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Research report

The interplay of health claims and taste importance on food consumption and self-reported satiety ☆

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ABSTRACT

Research has shown that subtle health claims used by food marketers influence pre-intake expectations, but no study has examined how they influence individuals' post-consumption experience of satiety after a complete meal and how this varies according to the value placed on food taste. In two experiments, we assess how labeling a pasta salad as "healthy" or "hearty" influences self-reported satiety, consumption volume, and subsequent consumption of another food. Using MANOVA, Study 1 shows that individuals who report low taste importance consume less—yet feel just as satiated—when a salad is labeled "hearty" rather than "healthy." In contrast, for individuals with higher taste importance, consumption and self-reported satiety are correlated and are both higher when a salad is labeled as "hearty" versus "healthy." Study 2 primes taste importance, rather than measuring it, and replicates these findings for consumption, but not for self-reported satiety. There was no effect on the consumption of other foods in either study. Overall, our findings add to earlier work on the impact of health labels by showing that subtle food descriptions also influence post-intake experiences of satiety, but that the direction of the effects depends on taste importance and on the selection of direct or indirect measures of satiety.

Introduction

Food manufacturers and restaurant chains often market their products using labels that contain health claims such as "healthy" or "smart choice." A substantial body of literature suggests that these food descriptions affect both taste and healthfulness perceptions among consumers, even when product formulations are unchanged (Chandon & Wansink, 2012; Howlett, Burton, Bates, & Huggins, 2009; Raghunathan, Walker Naylor, & Hoyer, 2006). In other words, research has shown that beliefs about the property of a food can directly influence the consumption experience.

Often, foods touted for their healthful properties are perceived as poor tasting and therefore may be avoided by those for whom taste is important. This "unhealthy = tasty" inference as well as factors that moderate this effect are well documented in the existing literature (Burton & Kees, 2011; Finkelstein & Fishbach, 2010; Kozup, Creyer, & Burton, 2003; Stroebe, van Koningsbruggen, Papies, & Aarts, 2013; Wilcox, Vallen, Block, & Fitzsimons, 2009). Further, some research suggests that a "healthy" label or brand can cause consumers to evaluate products as less caloric, while "unhealthy" labels exert the opposite effect, leading consumers to judge "unhealthy" products as more energy dense (Carels, Harper, & Konrad, 2006; Carels, Konrad, & Harper, 2007; Chandon & Wansink, 2007; Wansink & Chandon, 2006). However, it remains unclear whether inferences associated with "healthy" and "unhealthy" extend to important consequences of calorie perceptions, and in particular to satiation.

The current research explores the role of subtle "healthy" versus "tasty" food claims on individuals' food consumption and post-consumption experience of satiety. Since the "unhealthy = tasty" inference should differentially impact those for whom taste is more or less important, we further examine whether taste importance moderates the effect of food claims on the experience of satiety. Consistent with the "unhealthy = tasty" inference, we propose that foods labeled as healthy versus tasty will be assumed to be – and thus experienced as – less filling by consumers; this will be especially apparent among consumers who place higher importance on taste in their food decisions. Thus we view our work as extending prior studies that have shown that healthy foods can often be considered less tasty, less caloric, and less satisfying than non-healthy or hedonic foods. As we describe below we believe we extend existing research in the following ways: (1) we examine how health versus taste labels impact satiety, (2) we examine whether the effects of labels on satiety vary based on taste importance which is conceptually and empirically different from diet

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consciousness, (3) we examine both self-reported satiety and consumption-based measures, (4) we use labels with more detailed food descriptions which, in contrast to previous work, are more typical of how a food might be described by a marketer or in a restaurant and (5) we offer participants a food that is solid, substantial, and constitutes a full meal; past work has used liquids which may have different satiating properties than solids, or small, snack type foods that are unlikely to fully satiate the consumer.

Theoretical background

Satiation has been multiply defined in existing research. It is traditionally defined as the absence of hunger and attainment of fullness (Mook & Votaw, 1992). Other authors, however, have focused on the decline in enjoyment with greater consumption (Redden, 2008; Redden & Haws, 2013). The multiple definitions of satiation have led to multiple measures of satiation, with some studies using consumption as a proxy for satiation (Finkelstein & Fishbach, 2010; Geyskens, Pandelaere, Dewitte, & Warlop, 2007) whereas others relied on self-reports (Crum, Corbin, Brownell, & Salovey, 2011; Finkelstein & Fishbach, 2010; Irmak, Vallen, & Robinson, 2011).

Unfortunately, we cannot assume that self-reported and consumption-based measures of satiation are always well correlated. Some research suggests that self-reported satiety is determined by more than the amount people eat (Brunstrom, Collingwood, & Rogers, 2010; Kral, 2006; McCrory, Suen, & Roberts, 2002). In addition, it is unclear to what extent the variety of physiological, normative, cognitive, hedonic, and motivational factors that drive the decision to stop eating influence the perception of fullness and hunger (Knight & Boland, 1989; Polivy, 1976; Spencer & Fremouw, 1979). All of these reasons justify examining multiple measures of satiation.

