

How Diet and Health Labels Influence Taste and Satiation

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ABSTRACT: Research on how diet and health labels (including advertising) influence taste or satiation shows mixed findings that are study-specific and difficult to generalize. We offer a potential explanation to these inconsistencies. Results from a controlled cafeteria study suggest that health and diet labels might improve the perceived taste of less healthy, hedonic foods (such as desserts and possibly snack foods) without influencing the taste of more healthy utilitarian foods (such as entrées or possibly yogurt and soy foods). These findings have immediate implications for reinterpreting past research findings that may have gone unnoticed because they appeared inconsistent with conventional thinking.

Keywords: labeling, diet, health, labels, taste, satiation, names, advertising, cafeteria, restaurant

Introduction

A person's expectations about the taste of a food can have a sizable impact on the person's sensory evaluation of it (Schiffenstein and others 1999). Because both consumers and marketers have a growing interest in healthy foods, it is often assumed that the post-consumption evaluations of food with a health-related claim will be perceived differentially—perhaps more favorably—than those without such claims (Wansink and others 2005). Despite the intensity of these optimistic beliefs, empirical studies do not always support this optimism. Naming a product as healthy or as diet-related might add a positive halo to a food (Cardello and Sawyer 1992; Cardello 1994); it might result in a favorable disconfirmation (Schiffenstein and others 1999); it might have no effect (Tuorila and others 1998); or it might even “backfire” if they unfairly raise expectations that lead to disappointment (Richardson and others 1994).

Some of the inconsistencies in past findings might have to do with the foods being studied. Some studies used foods that were relatively unfavorable (having average taste ratings well below the mid-point of the ratings scale), whereas others used foods that were more favorable (having average ratings well above the mid-point of the rating scales). Some studies used unfamiliar foods, others used familiar foods (Cardello and others 1985; Tuorila and others 1994b). Some used desserts, whereas others used entrées or side dishes (Oakes and Slotterback 2000). Drawing conclusions across these different dimensions can prove difficult. Entrées and side dishes, for instance, are likely to already be viewed as relatively nutritious and perhaps not as unnecessarily caloric. Using such reasonably healthy foods in a study would provide insufficient contrast or would make it difficult to empirically detect differences between labeled and nonlabeled conditions (Kahkonen and others 1997; Tuorila and others 1998; Vickers 1993; Wansink and Park 2002). Consider the difference between utilitarian and hedonic foods (Chandon and others 2000). We propose that “health” or

“diet” labels should influence one's subjective taste of hedonic and less healthy foods (such as desserts) more than they will impact foods that are typically expected to be healthier and more utilitarian (such as entrées). Specifically, we examine the effect of health and diet labels for both entrées and desserts on both taste perceptions and on satiation.

A controlled cafeteria experiment is used to examine how various labels influence the post-consumption evaluations of 6 low-calorie entrees and 6 low-calorie desserts that have either no labeling, a “healthy” label, or a “diet” label. The resulting findings suggest key methodological implications for future research and have immediate implications for reinterpreting the results of past research.

Background

The name of a food can have a dramatic impact on its acceptance. Perhaps the most dramatic occurrence of this was during the early years of World War II. In the early 1940s, most of the prime cuts of American beef and pork were being shipped overseas to supply soldiers and the Allied relief effort. This led to concerns of a meat shortage on the home front, and studies commissioned by Margaret Mead's U.S. Committee on Food Habits examined the feasibility of serving organ meats—such as brains, kidneys, tongue, and liver—as potential replacements for the traditional cuts of meat, which were in short supply. Although the taste of these organ meats was generally acceptable when the type of meat was undisclosed, once disclosed, the meats became repulsive to many segments of consumers (Wansink 2002). One of the 1st recommendations of the committee was to avoid the negative associations related to the name “organ meats” by instead referring to them as “variety meats,” which was more acceptable.

