim's Hearty Sandwiches" restaurant. Participants in the consider-the-opposite estimation strategy were then asked to "write down three reasons why the sandwich is not typical of the restaurant that offers it. That is, write down three reasons why this is a generic meal that could be on any restaurant menu." Participants in the control condition received no further instructions.

Participants in the estimation condition were then asked to write down the calories contained in this meal (the sandwich and the beverage) and the amount of meat in the sandwich (in ounces). Participants in the consumption condition were not asked to make any estimation but were instead asked to indicate their intention to order potato chips with this meal, on a nine-point scale anchored at 1 ("I wouldn't want any chips") and 9 ("I would want

some chips"). Because we were particularly interested in the consumption intentions data, we assigned twice as many people to this condition as to the calorie estimation condition. On the last page of the questionnaire, we asked all the participants to rate how important healthy eating is to them by indicating their agreement with four sentences. Finally, all participants were asked to guess the purpose of the study. Four out of the 214 participants guessed the purpose of the study and their answers were eliminated from the analyses.

Results

To examine the effects of health claims and of the consider-the-opposite instructions, we conducted a series of ANOVAs with two independent variables: HEALTHCLAIM, a variable measuring whether participants received the healthy or unhealthy menu, and DEBIAS, a variable measuring whether participants were in the control or consider-the-opposite condition. Looking at calorie estimations first, we found that the main effects of HEALTHCLAIM and of DEBIAS were not statistically significant (respectively, $F(1, 65) = 2.0$, $p = .16$; and $F(1, 65) = .1$, $p = .81$). However, the expected interaction between HEALTHCLAIM and DEBIAS was statistically significant ($F(1, 65) = 5.2$, $p < .05$). In the control condition, calorie estimations were significantly lower with the healthy menu ($M = 409$ calories, a 38% underestimation) than with the unhealthy menu ($M = 622$ calories, a 6% underestimation), $F(1, 28) = 7.5$, $p < .01$. In the consider-the-opposite condition, calorie estimations were essentially the same for the healthy menu ($M = 526$ calories, a 20% underestimation) as for the unhealthy menu ($M = 477$ calories, a 28% underestimation), $F(1, 37) = .4$, $p = .55$ (see Figure 4a).

To test whether the effects of health claims persist for familiar units, we conducted the same ANOVA but with respondents' estimates of the amount of meat in the sandwich as the dependent variable. As for calorie estimations, the main effects of MENU and DEBIAS were

not significant (respectively, $F(1, 65) = 1.6$, $p = .21$ and $F(1, 65) = .6$, $p = .42$) but their interaction was statistically significant ($F(1, 65) = 6.9$, $p < .05$). In the control condition, the estimated amount of meat was lower with the healthy menu ($M = 3.4$ oz) than with the unhealthy menu ($M = 5.5$ oz), $F(1, 28) = 4.9$, $p < .05$. In the consider-the-opposite condition, estimated weights were the same in both conditions ($M = 5.2$ oz with the healthy menu and $M = 4.8$ oz with the unhealthy menu, $F(1, 37) = .3$, $p = .60$).

--- Insert Figure 4 about here ---

We studied the effects of health claims on consumption intentions (measured on a 1 to 9 scale) using the same ANOVA as for the calorie and weight estimates and found exactly the same effects, but in the expected opposite direction (see Figure 4b). The main effects of HEALTHCLAIM and of DEBIAS were not statistically significant (respectively, $F(1, 141) = .3$, $p = .59$ and $F(1, 141) = 1.9$, $p = .18$) but their interaction was statistically significant ($F(1, 141) = 4.2$, $p < .05$). In the control condition, intentions to consume chips were higher in the healthy menu condition ($M = 7.2$) than in the unhealthy menu condition ($M = 6.0$), although the difference was only marginally statistically significant ($F(1, 54) = 3.6$, $p < .06$). In the consider-the-opposite condition, however, consumption intentions were not statistically different between the healthy ($M = 5.6$) and unhealthy ($M = 6.3$) conditions ($F(1, 83) = 1.3$, $p = .26$).