Existing research that examines the role of health labels on food intake and feelings of hunger or fullness have failed to address some of these key factors related to satiety. Wooley, Wooley, and Dunham (1972) showed that obese people report higher hunger ratings after consuming a nutritionally identical milkshake when it was described as "reduced-calorie" versus a regular milkshake. However, it is unclear if this finding extends to people with a normal weight and to solid foods. Consistent with this, in a series of lab studies, Crum et al. (2011) demonstrated that ghrelin, a hormone related to feelings of physiological satiety, increased when people believed that they were consuming an "indulgent" versus a "sensible" milkshake but found no difference in self-reported satiety measures. Although these studies suggest that health labels may influence satiation, they all involved the consumption of liquids, which may not contribute to satiety in the same way as solid foods (Almiron-Roy, Chen, & Drewnowski, 2003).

Some studies have examined the effects of health labels using small portions of solid foods rather than liquids. Finkelstein and Fishbach (2010) demonstrated that people who consumed a protein bar sample (50 calories) labeled as a health bar were hungrier than those who ate the same food labeled as a candy bar, but only when eating the healthy food was perceived as mandatory. Irmak et al. (2011) found that describing jelly beans as "fruit chews" rather than "candy chews" increased consumption and perceived healthiness, but only among diet-conscious individuals. Further, they found no effect of pre-intake measures of how "filling" the food would be on food consumption, suggesting that consumption is unrelated to feelings of satiation. It is important to note that all of these studies utilized small portions of snack foods, which are hardly satiating and which differ from entire meals on a variety of physiological and psychological aspects (Herman & Polivy, 2005, 2008; Irmak et al., 2011; Rolls, Roe, & Meengs, 2004). In addition, in these studies the food labels essentially re-categorized the food itself as candy or as a healthier type of food (e.g., fruit or a health bar). Thus it is not clear if similar effects would manifest if the labels convey more subtle changes in the description of the food.

Additionally, previous work increasingly demonstrates that, because many people consciously or unconsciously expect a negative correlation between taste and health, individual differences in the strength of this intuition or in the importance of health moderate the effects of health labels on food choices For example, (Raghunathan et al., 2006) found that the impact of a label for a mango lassi drink (that either described it as healthy or unhealthy) on people's enjoyment of the drink depended on their belief in the unhealthy = tasty intuition. As described earlier, Irmak et al. (2011) found that health labels increased consumption only among individuals who watched their diet. Similarly, (Chernev, 2011) showed that people who are more versus less concerned with managing their weight are more likely to have misguided beliefs about the relationship between a meal's healthiness and its impact on weight gain. Thus these studies show that the importance of health and dietary restraint play a significant role in the impact of health claims on consumption and self-reported satiety.

However no research has focused on the impact of the alternative side of the unhealthy = tasty intuition by examining whether taste importance also moderates the impact of health claims on satiety-related measures. This is critical because taste has been identified as the most important factor influencing consumption (Glanz, Basil, Maibach, Goldberg, & Snyder, 1998) and those for whom taste is important are more likely to take the unhealthy = tasty intuition into consideration when making food choices. Further taste importance is conceptually different from health importance and dietary restraint, which have been examined in previous work. For example Glanz et al. (1998) demonstrated that taste importance and weight control correlate with different sets of demographics, health lifestyle segments, and eating behavior characteristics. Roininen et al. (2001) also showed that health related and taste related aspects of foods are different factors (as measured by the Health and Taste Attitude Scales) and have different correlates. For example, across several countries, the Taste sub-scales did not correlate at all with a Restrained Eating Scale. Similarly, Steptoe and Pollard (1995) identified sensory appeal and health as two separate and important factors that motivate food selection.

Together, this suggests that it is important to examine how taste importance moderates the effects of health claims on consumption and self-reported satiation.

Limitations of existing work and what we add

Overall, prior research suggests that health claims have positive effects on consumption and satiety after eating snacks among people who are diet- and weight- (versus taste) conscious, and negative effects among people who believe that healthy food is less tasty. These studies also suggest that health claims influence consumption and self-reported food perceptions differently and that self-reported perceptions are particularly sensitive to individual differences in diet and weight importance. However, existing studies have not examined the effects of subtle changes in the description of the food, used full-sized solid meals, nor have they directly compared the effects of health claims on both self-reported and consumption-based measures of satiety. Further, as health claims have expanded beyond food items targeted to dieters (43.1% of foods and beverages in 2010 had health claims according to the United States Department of Agriculture), it has become relevant to investigate whether other individual-level factors beyond diet consciousness (e.g. taste importance) affect the food consumption experience (Martinez, 2013).