Indeed, a person's prior expectations of a food can have a notable impact on subsequent post-taste evaluations, and these evaluations can be subtly influenced (Tuorila and Cardello 2002). Information related to a food's fat content, for instance, can influence taste expectations of foods and their post-consumption evaluation of these foods (Aaron and others 1994; Tuorila and others 1994; Kahkonen and others 1996). Because people cannot sample a food before purchasing it in a restaurant or store, they rely on cues that

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they think are related to their desired benefits. For instance, when in a restaurant, a person might use the name of the entrée or dessert as an important cue. This name helps provide meaning to the food (Steenkamp 1989).

Consider how people evaluate “Country Fresh Apple Pie.” If they associate “Country Fresh” cooking as being flavorful, they may combine their beliefs about the characteristics of “Country Fresh” (flavorful) with the characteristics of apple pie (sweet and tangy). These expectations they have about “Country Fresh” can establish an affect state (Mela 2001) that can bias their taste evaluation (Wansink and others 2005). Unless these expectations are strongly disconfirmed (Richardson and others 1994), laboratory studies often show that their post-consumption evaluation seems to generally be assimilated with prior expectations. One exception, however, is when foods taste better than expected. In these cases, a contrast occurs that can lead a food to be evaluated more favorably than if it had no label.

For many, apple pie can trigger attribute beliefs (such as “tasty” or “contains a lot of sugar”), which are combined into 1 overall evaluation of the food. When provided with a 2nd cue, such as a health label, people will try to integrate the mental schema related to the apple pie with the existing schema they have related to foods with health labels (Szykman and others 1997). Depending on how well the schemas match, people adjust their expectations about apple pie to bring both schemas in line with each other. For instance, if people associate “health” with “low amounts of sugar,” their expectations that apple pie has “a lot of sugar” needs to be downwardly adjusted to account for “healthy apple pie.” Instead of “a lot of sugar,” a person may believe that this version contains much less. They may also believe it will not be as tasty, flavorful, filling, or satisfying.

Indeed, adjusting 1 attribute belief may result in the unintended adjustment of additional beliefs, even if these latter beliefs are not directly associated with “diet” or with “health.” For example, based on the adjustment of their belief on the amount of sugar present in a food, a person’s belief about the sweetness and the tastiness of the food may be adjusted. After consuming the food, any favorable contrast (disconfirmation) with prior expectations will result in a more favorable evaluation. Similarly, any negative contrast may result in more negative evaluations (Wansink 1994).

Many people expect foods with diet labels or healthy labels to taste less flavorful and to be less satiating (or satisfying) than similar foods that are not considered diet-related or healthy. If their taste expectations are lower, they may be more favorably surprised after consuming such a food than if they thought it was going to be flavorful and satiating to begin with. Such disconfirmations are rare if the foods are not highly favorable foods. However, when such foods are presented to people, the resulting disconfirmation of expectation would result in a more favorable rating compared with the rating of an unlabeled version of the same food (Oliver 1980).

The food-specific effect of health and diet labels

Labeling research shows mixed results. As noted in the introduction, naming a product as healthy or as diet-related might add a positive halo to a food (Cardello and Sawyer 1992; Cardello 1994), it might result in a favorable disconfirmation (Schifferstein and others 1999), it might have no effect (Tuorila and others 1998), or it might even “backfire” if they unfairly raise expectations that lead to disappointment (Richardson and others 1994). Although there are notable exceptions involving fats and spreads (Kahkonen and others 1996; Tuorila and others 1998), substantial research on the effect of health labels is conducted on generally healthy foods, such as soy foods, yogurt, and entrées. Herein lies a potential reason why there have been inconsistencies in the past.

For health or diet labels to have a positive impact, 1 of 2 conditions need to be met. First, there needs to be a diminished expectation to the food because of the label. Second, there needs to be a very positive disconfirmation of one’s expectations. That is, the food has to taste much better than expected. In some past studies, foods have failed to overcome poor prior expectations. When this occurs, the post-consumption evaluation is simply assimilated with one’s negative expectations and the resulting evaluation is low. In other contexts, as with entrées, health-related labels may not have influenced expectations to begin with.