In the final analysis, we examined whether these results can be mediated by the activation of the goal of eating healthily. The ratings of respondents in the healthy and unhealthy menu conditions were not statistically different on any of the four sentences measuring healthy eating goals ($F(1, 206) = .6$, p = .42 for "I watch how much I eat," $F(1, 206) = 2.0$, p = .16 for "Eating healthily is important to me," $F(1, 206) = .5$, p = .49 for "I pay attention to calorie information," and $F(1, 206) = .4$, p = .50 for "Looking thin is very important to me"). These

results show that the effects of health claims on calorie estimation and complementary food decisions are not mediated by the activation of healthy eating goals.

Discussion

The most important contribution of Study 4 is that the health halo effects on calorie estimation and complementary consumption decisions disappear when consumers consider arguments contradicting the health claims. In fact, the effects of health claims are slightly reversed when participants consider opposite arguments. Although this reversal is not statistically significant, its robustness for all dependent variables suggests that some overcorrection might be taking place. Study 4 also shows that manipulating the name of the restaurant and the type of food on the menu, while keeping the target meal constant, suffices to influence consumers' choice of side orders and their estimation of the number of calories contained in a familiar meal consisting of a ham sandwich and a cola.

These results show that the health halo effects found in Studies 1–3 were not specific to the manipulation used (the Subway and McDonald's brands) and can be relatively easily created from a restaurant name and the choice of other items on the menu. The findings of Study 4 also rule out the alternative explanation that the results of Studies 1–3 were driven by differences in food type in the healthy and unhealthy conditions or by the choice of unfamiliar units of measurement (calories). Finally, Study 4 supports the findings of Study 3, that health claims influence complementary consumption decisions even when people are not explicitly asked to estimate calories. Next, we examine the factors that may underlie these effects and their implications for the debate on the cause and remedies of obesity.

GENERAL DISCUSSION

The goal of this paper is to help explain the American obesity paradox—low-fat food and high-fat people. The results of four studies show that consumers estimate that food contains up to 35% fewer calories when it is sold at restaurants claiming to be healthy, such as Subway, than when it comes from restaurants seen as unhealthy, such as McDonald's. These findings are obtained when estimating single sandwiches as well as entire fast-food meals, before and after intake, and for familiar and unknown restaurant brands. Remarkably, the biasing effects of health claims on calorie estimations are as strong for consumers highly involved in nutrition than for consumers with little interest in nutrition or healthy eating. These results also hold when calories are measured in the field, as people are finishing their own meals, a context which should tempt consumers strategically to minimize their estimations in order to reduce their guilt or to look good in the eyes of others.

Two studies further show that the biasing effects of health claims on calorie estimation lead to overeating, that is, to undetected increases in calorie intake. This is because consumers choose higher-calorie side orders, desserts, and beverages when the main course is positioned as healthy than when it is positioned as unhealthy. Indeed, consumers chose side orders containing 131% more calories after selecting the "healthy" main course rather than the "unhealthy" one—even though the "healthy" option already contained 50% more calories than the "unhealthy" one. As a result, meals ordered from "healthy" restaurants can actually contain more calories than meals ordered from "unhealthy" restaurants, without consumers noticing. We also find that the effects of health claims on complementary food choices are mediated by how much consumers bias calorie estimations for the main course, and not by feelings of guilt or by the activation of healthy eating goals. Fortunately, we find that the effects of health claims on calorie estimations and complementary consumption can be

eliminated by prompting consumers to consider whether the opposite health claims may be true.