These aims were tested in a two experiments among students at New York University. In Study 1, after checking that even subtle health claims influence satiety, taste, and healthfulness expectations, we examined the effects of these claims on experienced satiety, food consumption, and ad libitum intake of cookies following the experiment. We also examined whether taste importance in food decisions was an important moderator of this relationship and included a control condition with no description of the food.

Based on previous research, we propose that the underlying factor driving the differential findings between weight (versus taste) conscious individuals is taste importance and the extent to which healthy foods are perceived negatively. In that vein, we expected that for those with high taste importance, health claims would reduce consumption, while they would increase consumption for the low taste importance group who may perceive healthy foods more positively. We also expected that health claims would lead to a dissociation between measured and reported satiety among the low taste importance group (versus the more common group of people who care about taste) for whom perception of satiety, like other food perceptions (Chernev, 2011; Irmak et al., 2011; Provencher, Polivy, & Herman, 2009; Raghunathan et al., 2006), are likely to be influenced by more than just intake. For example, this group may be more likely to infer that "unhealthy = energy dense" and may unconsciously convince themselves that they are more sated because of the indulgent nature of the food. In Study 2, we attempted to replicate these effects by directly manipulating taste importance, through unconscious priming, rather than measuring it as we did in Study 1, and examined the effect of taste importance on food consumption, self-reported satiety, and ad libitum intake of pretzels. As with Study 1, we expected that health claims would reduce consumption among participants primed with taste and increase it among participants not primed with taste and expected a positive correlation between food consumption and reported satiety only in the high taste importance condition.

Methods

The Institutional Review Board at New York University reviewed and approved all study materials. All study participants provided their informed consent prior to their inclusion in the study.

Study 1: The effect of health claims and measured taste importance on consumption and self-reported satiety

Purpose

Study 1 was conducted in order to examine the effects of food labels on consumption and self-reported satiety for those who place higher versus lower importance on food taste. *Pre-test:*

To pre-test various labels, we asked 54 NYU students to look at the same photograph of a pasta salad with one of three different labels. Two of the labels had a health-focused description (*Smart Choice South Beach Chicken Pasta Salad with Fat-free vinaigrette* or *Healthy Choice Chicken Pasta Salad*). The third label had a more traditional taste- and quantity-focused description (*Hearty Traditional Chicken Pasta Salad with Mozzarella Cheese*). We measured satiety expectations by asking participants to rate their agreement with two statements on a 1–7 point scale ("I think I would be comfortably full after eating a full (2/3 cup), regular sized plate of this pasta salad for lunch" and "after eating a full (2/3 cup), regular sized plate of this pasta salad for lunch, I think I would still be hungry for more food"). We averaged these two statements (after reverse coding the second statement) to measure satiety expectations. We measured taste and healthfulness expectations by asking participants how strongly they agreed that "I think this pasta salad would be very tasty," and "I think that this pasta salad sounds healthy."

Health labels influenced satiety ($F(2,106) = 20.37$, $p < 0.0004$), taste ($F(2,106) = 11.98$, $p < 0.0004$), and healthfulness perceptions ($F(2,106) = 34.43$, $p < 0.0004$). Participants expected the same salad to be less satiating with either the "healthy choice" label ($M = 3.91$) or the "smart choice" label ($M = 3.86$) than when it was described with the "hearty traditional" label ($M = 4.76$, $F(1,106) = 28.9$ and $F(1,106) = 32.1$, $p < 0.0004$). The "smart choice" and "healthy choice" labels were not statistically significantly different from one other for measures of satiety ($F(1,106) = 0.32$, $p = 0.57$), healthfulness ($F(1,106) = 1.48$, $p = 0.23$), or taste ($F(1,106) = 0.28$, $p = 0.60$). Additionally, both the "smart choice" ($M = 5.1$) and "healthy choice" ($M = 4.9$) labels were evaluated as more healthful than the "hearty traditional" label ($M = 3.4$, $F(1,106) = 42.2$ $p < 0.01$ and $F(1,106) = 59.6$, $p < 0.0004$). Similarly, the "smart choice" ($M = 4.0$) and "healthy choice" ($M = 3.9$) labels were evaluated as less tasty than the "hearty traditional" label ($M = 5.0$, ($F(1,106) = 15.6$ $p < 0.01$ and $F(1,106) = 20.1$, $p < 0.001$). To test the robustness of the health claim effects across different operationalization, we used the "smart choice" label in *Study 1* and the "healthy choice" label in *Study 2*.

Participants and study design

Non-vegetarian women over the age of 18 were recruited from the New York University Stern School of Business subject pool. Subjects were told that they would be participating in a taste test for NYU catering and that they would receive lunch and dessert for compensation. Based on self-reported weight, the average BMI for the study sample was 21.5 (range 17.2–28.3, SD = 2.3), which classifies most of the sample as normal weight (BMI 18.5–24.9), with 5% of the subjects underweight (BMI < 18.5) and 8% overweight (BMI $\geqslant$ 25) (World Health Organization, 1998).

