

# Guiltless Gluttony: The Asymmetric Effect of Size Labels on Size Perceptions and Consumption

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Size labels adopted by food vendors can have a major impact on size judgments and consumption. In forming size judgments, consumers integrate the actual size information from the stimuli with the semantic cue from the size label. Size labels influence not only size perception and actual consumption, they also affect perceived consumption. Size labels can also result in relative perceived size reversals, so that consumers deem a smaller package to be bigger than a larger one. Further, consumers are more likely to believe a label that professes an item to be smaller (vs. larger) in the size range associated with that item. This asymmetric effect of size labels can result in larger consumption without the consumer even being aware of it (“guiltless gluttony”).

Portion sizes for specific food types have increased markedly in the United States since the 1970s, with the greatest increases occurring for food consumed at fast food establishments (Nielsen and Popkin 2006; Shuren 2005; Smiciklas-Wright et al. 2003). The U.S. Department of Agriculture (Center for Nutrition Policy and Promotion) provides much evidence for this increase based on surveys done with the U.S. population on daily food intake (Continuing Survey of Food Intake by Individuals 1989–91, 1994–96, 1998; Nationwide Food Consumption Survey 1977–78). Further support for this phenomenon is provided by Young and Nestle’s (2002) study, which tracks portion sizes from the 1970s to the late 1990s. This study found that the amount of food allotted to one person increased in

virtually every food category examined. French fries, hamburgers, and soda expanded to portions more than twice what they were at the beginning of the period; steaks, chocolate bars, and bread products also grew markedly.

As American portion sizes have grown over the past 3 decades, the prevalence of obesity among U.S. adults and children has risen and is now seen as one of the leading public challenges of our time (National Alliance for Nutrition and Activity 2002). Obesity is second only to smoking as the cause of preventable death in the United States. General consensus holds that increase in food portions is one factor contributing to the obesity epidemic in the United States (Nielsen and Popkin 2006), with larger portions encouraging people to eat more (Young and Nestle 2002).

Standard portions, as defined by the federal government for the Food Guide Pyramid and the Dietary Guidelines for Americans, are considerably smaller than portions typically consumed by the public (Young and Nestle 2003). Moreover, there is limited consistency in the range of portion sizes offered across different food providers. Both the discrepancy between the standard portions and the typically consumed portions and the inconsistency in portion sizes across food providers contribute to people’s uncertainty about the appropriate amount to eat (Young and Nestle 1998).

In this context of large portion sizes and consumer uncertainty about appropriate food intake, we propose that size labels chosen by vendors (such as “small-medium-large”)

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can have a major impact on consumers' purchase and consumption behavior. As such, food providers' choice of size labels has many potential legislative and liability-related implications that need to be studied. Questions that need addressing include these: How do size labels influence consumer understanding of the quantities of food products? Do misperceptions in estimation of food size affect actual consumption? After consumption, do people correct for their misperceptions? What factors may play a role in extenuating or exacerbating possible misperceptions? The answers to these questions have immediate implications for public policy officials, responsible managers, and vigilant consumers.

In exploring the impact of size labels on perception and consumption, we suggest that the mental representation of the size of a food product may be construed from a combination of the sensory cues depicting actual size of the product (visual and satiation cues) and the semantic cue(s) associated with it (the size label and other verbal descriptors). Consumers are faced with the task of integrating these pieces of information in order to make their size estimations. For addressing how this integration is done, we invoke dual process models of information processing (Chaiken 1980; Petty and Cacioppo 1986) and Hsee's work on the evaluability of information (Hsee 1996).

Building on dual process models, we suggest that within everyday consumption settings, size labels may have a considerable impact on size judgment. In line with their greater ease of evaluability relative to sensory cues (which may require considerable effort to interpret correctly, as will be explained below), size labels may exert significant influence on size judgments. Specifically, we propose an asymmetric effect of size labels on size estimations and related consumption behavior. Chandon and Wansink (2007b) show that the underestimations of large meals are stronger than the overestimations of small meals, following from the "empirical law of sensation" (Stevens 1986). When this psychophysical effect is coupled with consumers' psychosocial concerns about health and body image and their hedonic urge to eat more, consumers may be more inclined to believe a label that professes an item as being smaller than it is versus larger than it is (in the size range one associates with that item). Mislabeling larger items as being smaller also allows consumers to guiltlessly consume more—what we refer to as "guiltless gluttony"—and this can have an impact on both actual and perceived consumption.

Next, we elaborate on our conceptual framework and propose our hypotheses. This is followed by our set of five studies. We conclude with insights from the studies and implications for public policy officials, managers, and consumers.

## CONCEPTUAL FRAMEWORK

### Integrating Sensory and Semantic Cues in Forming Size Judgments

Our focus is on the effect of size labels on size estimation and subsequent consumption of food items. However, the

basic conceptual question underlying this focus is "How do people integrate different cues to arrive at a size judgment?" As stated earlier, within the context of food categories, judgments of size estimations can be made using visual cues from the stimulus itself, satiation cues from the actual consumption experience (i.e., sensation of fullness), and semantic cues in the form of size labels (and other written information). We build on dual process theories of information processing as a framework to explain this information integration in making size estimations. While these theories were initially developed as theories of persuasion, they were later shown to apply to a range of other judgment contexts (Chaiken, Liberman, and Eagly 1989). We use the Heuristic-Systematic Model (HSM; Chaiken 1980) for developing our hypotheses, though the Elaboration Likelihood Model (Petty and Cacioppo 1986) is equally applicable.