Implications for Researchers

These findings also have implications for the literature on consumer self -regulation, and particularly for studies of the effects of goals on behavioral performance. Polivy and Herman (1985) coined the "what-the-hell" effect to describe the behavior of restrained eaters who overindulge when they exceed their daily calorie goal because they consider that the day is lost. The "what-the-hell" effect has been shown to occur for negatively-framed goals, such as setting a daily calorie goal (Cochran and Tesser 1996), but not when the goal is framed as a gain or when the goal is distant (e.g., a weekly calorie goal). Further research could test whether the "what-the-hell" effect may moderate the effects of health claims on consumption. Because unhealthy meals are perceived to contain more calories than healthy meals, restrained eaters are more likely to think that they have exceeded their calorie goal when the food or restaurant is seen as "unhealthy" than when it is not. Restrained eaters are thus more likely to experience a "virtual what-the-hell" effect and to order more foods in unhealthy restaurants, which goes in the opposite direction of the health halo effect discussed in this paper. The net effect in terms of calorie intake would then depend on the proportion of restrained eaters with violated calorie goals among all consumers eating in each type of restaurant.

The success of the consider-the-opposite debiasing strategy suggests that selective activation may underlie the effects of health claims on calorie estimations and consumption decisions. Still, further research is needed before other potential explanations, such as simple priming effects caused by spreading activation, normative updating, or conversational norms, can be ruled out. For example, the menus used in Study 4 could be modified to include both healthy and unhealthy items. The selective accessibility account would predict that consumers

will retrieve more healthy items from a restaurant with a healthy name and more unhealthy items from a restaurant with an unhealthy name, and that the effect of the restaurant name on calorie estimates will be mediated by the frequency of the items retrieved.[2]

More generally, more research is necessary to examine whether health claims have the same effects on prudent and impulsive consumers. Whereas most studies found that food temptations prime hedonic goals, Fishbach, Friedman, and Kruglanski (2003) found that they activate the overriding dieting goals among prudent consumers. Prudent and impulsive consumers also differ in how they respond to hedonic primes over time. Ramanathan and Menon (in press) found that hedonic primes increase preferences for unhealthy foods for both groups but that the preference for hedonic food persists only for impulsive consumers. Ramanathan and Williams (in press) further showed that balancing hedonic and utilitarian goals is more common among prudent consumers than impulsive consumers.

Implications for Managers, Policy Makers, and Consumers

One focus of health professionals, public policy makers, and responsible marketers is to reduce overeating by proposing healthier meals. This is obviously very commendable and we must emphasize that our arguments by no means imply that consumers should not eat at restaurants that, like Subway, offer healthier meals than their competitors. Still, our findings show that the public health benefits of healthier foods are at least partially negated by the halo effects of health claims on calorie estimation and their impact on the choice of calorie-rich complementary food and beverages.

More generally, the strategy to promote healthy eating leads some to point a finger at all food indulgences. This can be counterproductive because temptations abound and willpower is notoriously fallible. The risk is that this accusatory approach may lead to demotivation and

[2] We thank one of the anonymous reviewers for this suggestion.

create a backlash. Our findings suggest that another worthy public policy effort may be to help people estimate better the number of calories they consume. There is nothing wrong with occasionally eating a high-calorie meal as long as people recognize that they have eaten a lot of calories and that they need to adjust their future calorie intake or expenditure accordingly. In fact, countries with a more hedonic attitude toward food, like France or Belgium, tend to have less serious obesity problems (Rozin *et al.* 1999).

Reducing biases in calorie estimation is important because even small calorie underestimations can lead to substantial weight gain. For example, Study 1 found that the mean estimation of a 1,000 calorie meal was 159 calories less if the meal was bought at Subway than if it was bought at McDonald's. This difference can lead to substantial weight gain if people eating at Subway think that they have earned a 159 calorie credit that they can use toward eating other food. In fact, given that a 3,500-calorie imbalance over a year leads to a one pound weight gain (Hill *et al.* 2003), an extra 159 calories will lead to an extra 4.9 pound weight gain for people eating a 1,000 calorie meal at Subway twice a week compared to those eating a comparable meal at McDonald's with the same frequency.