Procedure

37 participants were randomly assigned to one of three label conditions used to describe the same chicken pasta salad: a health-focused description (*Smart Choice South Beach Chicken Pasta Salad with Fat-free vinaigrette*), a traditional, taste- and quantity-focused description (*Hearty Traditional Chicken Pasta Salad with Mozzarella Cheese*) and a no-label condition (where the dish was simply described as *Chicken pasta salad,* with the expectation that this condition would fall in between the other two in terms of consumption and reported satiety). Note that, despite the different labels, each participant received the same pasta salad in all three conditions and all three labels could realistically be used by food marketers intent on positioning their salad as either healthy, traditional hearty, or in-between.

In the main study, after subjects entered the lab, they were presented with a ¼ cup tasting portion of a chicken pasta salad made with standard rotini pasta, chicken breast, peppers, onions, broccoli, Italian salad dressing, and mozzarella cheese, which all participants finished. While eating the pasta salad, they answered a short questionnaire about its quality. The tasting portion was included in order to support the cover story that participants were conducting a taste test. Per the stated intent of the study, participants then received a ¾ cup "lunch" portion to thank them for their participation, which was still only described as a pasta salad. After participants finished their lunch, they were served an additional 1.5 cup portion, which was labeled with the treatment condition ("hearty traditional" pasta salad, "smart choice," or control). When they received the 1.5 cup portion, they also received the full questionnaire to complete. After finishing the survey, they were thanked for their participation with small chocolate chip cookies and later debriefed about the intent of the study. Research assistants measured the food remainder from both servings and recorded the number of chocolate chip cookies from a large plate selected by each participant. Our food consumption measure is

based on the amount participants consumed from the 1.5 cup portion in order to see how the label influenced intake after a preload of ¾ cup. Note, we used this procedure because we wanted subjects to have eaten equivalent amounts before they rated their satiety and had the opportunity to consume more. We did not provide a label with the initial ¾ cup serving to ensure that initial consumption volume would not be affected by the label. The purpose of having the later 1.5 cup portion and the plate of chocolate chip cookies was to have a consumption-based measure of satiety that was not based on self-report alone.

Survey questions

While consuming the final 1.5 cup serving of pasta salad, respondents completed a questionnaire asking participants to evaluate several aspects of the food and the relative importance of factors including taste in their food consumption decisions using 9-point Likert scales. Subjects also self-reported their height and weight.

Dependent and moderator variables

- A composite measure of satiety was created by averaging three self-report measures (alpha = 0.84): "I am comfortably full after eating this pasta salad," "I feel like I need more food after this meal" (reverse coded), and "One serving of this pasta salad is enough food for lunch." Similar satiety measures have been used in existing research (Merrill, Kramer, Cardello, & Schutz, 2002; Wansink, Van Ittersum, & Painter, 2004).
- *Food consume*d: the amount of food in ounces consumed from the 1.5 cup (14 oz) portion.
- *Taste importance:* numeric response to "Now please rate overall the importance of taste when making a lunch purchase where 1 = not at all important and 9 = very important."

Results

Most people finished the ¾ cup serving of pasta salad (90% left ⩽4 oz) and there were no differences across conditions, as would be expected since they had not seen the food label by then. The consumption (based on the 1.5 cup serving) and self-reported satiety data were analyzed via separate regression analyses both with a mean-centered continuous measure of taste importance, a linear contrast coding of health claims (equal to ½ in the "smart choice" condition, 0 in the "no label" condition, and –½ in the "hearty traditional" condition), and their interaction. Similar results were also obtained when taste importance was dichotomized via a median split (results not shown). For illustrative purposes, Fig. 1 shows the mean levels of satiety and consumption in the three labeling conditions for participants with a high or low level of taste importance (dichotomized via a median split).

We first analyzed the consumption results. The main effect of taste importance was positive and statistically significant ($\beta = 0.98$, $t = 2.03$, $p = 0.05$), indicating that participants who placed a greater emphasis on taste consumed more salad. The main effect of the labeling intervention was not statistically significant ($\beta = 0.66$, $t = 0.53$, $p = 0.60$) but its interaction with taste importance was statistically significant ($\beta = -3.12$, $t = -2.02$, $p = 0.05$), indicating that the effects of health claims on consumption depended on taste importance. To illustrate this interaction, we performed post hoc contrast tests to compare the "smart choice" and "hearty traditional" labels among the high and low-taste importance groups (Fig. 1). Among the low taste importance group, consumption was higher in the healthy "smart choice" label condition ($M = 7.7$ oz) than in the "hearty traditional" label condition ($M = 4.8$ oz, $F(1,15) = 4.53$, $p = 0.05$). Among the high taste importance group, however, we found the opposite; consumption was lower in the "smart choice" label condition ($M = 7.3$ oz) than in the "hearty traditional" condition ($M = 9.4$ oz, $F(1,7) = 0.98$, $p = 0.35$), although this difference was not statistically significant.