Consider a key distinction between utilitarian and hedonic foods. Recent studies have shown dramatic differences exist in the effectiveness of marketing efforts depending on whether products are utilitarian or hedonic (Chandon and others 2000). That is, some promotion efforts that have no impact on the acceptance of utilitarian products can have almost dramatic results with hedonic products. This may also be the case with the naming of foods.

If reasonably healthy, utilitarian foods, such as entrées, are perceived as being relatively healthy or nutritionally dense to begin with, a health label may have little effect on a person’s belief about these foods. For instance, if a person perceives entrées to contain little sugar and little fat to begin with, their taste expectations may not be greatly influenced by label information claiming the product is healthy or diet-related.

In contrast, different results might be expected from a food that is more hedonic and is not viewed as relatively healthy or nutritionally-dense (say a dessert or a sweet or salty snack). Because desserts are typically not perceived as either healthy or as diet-conducive, it is likely that healthy or diet-related claims might negatively influence one’s expectations of the food’s taste. Consistent with an assimilation-contrast framework (Wansink 1994), if this dessert ends up tasting much better than expected it could benefit from an expectation contrast (post-disconfirmation) that could boost taste perceptions.

Three types of food-related attributes

There are 3 basic food-related attributes: search attributes, experience attributes, and credence attributes. Search attributes (such as color or price) can be accurately evaluated before purchase and consumption. Experience attributes (such as flavor or taste) cannot be accurately evaluated before consumption. Finally, credence attributes are difficult to determine without expert help or empirical data. These might include whether a product was grown with the help of biotechnology, or the level of vitamin A it contains, or its exact calorie count. We expect that diet and health labels have different levels of impact on different types of attributes. The smallest effect of labels is expected to be on the evaluation of search attributes. People can determine their true level and will not be greatly influenced by the health label—after all, the color red is red.

Health labels and diet labels are likely to have the biggest impact on experience attributes, such as taste and satiation. Although people may be unable to determine the true levels of these attributes without consuming the entrée or dessert, they can develop prior expectations about the taste, and these expectations can bias their perceptions (Bowen and others 1992, 2003).

If prior expectations can be negatively influenced by diet and health labels (Wansink 2003b), these lower expectations will result in more favorable evaluations if the expectations are subsequently positively disconfirmed. For such contrast to occur, however, the food must be good. In some past studies, foods have been used that have had objectively low taste evaluations of 3.0 to 5.0 (on 9-point scales), including ratings of soy (Wansink and Park 2002) and of Swedish oat snacks (Tuorila and others 1998). Such foods would

be unable to provide the necessary taste quality that would result in a contrast in evaluation. On the contrary, if a food is unexpectedly favorable, the contrast with expectations should result in an enhanced evaluation. These differences may be more apparent with desserts (and with less healthy snacks) than with entrees. Thus, we hypothesize:

H₁: Compared with entrees, the taste of a favorable dessert will be more positively evaluated if it has a healthy or diet-related label than if it does not.

A similar effect is expected regarding a person's evaluation of credence attributes (such as calorie content). In general, people have difficulty determining the true level of these attributes, and this leaves them to be more dependent on external sources of information such as labels. The number of calories in a food is an example. When purchasing a food, calorie information is provided on the packaging. When ordering a dinner, however, this kind of information is typically not available, and someone concerned with calories must make inferences about the true calorie level on the basis of labels or cues. Because information related to calories is not easy to evaluate, we expect that people will be more influenced by labels than by their direct consumption experience. Because expectations related to calorie content are thought to be more extreme for desserts than entrees, we expect . . .

H₂: Compared with entrees, a favorable dessert will exhibit larger post-consumption calorie estimation differences if it has a healthy or diet-related label than if it does not.

Although, there is evidence that labels can change the taste perceptions of identical products, it is less clear whether labels can actually make a person feel more satiated. Before consuming a food, we might think that suggesting that a food is a diet-related food or a health-related food might make people believe it is less filling and will be less satisfying. If after consuming this food a person believes he or she is more full or satiated than expected, health or diet labels might actually make a person feel relatively *more* satiated than if he or she had eaten a nonlabeled product.