Our findings regarding the robustness of confirmation biases suggest that it is unlikely that consumers will learn to estimate calories from experience. In Study 3, for example, meals were 56% larger when participants received a coupon for a Subway sandwich than when they received a coupon for a Big Mac, yet calorie estimations were 19% lower for the Subway meals than for the McDonald's meals. What can be done to improve the accuracy of calorie estimation? Although one suggestion may be to make nutrition information mandatory in all restaurants, this is vigorously opposed by the restaurant industry on the grounds that it is impractical and anti-commercial. Our findings on the effectiveness of the consider-the-opposite strategy suggest that a potentially less controversial solution would be to launch educational campaigns encouraging people to examine critically the health claims associated

with various restaurants and foods, in addition to evaluating the quality and quantity of the ingredients.

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FIGURE 1

STUDY 1: CALORIE ESTIMATIONS OF SUBWAY AND MCDONALD'S DINERS

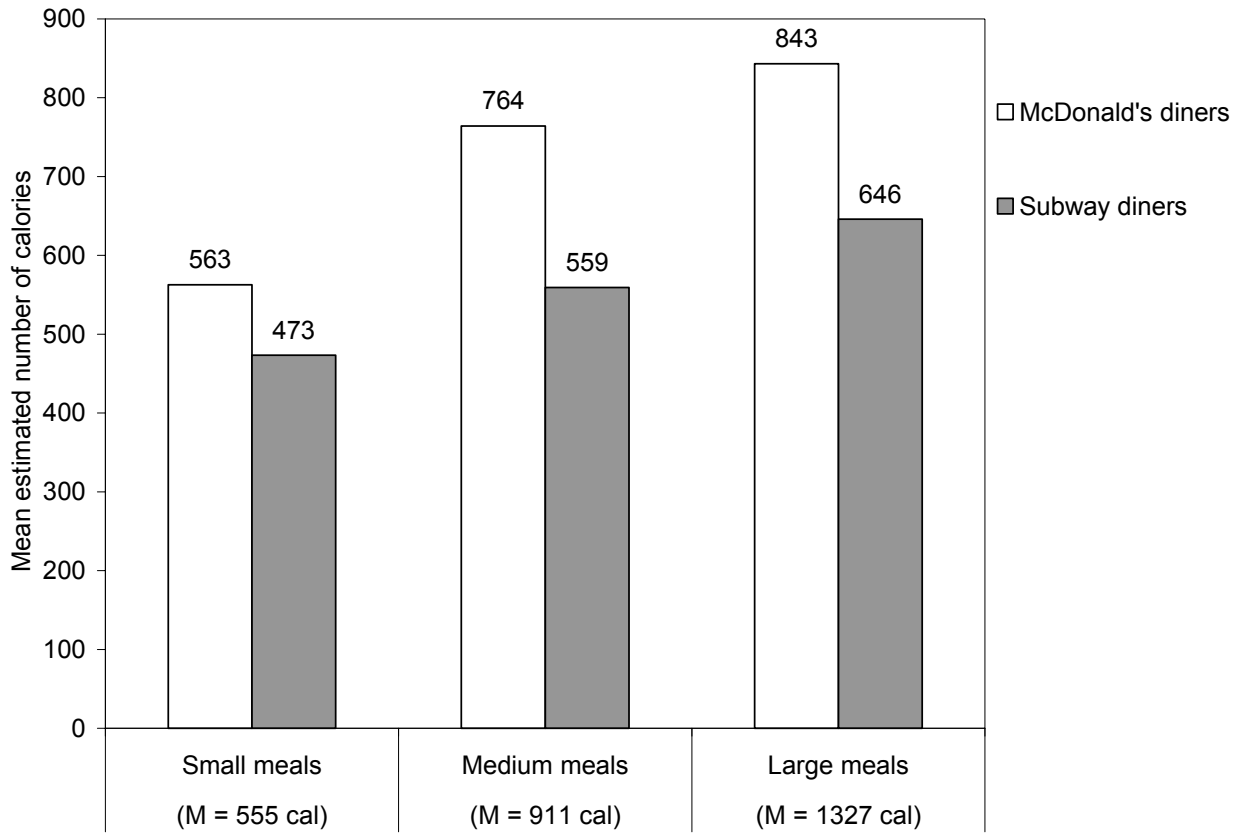

FIGURE 2

STUDY 2: HOW NUTRITION INVOLVEMENT INFLUENCES CALORIE ESTIMATIONS FOR SUBWAY AND MCDONALD'S SANDWICHES

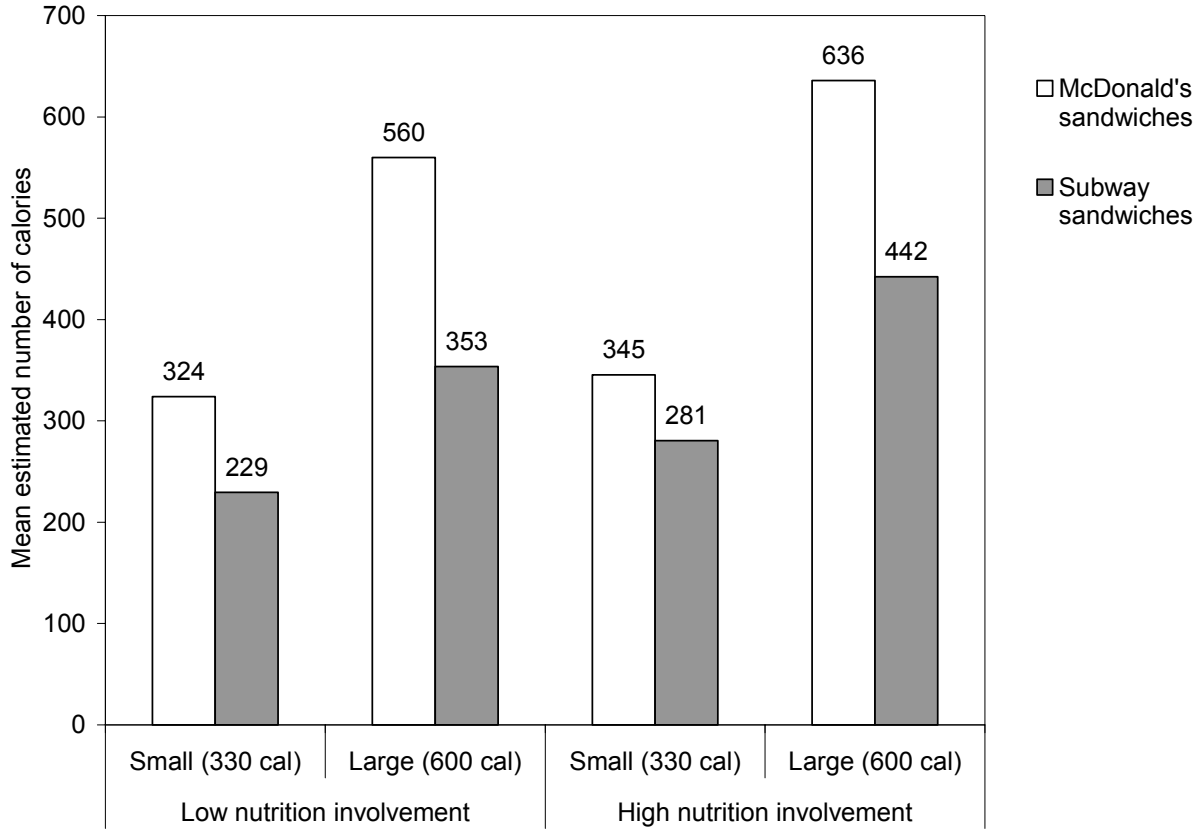

FIGURE 3

STUDY 3: HOW SUBWAY AND MCDONALD'S COUPONS INFLUENCE THE ESTIMATED AND ACTUAL NUMBER OF CALORIES (FOR THE MAIN SANDWICH, THE SIDE ORDERS, AND THE WHOLE MEAL)