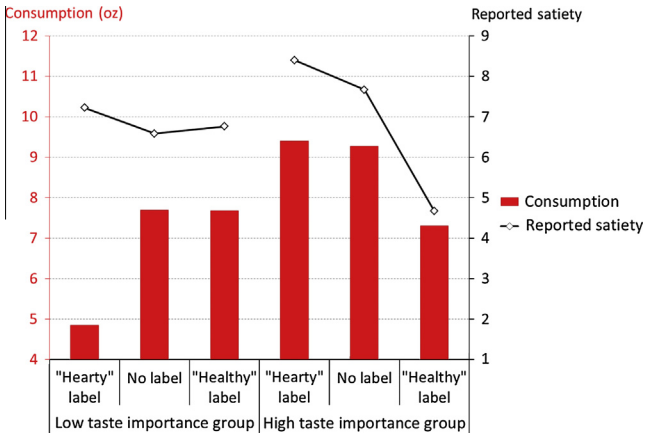

Fig. 1. *The effects of treatment condition and taste importance on consumption and satiety*. Among participants with low taste importance, food consumption was greater in the "healthy" versus "hearty" label condition, but self-reported satiety measures were similar between the 2 conditions. Conversely, among participants with high taste importance, food consumption and satiety were higher in the "hearty" versus "healthy" label condition.

We analyzed the self-reported satiety measures with the same regression analyses. In contrast to what we found for consumption, the main effect of the labeling treatment on satiety was statistically significant ($\beta = -1.14$, $t = 2.25$, $p < 0.02$), indicating that satiety was, on average, lower when the salad was labeled "smart choice" rather than "hearty traditional." The main effect of taste importance was not statistically significant ($\beta = -0.13$, $t = -0.67$, $p = 0.51$), but its interaction with treatment was statistically significant ($\beta = -2.06$, $t = -3.37$, $p < 0.02$), indicating that the effects of health claims on satiety depended on taste importance. As for consumption, we performed post hoc contrast tests to compare the "smart choice" and "hearty traditional" conditions among the high and low-taste importance groups. Among the low taste importance group, reported satiety was similar in the "smart choice" label condition ($M = 6.8$) and the "hearty traditional" condition ($M = 7.2$, $F(1,15) = 0.50$, $p = 0.49$). Among the high taste importance group, however, we found the opposite; reported satiety was significantly lower in the "smart choice" label condition ($M = 4.7$) than in the "hearty traditional" condition ($M = 8.4$, $F(1,7) = 29.2$, $p < 0.01$).

In the final analysis, we examined the dissociation between consumption and self-reported satiety across levels of taste importance. We conducted a multivariate analysis of variance (MANOVA) with consumption and satiety as the two (within-subjects) dependent variables, using the same factors (the label treatments, taste importance, and their interaction). This analysis revealed a significant three-way interaction between taste importance, the label treatments, and the within-subject effects of the type of satiety measure ($F = 11.77$, $p < 0.02$), indicating that the interaction between taste importance and the label treatments had different effects on satiety than on consumption. To illustrate this three-way interaction, we computed the correlation between consumption and satiety for subjects in the high and low taste importance group. As can be seen in Fig. 1, consumption and satiety were negatively correlated in the low taste importance group ($r = -.39$) but were positively correlated in the high taste importance group ($r = .34$), and the difference between the two correlations was statistically significant ($z = -1.94$, $p = 0.05$). Finally, no manipulation had a significant effect on the number of cookies taken ($p > 0.96$).

Summary

In Study 1, we observe that the effect of labels on consumption and self-reported satiety differs with self-reported measures of

taste importance. However, since reported differences in taste importance could be associated with other relevant individual differences, we cannot be certain that the difference we observed are due solely to taste importance. Therefore in the next study we directly manipulate, rather than measure, taste importance.

Study 2: The effect of health claims and manipulated taste importance on consumption and self-reported satiety

Purpose

Study 2 is defined to confirm the moderating role of taste importance by manipulating it through priming rather than measuring it. Self-reported ratings of the importance of taste may be associated with a number of other relevant factors. Therefore in this study we use a direct manipulation of taste importance that involves hedonic priming. The goal of this study is to attempt to replicate the effects observed in *Study 1*, to increase our confidence that these findings were due to differences in taste importance and not to other factors.

Pretest: Label and taste test

Since taste importance played a key role in consumption and self-reported satiety in *Study 1*, we felt it important in this study to ensure high acceptance and taste ratings for the pasta salad. Therefore we had 22 participants sample four potential pasta salads to evaluate taste acceptability as well as believability of the treatment manipulations prior to subject recruitment for *Study 2*. Based on quantitative and qualitative analyses, an olive oil based pasta salad with vegetables, chicken, feta cheese, and artichokes was selected because it had the highest taste acceptability and believability of treatment manipulations.