In contrast, if one's prior expectations of how filling they thought the dessert would be are very strong, these expectations may dominate the actual sensory experience. Effectively, they might say to themselves, "This can't be *that* filling." For this reason, we state this hypothesis as exploratory.

H₃: Compared with entrees, a favorable dessert will exhibit larger post-consumption satiation differences if it has a healthy or diet-related label than if it does not.

Materials and Methods

To determine how people respond to health labels and diet labels, we conducted a 6-week field experiment in a faculty cafeteria at the Univ. of Illinois at Urbana-Champaign. Approval was received from the Human Subjects Committee of the Institutional Review Board for the university. A controlled field study was used to minimize the influence of demand effects and to determine how labels influenced the perceptions of taste and satiation of people in a natural environment with external validity. Six different low-calorie entrées and 6 different low-calorie desserts were selected based on insights from a focus group and based on whether they represented a wide variety of foods (Table 1). To help ensure that the foods were highly palatable, a trained chef provided guidance on how to make the dishes lower calorie with the promise that it would not significantly compromise their flavor.

Of those participating, 87% were faculty or staff, 6% were graduate student, and 7% were visitors from off campus (including spouses). Ages ranged from 22 to 71 with the mean age being 39.1 years.

Table 1 — Menu items and their healthy or diet-labeled counterparts

Menu items	Labeled menu items
Entrées	
Taco bar	Healthy taco bar
Italian seafood filet	Healthy Italian seafood filet
Grilled chicken	Healthy grilled chicken
Lentils over rice	Diet lentils over rice
Chicken Parmesan	Diet chicken Parmesan
Couscous	Diet couscous
Desserts	
Chocolate tofu cheesecake	Healthy chocolate tofu cheesecake
Chocolate pudding	Healthy chocolate pudding
Apple crisp	Healthy apple crisp
Tofu chocolate cream pie	Diet tofu chocolate cream pie
Pineapples soy muffins	Diet pineapples soy muffins
Zucchini cookies	Diet zucchini cookies

As will be discussed in the "Results and Discussion" section, there were no significant differences between those who bought the descriptively named menu items and those who bought the regularly named menu items.

When food products meet certain criteria, both "healthy" and "diet" are permissible terms (www.fda.gov). These 2 particular words—"diet" and "healthy"—were selected because they are frequently used in practice and are frequently evaluated in the research literature. Along with these 2 labels, a control condition was created in which entrées and desserts were displayed with only the name of the product but with no mention of it being a healthy or a diet recipe. We had no predictions as to whether the diet label would be either more or less effective than the healthy label. We did believe that both labels would be effective with desserts but would show no difference from the control condition when used with entrées.

During the Tuesday and Friday lunch of each of the 6 test weeks, 2 entrées and 2 desserts were offered with a basic label (such as "grilled chicken"); 2 entrées and 2 desserts were presented with a health label; and 2 entrées and 2 desserts were not offered. For the next 2 weeks, the entrées and desserts and the conditions were systematically rotated until all items were present in all conditions. In the 4th week, the rotation was repeated. The rotation helped minimize any unexpected variations that might affect either preferences or participation (such as blizzards, religious holidays, or home football games). To minimize contamination across conditions, the only person who was aware of the label conditions was 1 of the experimenters who was individually responsible for changing the labels every Tuesday and Friday. During a 6-week period, each entrée and dessert was available 6 times. Reasonable efforts were made to control the production of the entrées and desserts, and there was no reason to believe there were production variations across days or across conditions. In addition, because every entrée and dessert was offered at least 6 times, an unnoticed problem with quality control would have been moderated by the repeated serving occasions.