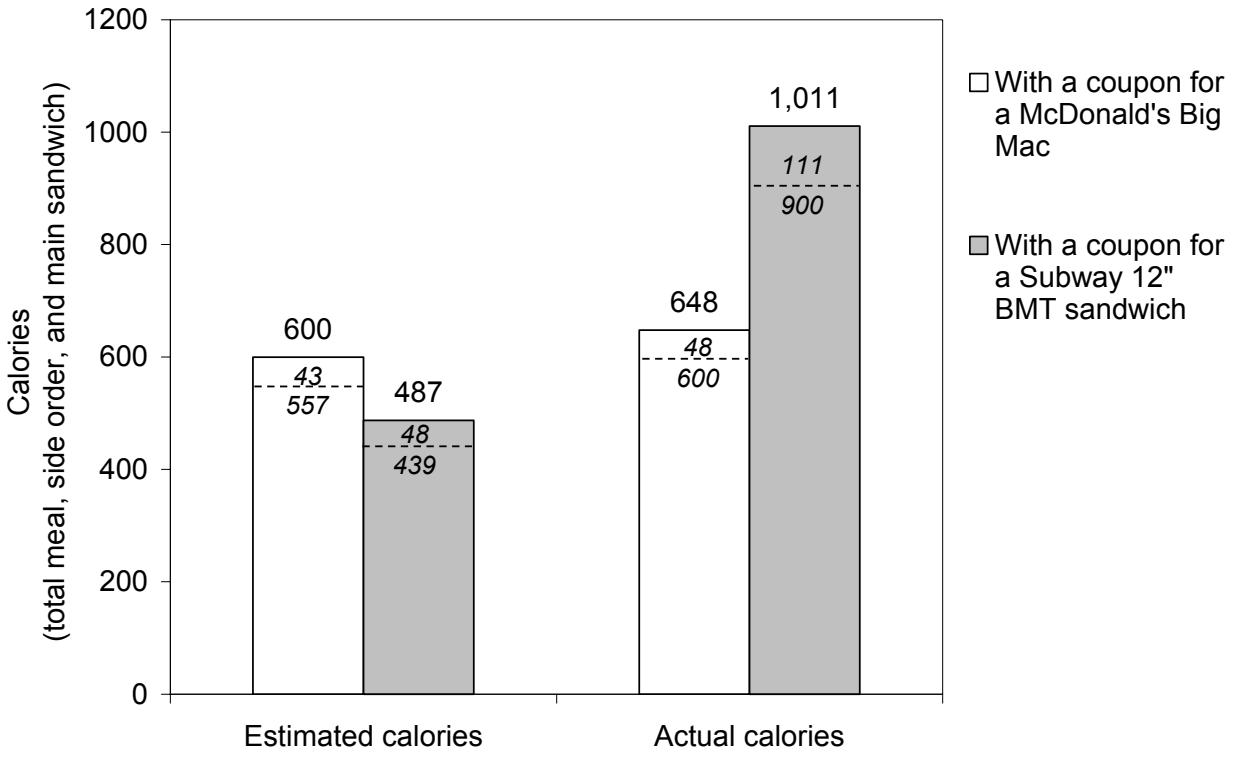

FIGURE 4

STUDY 4: HOW HEALTH CLAIMS AND DEBIASING INSTRUCTIONS INFLUENCE CALORIE ESTIMATIONS (A) AND SIDE ORDER CONSUMPTION INTENTIONS (B)