Participants and study design

98 non-vegetarian women over the age of 18 were recruited from the New York University Stern School of Business Marketing subject pool and via flyers. Participants were told that they would be participating in a taste test for NYU catering and that they would receive lunch and $10 compensation for their participation. Based on self-reported means and weight, BMI for the study sample was 22.2 (range 17.1–30.4, SD = 3.3), which classified the majority of participants as normal weight (BMI $\leqslant$ 18.5–24.9), with 10.5% underweight (BMI < 18.5) and 19.9% overweight (BMI $\geqslant$ 25).

Procedure

Participants were randomly assigned to one of two priming conditions: a control condition or a taste condition. Before beginning the taste test, all participants completed a few minute scrambled sentence worksheet that included either neutral words (e.g. ball, train, gift) or words that primed taste (e.g. yummy, hedonistic, delicious) (Bargh & Chartrand, 2000). They were told by research assistants that this task was meant to clear their minds from the worries of the day. After the priming task, participants received a laminated description of the pasta salad. The treatment conditions were randomly allocated: 47 participants received a description that read "*Hearty Traditional Chicken Pasta Salad with Creamy Cheese Chunks*" and 51 participants received a description that read "*Healthy Choice Mediterranean Chicken Pasta Salad with Artichokes*." The "healthy" label was selected based on the label pretest described in *Study 1*, which demonstrated no significant differences between "healthy choice" and "smart choice" descriptions. At this time, participants received a ¾ cup serving of the pasta salad to consume for lunch. The composition of the pasta salad was identical across conditions. Research assistants recorded the amount of time subjects spent eating and provided each participant with a debriefed about the intent of the study before leaving.

Note we made a few changes to the procedure in this study from what we did in Study 1. Since in Study 1 we did not observe any differences in cookie consumption across conditions, we provided participants with pretzels after the main meal instead of cookies, since these may be viewed as having more neutral health properties than cookies. In Study 1, we wanted to ensure that all participants had consumed an equivalent amount of food before being exposed to the food label, so we had multiple servings. However, one downside of this approach was that participants may have already formed their perceptions of whether they food was more hearty or healthy based on the consumption experience alone, which may have attenuated the impact of the label. Related to this, in Study 1 we found that after nearly all participants consumed the entire ¾ cup portion and on average they consumed a little more than half of the 1.5 cup of pasta salad that was offered next. In this study we wanted to ensure that participants were not tiring of consuming the same food over time. Consequently, in Study 2, we chose to provide the label prior to consumption and measured food consumption in a single ¾ cup portion of the pasta salad.

Survey questions

After eating the pasta salad, participants completed a questionnaire which included 7-point Likert scales to measure their agreement with various statements. Self-reported measures included questions regarding satiety and other individual-level measures with the potential to influence eating behavior.

Self-reported satiety

A composite measure of satiety were created using two self-report measures: "I feel like I need more food after this meal" measured on an agree (7), disagree (1) scale, and "Please circle a number right now (from 1 to 7) that best describes how hungry you are right now," with 7 being "extremely hungry." The variables for "need more food" and "current hunger" were reverse coded for use in the composite satiety score. A higher satiety score indicates greater self-reported satiety or fullness.

Food consumed

The weight of any food remainder in ounces was also recorded, along with the number of pretzels consumed from the bowl of 50 pretzels given to each subject. The number of ounces of pasta salad consumed was equal to the ¾ cup starting volume (10.875 oz) minus the food remainder in ounces.

Results

We analyzed the consumption volume results with an ANOVA. The main effect of label treatment ($F(3,94) = 0.75$, $p = 0.39$) on food consumption was not statistically significant. The main effect of the priming manipulation was also not statistically significant ($F(3,94) = 0.01$, $p = 0.94$) but their interaction was statistically significant ($F(3,94) = 4.2$, $p < 0.04$). The results, shown in Fig. 2, follow a similar pattern, though are not identical to those observed in *Study 1*. Based on post hoc contrast tests, we found that among unprimed participants, food consumption was significantly greater in the "healthy choice" label condition ($M = 9.6$) than in the "hearty" condition ($M = 9.0$, $F(1,94) = 4.9$, $p = 0.03$), mirroring the consumption findings in the low taste importance group in Study 1. However, among those primed with taste, though the consumption with the "healthy choice" label ($M = 9.8$) was slightly lower than with the "hearty traditional" label ($M = 10.0$), this difference was not statistically significant ($F(1,94) = 0.62$, $p = 0.43$).