Each person who had selected 1 of the target entrées or desserts was asked to complete a questionnaire after his or her meal. After answering basic demographic questions (age, gender, and education), diners were asked to use 9-point Likert scales (1 = strongly disagree; 9 = strongly agree) to indicate the extent to which they agreed or disagreed with a number of 1-item statements related to sensory perceptions and to their dietary habits. The sensory per-

Table 2—Respondents were similar across all conditions^a

	Regular (control group)	Labels		F-value/ χ^2 (P value)
		"Diet"	"Healthy"	
Entrée	Gender (female)	51.50%	56.50%	0.425 (0.809)
	Age	39.97 (11.00)	40.52 (10.70)	0.985 (0.375)
	Nutritional value is important	6.26 (1.94)	6.00 (2.31)	0.293 (0.746)
	I watch what I eat	6.21 (1.76)	5.92 (2.13)	0.205 (0.815)
Dessert	Gender (female)	47.40%	55.00%	0.841 (0.657)
	Age	40.11 (10.77)	37.45 (10.12)	1.361 (0.261)
	Nutritional value is important	6.56 (2.10)	6.36 (2.25)	0.243 (0.784)
	I watch what I eat	6.16 (1.99)	6.30 (2.25)	0.830 (0.439)

^aStandard deviations are shown in parentheses.

ception statements were the standard ones that were generally asked when testing the acceptance of various recipes in the cafeteria. These included, "This item was appealing to the eye," "This item tasted good," and "After finishing this menu item, I felt comfortably full and satisfied." The 2 dietary habit statements ("I try to eat nutritiously" and "I carefully watch what I eat") were also asked on the same 9-point scale. After this, diners were asked to estimate how many calories they thought the target menu item contained. These questions are similar to others that have been asked in field study contexts (Wansink and Park 2002; Wansink 2003b). Approximately 65% of the customers in the sample had selected entrées and desserts with health labels or diet labels, and 35% had selected their regular-labeled counterparts. Ninety-seven percent of the diners (324) completed and returned their questionnaires upon finishing their meal and leaving the cafeteria.

While controlled field studies minimize demand effects and allow for a more natural observation, it is important that the various conditions be relatively balanced to minimize any bias related to self-selection (Daillantspinner and Issanchou 1995; Engell and others 1998). To determine this, we first examined whether people in the 3 conditions differed with respect to gender, age, or to the importance they attached to the nutritional value of the foods they choose and whether they differed in how carefully they watched what they ate. As Table 2 indicates, analyses of variance indicated there were no significant differences across the conditions ($P > 0.20$) and across the groups they reflect.

Results and Discussion

Analyses of variance and Tukey's post hoc test were conducted to examine whether post-consumption evaluations differed across the entrées and desserts and across the 3 conditions (control group, "diet," or "healthy"). In line with H_1 , Table 3 and Figure 1 show that diet labels and healthy labels influenced taste perceptions toward desserts but not toward entrées. In particular, when compared with unlabeled desserts in the control condition, people rated desserts with diet labels or with health labels as "tasting appealing" ($F_{2,91} = 3.826$; $P = 0.025$) and as "tasting good" ($F_{2,91} = 3.281$; $P = 0.042$). There were no significant differences with entrées.

Recall that it was suggested that this would occur because diners would be relatively more pleasantly surprised with the taste of the dessert than the entrée. Yet, because we wanted to keep the study as unobtrusive as possible, diners were not asked their expectations of their food before consuming it.

Recall that independent of any satiation level, we believed that the difficulty in estimating a credence attribute such as calorie level would lead a person to rate desserts with diet labels and healthy labels as being less caloric than an identical food that was not labeled in these ways (H_2). This was confirmed. Compared with

foods with a diet label (212.3 calories) and a healthy label (202.3 calories), diners estimated that the unlabeled food had 27% more calories (282.2; $F_{2,92} = 4.172$; $P = 0.018$). There were no significant differences with entrées, which, in general, were slightly more caloric than the desserts because of their larger portions size.

We had also tentatively suggested (H_3) that labels might not influence the satiation level of entrées, but they might influence the satiation level of desserts. What was found was that diet labels and health labels did not influence the satiation level of either entrées or desserts. One interpretation of this finding is that people can simply "trust their stomachs." That is, they know when they are full. Yet this null finding could also be the result of satiation being confounded with other foods. A person who eats only a dessert may not perceive that dessert as satiating as someone else who had just completed a full meal.

One concern in nonrandomized design field studies is that the people who self-selected themselves into 1 condition are substantially different than those in another. As described, there were no significant differences between the 2 groups ($P > 0.20$ level) with respect to gender, age, whether they tried to eat nutritiously, and how carefully they watch what they eat (Table 2). This gives us con-

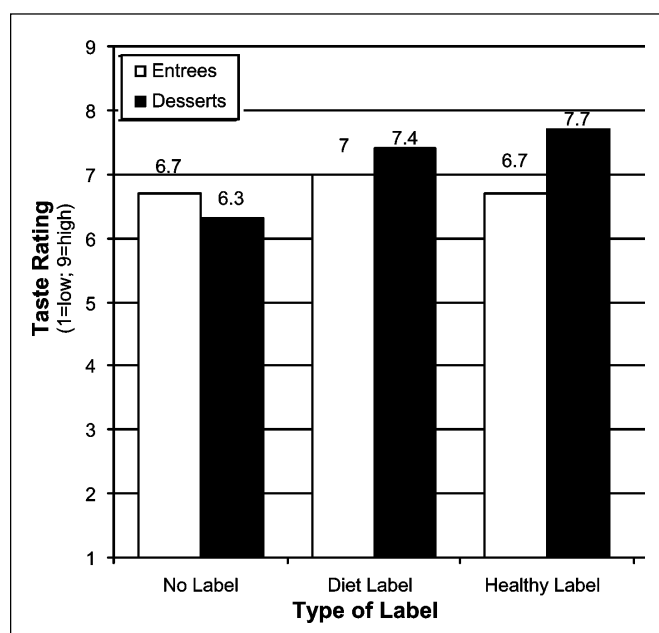


Figure 1—Diet and health labels are more effective for desserts than for entrées

Table 3—Diet and health labels favorable bias the taste ratings of favorable desserts^{a,b}

		Labels			F(2,220) (<i>P</i> value)
		Regular (control group)	“Diet”	“Healthy”	
Entrées					
Taste (H_1)	This is appealing ^c	5.68 (2.05)	6.00 (1.86)	5.79 (1.87)	0.454 (0.636)
	This tastes good ^c	6.71 (1.82)	6.97 (1.45)	6.66 (1.89)	0.605 (0.547)
Satiation (H_2)	This is filling ^c	6.71 (1.95)	6.63 (1.53)	6.40 (1.79)	0.697 (0.499)
	I am comfortably full ^c	6.76 (1.86)	6.90 (1.60)	6.54 (1.78)	0.842 (0.432)
Calories (H_3)	How many calories?	358.32 (155.85)	342.16 (189.10)	370.37 (229.00)	0.382 (0.683)
				F(2,91) (<i>P</i> value)	
Desserts					
Taste (H_1)	This is appealing ^c	6.68 (2.08)	7.87 (1.11)**	7.53 (1.60)*	3.826 (0.025)
	This tastes good ^c	6.32 (1.81)	7.40 (1.85)*	7.65 (1.49)**	3.281 (0.042)
Satiation (H_2)	This is filling ^c	6.59 (2.11)	7.20 (1.74)	7.28 (1.65)	1.437 (0.243)
	I am comfortably full ^c	6.98 (2.01)	7.34 (1.85)	7.17 (1.87)	.250 (0.779)
Calories (H_3)	How many calories?	282.21 (164.12)	212.34 (108.06)*	202.32 (94.56)**	4.172 (0.018)

^aStandard deviations are shown in parentheses.

^bNote that we did not include the means for the individual foods because these are often small numbers (10), are not always balanced at these low levels, and can be misleading. Instead, to account for the different types of dishes, we conducted the analyses of variance (ANOVAs) using a dummy variable. This enabled us to pool the data while still accounting for general mean shifts for each type of food.

^cMeasured on 9-point scales (1 = strongly disagree; 9 = strongly agree).