The satiety data were also analyzed using ANOVA. None of the effects were statistically significant ($F(3,93) = 0.01$, $p = 0.94$; ($F(3,93) = 3.26$, $p = 0.07$; and ($F(3,93) = 0.25$, $p = 0.62$,) for the main effect of treatment, the main effect of priming, and their

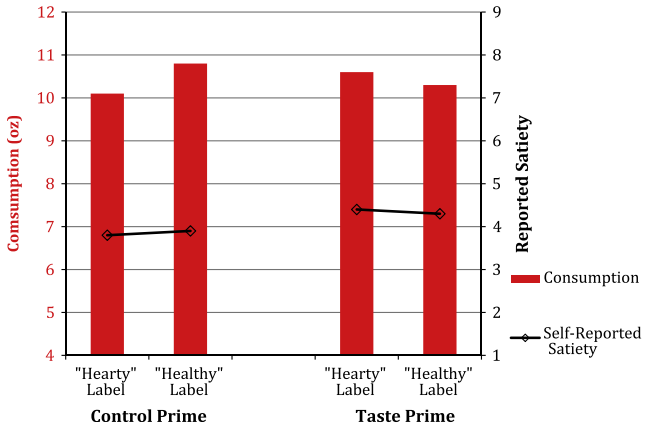

Fig. 2. *The effect of treatment condition and prime on satiety and food consumption.* Among unprimed participants, food consumption was greater in the "healthy" versus "hearty" label condition, and self-reported satiety measures were similar between the 2 conditions. Conversely, among participants primed with taste, food consumption was greater in the "hearty" versus "healthy" condition, though satiety remained similar between the 2 conditions.

interaction respectively). Thus the satiety results from *Study 1* were not replicated for satiety.

The pretzel intake data were analyzed using ANOVA and none of the effects were statistically significant ($F(3,94) = 0.06$, $p = 0.81$; ($F(3,94) = 1.40$, $p = 0.24$; ($F(3,94) = 0.07$, $p = 0.20$) for the main effects of treatment, priming, and their interaction respectively. Thus, as we saw in *Study 1* with cookie consumption, the experimental factors did not influence post-meal pretzel consumption.

Discussion

Summary

The results of the two studies suggest that even subtle food labels affect food consumption and satiety. This study adds to the literature on the inferences people draw from health claims by demonstrating that food labels affect the experience of eating beyond taste and healthfulness associations in meal-based situations. The pre-test demonstrates that individuals believe that a non-consumed pasta salad described as a "healthy choice" or a "smart choice" will be less satiating and less tasty than the same salad described as "traditional hearty." *Study 1* demonstrates that this belief affects experienced satiety following consumption. Further, self-reported satiety and food consumption vary based on how important food taste is to participants. Individuals who reported high taste importance reported lower levels of satiety, and though not significant, consumed less food, when it was described with a healthy label. Conversely, individuals with low taste importance consumed more food when it was described as healthy, and reported similar levels of satiety as in the hearty condition. In other words, the "traditional hearty" label decreased consumption but not satiety among individuals with low taste importance.

In *Study 2*, we explored the robustness of the relation between health claims and taste importance by experimentally manipulating taste importance instead of measuring it. Replicating the results of Study 1, we found that health claims tended to reduce consumption when taste was made salient, though this difference was not significant, but significantly increased it when taste was not salient. This pattern of effect did not occur for self-reported satiety, which remained constant.

Our results confirm the conclusions of emerging research suggesting that food health labels prompt consumers to form beliefs about the satiating properties of a food and that these in turn can affect consumers' experienced hunger even after consuming the food. From a theoretical perspective, our research contributes to the growing literature on factors that influence food consumption and over-consumption. Our findings help provide a greater understanding of previously shown effects of food health labels on perceptions and behavior. For example, in contrast to Irmak et al. (2011), our work suggests that consumers draw inferences about both the satiating capacity and healthfulness of a food based on its description. Our data also suggest that these inferences are not only limited to dieters, and that even subtle label manipulations (descriptions including the word "hearty" versus "healthy" compared to labels that change the categorization of the food such as "pasta" versus "salad") affect consumer beliefs about the health qualities of a food.

Our findings extend prior literature that has shown that dieters and those with health concerns react differently to health labels. Although the literature has established a conceptual distinction between taste importance and health importance in food choices, one might question whether our taste importance measures primarily capture differences in health importance In order to ensure low taste importance was not a marker for dieting tendency, we examined the correlations between diet consciousness, as described by Irmak et al. (2011), and our measure of taste importance in a separate posttest involving 89 female Mechanical Turk participants. Importantly, the results indicated no significant correlation between these two measures ($r = 0.02$, $p = 0.84$) regardless of whether the entire sample was used or whether it was restricted to women <35 years ($n = 55$) or exclusively from urban environments ($n = 42$). Taken together, our work indicates that the process by which health labels positively or adversely influence a consumer's expectations about the taste or satiating properties of food are influenced by more than whether they have a salient diet or weight goal. Additionally, it provides initial support for the idea that emphasizing the taste or hedonic properties of healthful foods may help increase consumption and satisfaction among a subset of consumers.

Effects of mere beliefs on satiety

There is substantial evidence that mere beliefs can influence the experience of taste. Many consumers, for example, expect that a product with greater perceived healthfulness is less tasty than a product perceived to be less healthful (Raghunathan et al., 2006). Bowen, Tomoyaso, Anderson, Canrney, and Kristal (1992) found that low-fat labeling can affect both taste expectations and experienced taste, and that this effect could be modified by cognition associated with those labels (Bowen, Green, Vizenor, Kreuter, & Rolls, 2003). While previous studies demonstrated that low-fat labels can cause less favorable taste evaluations regardless of the actual fat content of the item (Aaron, Mela, & Evans, 1994; Kahkonen, Tuorila, & Rita, 1996; Tuorila, Meiselman, Bell, Cardello, & Johnson, 1994), Bowen et al. (2003) found that for people with negative cognitions associated with fat, the effect was reversed. Thus individual differences in health consciousness may be an important moderating factor in the impact of health labels on perceptions.

The literature on beliefs and satiety is less developed. A recent study by Finkelstein and Fishbach (2010) documented higher hunger ratings after people consumed a small snack food with a label that emphasized the healthfulness versus the tastiness of the snack. Moreover, hunger ratings were higher among the group that consumed the product with the health label compared to a group that did not consume any snack. The authors speculate that encouraging healthy eating increases the accessibility of the competing appetite drive (i.e. counter-regulatory eating), which leads to greater hunger and increased consumption. However, it is possible that the amount of food used in their study was sufficiently

small (50 calories) that subjects may have been responding to 'hedonic' hunger (an indulgent hunger that exists independently of caloric needs), as it is unlikely that a 50-calorie bar would satisfy a person's physiological hunger. Consequently, people who received the "tasty" description may have been affected by the "unhealthy = tasty" intuition (Raghunathan, Walker Naylor, & Hoyer, 2006) and may have had their hedonic hunger satisfied, while those primed with a "health" label had their hedonic hunger primed. In our study, the main effect of the labeling condition was not statistically significant, and there was no difference in consumption volume based on the label alone. This suggests that encouraging healthy eating may not always increase the accessibility of the competing appetite drive.

Strengths and limitations

The two studies and the pre-test were conducted among a convenience sample of female New York University students, and consequently further research is necessary to examine the extent to which these results generalize to other populations. While some of our findings were not statistically significant, this may have been due to the small sample sizes used for these lab studies. We urge future research test these effects in field settings with larger sample sizes. Importantly, the timing of when participants viewed the label descriptions may have influenced food consumption in Study 2, which may partly explain the divergent results between Study 1 and Study 2. In both studies, it is possible that social desirability may explain the absence of effects on the number of cookies or pretzels eaten after consumption of the salad. The plate of cookies used as a post-lunch snack was presented to participants in a public space where both the researcher and other participants could observe the quantity selected. While the pretzels were presented to each participant individually, participants may have been influenced by perceived consumption norms regarding snacking immediately following a meal, particularly because the pretzels may not have been categorized as a true dessert item. Finally, the participants in Study 2 appeared to intrinsically place a high value on health and weight, which may have diminished the strength of the taste prime and the appeal of the labels that included words like 'hearty' and 'creamy'. Future research should examine the effects of purer 'tastiness' claims. Participants were asked to rate the importance of consuming a nutritious lunch, and the mean score was 5.6 (s.d. ±1.2), with a maximum possible score of 7. Similarly, participants rated themselves as relatively healthy overall ($M = 5.0$, s.d. ±0.93). Further, although more than 75% of the sample was either underweight or normal weight, participants rated themselves as closer to overweight on average with respect to perceived weight status ($M = 5.2$, s.d. ±1.2). The health characteristics of this sample may also provide further explanation for why pretzels were not viewed as neutrally as they have been in previous studies.

Despite these limitations, this study has a number of strengths. It builds upon existing literature which has demonstrated how the unhealthy = tasty intuition can influence food choice by examining the influence of taste importance (both self-reported and manipulated) on food consumption and self-reported satiety. This is the first study to our knowledge to utilize a complete meal rather than snack or liquid shake to examine the effect of health claims on food consumption and satiety. Through these two experiments, we demonstrate how health claims influence individual's expectations and experiences differently according to the relative importance they attach to taste versus health.

In conclusion, our findings have important implications for policy makers and marketers. In recent months, legislation has been passed or proposed that recognizes the environmental contribution to overeating, including nationwide menu labeling legislation, front-of-package labeling, and stronger regulation of health claims. Understanding the impact of health labels on satiety is therefore critical for marketers and policy makers who are negotiating the next steps in the nationwide struggle against obesity. Firms that market food products or services will be able to use our findings to create labels for their healthier offerings that improve their taste appeal as well as their capacity to be satiating. Our hope is that this will help align companies' goals and interests with the nations' and consumers' desire for healthy, satisfying food that is tasty.

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