*/** = based on Tukey's post hoc tests: * = $P < 0.10$; ** = $P < 0.05$; *** = $P < 0.01$.

vidence that the differences we find are due to the labels themselves and not due to differences in sample characteristics.

Discussion

This study begins to offer a potential explanation as to why there are inconsistencies and mixed findings in the area of how food labeling influences perceptions, tastes, and evaluations of foods. These results suggest that health and diet labels might be much more effective in influencing the evaluation of some foods than others. In particular, they seem to have a more positive impact on the evaluation of hedonic and highly favorably foods (such as desserts) than on the evaluation of entrees, which tend to be more utilitarian. In contrast to showing this in a laboratory environment, we illustrated this important distinction in the context of a unobtrusive, naturalistic eating environment involving low-involvement consumers.

These results are in contrast with some past work because it suggests that evaluations were influenced because of a contrast effect instead of an assimilation effect. One reason why this occurs can be related to the types of foods typically used in studies. A food that is not objectively rated as favorable (such as soy or selected types of yogurts) will not be favorable enough to generate disconfirmation. Indeed, in many of these studies, these products are never rated above the mid-point of the taste and hedonic rating scales.

While the process by which this occurs needs further investigation, these results involving highly favorable foods are consistent with a disconfirmation bias. That is, people may expect a dessert that is labeled as healthy or as diet-related to not taste very good. When it does taste good, it disconfirms these prior expectations and leads to an over-evaluation in one's ratings of the food. Health labels have less of an ability to influence perceptions and evaluations of foods that are already considered relatively healthy, such as entrées. This would be consistent with people believing that an entrée that is healthy or diet-related is not likely to be notably different in taste than its less healthy counterpart.

In this study, we varied the type of food consumed (desserts versus entrees). Yet food really served as a proxy for the types of pre-consumption processes we believe drives post-consumption evaluations. We believe that 1 reason desserts would be more suggestible than entrees is that the low expectations of how “diet” or

“healthy” desserts provides a stronger contrast with actual taste than does an entrée. It is this contrast between these low pre-consumption expectations and post-consumption evaluations that we believe drives the contrast effect that influenced ratings.

In the same way these findings were significant for labeling, they would also be relevant for the manner in which food products are advertised or promoted. Whereas a consumer's initial purchase of a food product can be driven by the expectations developed through packaging and advertising, the repurchase of the food is also influenced by sensory characteristics. The description or connotations suggested from the name, the package, or the advertisements can influence both the initial impression (which can lead to purchase) and the subsequent evaluation (which can lead to repurchase).

Limitations

The purpose of this study was to examine the effect of labeling in a realistic environment where a wide range of palatable foods were being consumed in a natural manner. To avoid potential demand effects, this study focused only on post-consumption evaluation measures. While it was necessary to sacrifice some control to gain external validity, care was taken to systematically rotate conditions, to balance cells, and to measure potential confounds that might be attributed to self-selection. Our analysis of the types of people who purchased the various products indicated no significant differences in demographics or in nutritional orientation (recall Table 2). In further examining issues related to pre-expectation and post-evaluation measures, additional research on this topic can be moved into the laboratory with the confidence that it has external validity in a field situation.

There is a presupposition with this research that the foods being tasted are of generally reasonable quality. If the foods instead are of low or inferior quality, the influence of labels is likely to have little influence on any post-consumption evaluations. Although this is probably not something that needs to be systematically tested, it is worth noting as a boundary condition of this research.

Implications for future research

One key opportunity for future research will be to investigate factors such as satiation levels in the laboratory. The study con-

ducted here necessarily had to allow people to consume whatever combinations of food they wanted. If people only eat a pre-measured amount of food, a better understanding of satiation could be developed. In particular, knowing when expectations provide an anchor point to post-consumption evaluations and when they provide a contrast point would be useful. An anchoring point would result in moderated evaluations, whereas the contrast point would result in exaggerated evaluations.

Although foods that were labeled as diet or as healthy did not show any difference in satiation, they might still influence one's consumption volume. There are numerous stories of how people eat more "diet" cookies than regular cookies, and how "dietary" labels lead consumers to over-consume. While this study provided no evidence that these labels reduced the ratings of satiation, this is worth examining in more detail (Rolls 1994; Rolls and others 1998).

Research interest in the area of cues and sensory evaluation is increasing; however, we need to know more about how advertising, packaging, or places of origin influence sensory perception at the moment of consumption (Deliza and MacFie 1996; van Ittersum and others 2003). Some of the existing studies in this area have found weak or mixed effects, and 1 possible reason is because they involved laboratory evaluation situations in which participants may not have been highly involved with the task. Our solution to this was to examine the evaluation of actual diners who had made actual choices. In examining this in a natural environment, we were willing to trade off some internal control in exchange for external validity. One necessary consequence of this approach is that diners had self-selected their own items instead of being randomly assigned to a particular condition. Although there were no differences between the groups (recall Table 2), their self-selection of their foods could have intensified the role that expectations played in subsequent evaluations.

Future research could also examine what types of differences exist between different types of products. Because of the field situation in which this was conducted, we could not control how many people were given the different types of foods. As a result, the total number of menu items selected was enough to conduct an aggregate test of names, but not enough to conduct a food-by-food analysis.

Given the interest in better understanding the subtle drivers of obesity, it is interesting to speculate whether healthy or diet-related menu names lead people to consume more food than they otherwise would have. If descriptive names improved a person's sensory perceptions of the food, it might also influence how much they wanted to eat. Conversely, however, if descriptive names also lead people to believe the food was more caloric (as we found), and it may actually decrease how much is ultimately eaten.

Conclusions

There have been many proprietary studies and discussions of how labels influence sensory characteristics, and many have offered inconsistent or study-specific results. The findings reported here begin to provide a rationale and preliminary evidence as to why many seem to provide inconsistent findings. If one's pre-consumption expectations and post-consumption evaluations are not sufficiently in contrast, health or diet labels will have little consistent influence and would be likely to show a tendency toward assimilation (which could be either negative or positive, depending on one's prior expectation). For instance, this would explain why many studies of lightly processed and less favorable foods (such as soy and yogurt) show negative assimilation effects, whereas more highly processed and favorably enhanced foods tested in proprietary studies by brand managers are often claimed to have positive contrast effects.

In general, it may be that 1 area where there is unlikely to be dramatic contrasts is with reasonably healthy entrees or side dishes. In such cases, labeling something that is already viewed as healthy or as diet-oriented will have little impact on subsequent evaluations. The inability for past studies to find differences has sometimes been attributed to a lack of statistical power or to experimental confounds. Our results suggest a more likely factor is that they are examining products for which there will be little effect because of insufficient contrast.

Before unpublished studies in this area are disregarded, or before published ones are given too much credence, it is worth reflecting on what a reanalysis of these studies might provide if the products are grouped on the basis of people's perceptions of them before consumption. A meta-analysis of these published and unpublished results may show more consistency than previously believed.

There is also an important lesson for future researchers in this area. In experiments, it is important to select those foods and those measures that are most likely to be sensitive to labeling differences. If a label provides no "new information" to a food, we cannot realistically expect it to influence perceptions. It is important to carefully choose the foods, pre-measures, and post-measures that will most fairly enable us to test hypotheses.

Last, there is evidence that simply mentioning certain ingredients or attributes of a food (such as "reduced fat" or "Atkins approved") can provide cues that can create either positive or negative biases on expectations and evaluations (Kahkonen and others 1996). Recent studies have also shown that highlighting a specific ingredient in a food can provide a cue that biases taste evaluations (Wansink 2003a), regardless of the seemingly contrary effects it can have on blood glucose levels (Painter and Prisecaru 2002). A recent study showed, for instance, that people who were given an energy bar purportedly containing soy protein rated it as relatively more grainy and tasteless, even though there was no soy in it (Wansink and Park 2002). Given the visibility of production processes, such as those involving biotechnology or irradiation (Wansink and Kim 2001), it may be that even such processes could provide unwanted cues that influence expectations and sensory evaluations (Wansink 2005).

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