According to HSM, *systematic processing* is conceptualized as a comprehensive, analytic orientation to information processing in which perceivers access and scrutinize all informational input for its relevance to the judgment task. On the other hand, *heuristic processing* is a more limited mode of information processing that is both less effortful and less capacity limited than systematic processing. In heuristic processing, individuals focus on that subset of available information that enables them to use heuristics, or simple decision rules, to formulate their judgments quickly and efficiently (Maheswaran and Chaiken 1991). Accordingly, consumers' utilization of each piece of information about a stimulus will depend on its ease of use, diagnosticity, and consumers' motivation to be accurate in their judgment, given available cognitive resources.

It is likely that for everyday food consumption decisions, people have a low concern for accuracy in their size judgments. It has been shown that consumers are not very motivated to be accurate in many routine behaviors entailing frequently purchased goods. For instance, consumers do not accurately remember prices of items they have recently purchased (Dickson and Sawyer 1990; Krishna, Currim, and Shoemaker 1991), and they do not frequently make use of unit price information (Mitchell, Lennard, and McGoldrick 2003). In the context of purchasing and consuming dozens of products each day, consumers may find it too time consuming and unnecessary to estimate sizes of individual products accurately, and hence they may depend to a large extent on heuristic processing.

But to what extent would consumers rely on size labels versus the other semantic descriptors and sensory cues? Hsee's (1996) work on evaluability from the choice-judgment literature provides valuable insight in understanding the ease of use and diagnosticity of pieces of information emanating from a stimulus. Hsee defines an attribute as "hard to evaluate independently" when the evaluator does not know how good a given value on the attribute is without comparison (i.e., when the stimulus is presented individually). This depends on how much knowledge the evaluator has about the value distribution of that attribute. Without such knowledge, the evaluator will not know where a given

value on that attribute lies in relation to the other values on that attribute.

Common size labels, such as small-medium-large, by their inherent lexical nature, suggest a relative standing and magnitude comparison. That size labels very powerfully connote a relative standing is seen in Prelec, Wernerfelt and Zettelmeyer's (1997) research, which suggests that consumers use size labels even in tasks of evaluating their own body size. In their studies, average-sized people bought large-sized raincoats when they were labeled as being medium, even when the raincoats were displayed visually to them.

On the contrary, multiple studies have demonstrated that consumers have difficulty in estimating food volume through visual inspection or from a feeling of satiation (e.g., Chandon and Wansink 2007a, 2007b; Livingstone and Black 2003; Raghuram and Krishna 1999; Young and Nestle 1995). In addition, verbal information about the stimuli also is not easy to use for forming size estimates even when it is about the actual size (e.g., 20 oz.), since it may be difficult to put into context (e.g., What exactly is 20 oz.?). Even if benchmarks are provided within the verbal information, the lack of consistent portion sizes across food providers restricts their use and still makes size estimation difficult. As such, size labels, such as "small" and "large," may provide consumers with easy-to-interpret crutches for direction on size judgment and also on the appropriate amount to eat and drink. The arguments developed here suggest that:

- H1:** Consumers will be influenced in their food size estimates by the size label even if they have access to the physical stimuli (sensory input) or to verbal information on the actual size.

### The Asymmetric Effect of Size Labels on Size Judgments

What happens when the different pieces of information (e.g., size label, visual, satiation, and verbal cues) about the stimuli are not entirely consistent? How are consumer size estimations affected by this inconsistency? In other words, what happens when a product is possibly mislabeled? By mislabeled, we mean that a product is called "large" when it is actually medium or small within the context of similar products in the category, and vice versa. Such mislabeling instances are widespread for food and drink products because of the limited use of standard portion sizes and much variability in actual size across providers. For example, a "cup" is technically defined as 8 ounces, while for coffee, a cup seems to be 6 ounces as indicated by the calibrations on the water reservoirs of coffee makers and implied by brewing instructions on packaged coffee. However, actual sizes of cups for coffee sold in the United States are larger than 6 ounces and are not of consistent size across different providers. Some coffeehouses serve coffee in 10-14-18 ounce cups labeled small-medium-large, respectively (e.g., Dunkin Donuts), while others use exactly the same size labels for 12-16-20

ounce cups (e.g., Caribou Coffee and Seattle's Best Coffee). In most vending machines, a "small" cup of coffee is 8 ounces and a "medium" cup of coffee is 12 ounces (e.g., AVI Food Systems Inc. and Cudo Coffee Vending).

For soft drinks, some restaurant chains offer soda in 16-20-32 ounce cups with small-medium-large labels (e.g., McDonalds and Kentucky Fried Chicken), whereas others use the same labels for 20-32-40 ounce cups (e.g., Wendy's). This suggests that a 32 ounce cup of soda may be labeled as "medium" in one restaurant and as "large" in another.

On occasions where there is inconsistency between the actual size of a product and the size label used to describe it, to what extent do people rely on the size label versus visual or other verbal cues? Here consumers are faced with the task of integrating different pieces of information that are inconsistent. On the one hand, greater cognitive elaboration might occur in an effort to resolve the inconsistency, and hence systematic processing could take place (Maheswaran and Chaiken 1991), where consumers will process all available information. On the other hand, since the size label is easier to evaluate independently compared to the visual and other verbal cues, consumers could engage in heuristic processing and depend to a greater extent on the size label (vs. other cues). In fact, consumers might not even recognize the incongruence of the size label cue and other cues depicting actual size because of the perceptual difficulty of processing these sensory cues and other verbal descriptors accurately and putting them into context (as discussed in the previous section).

We also suggest that the direction of mislabeling (i.e., whether a large item is mislabeled as being smaller or a small item is mislabeled as being larger) is important and can have differential impact. The "empirical law of sensation" (Stevens 1986) from the psychophysics literature posits that equal relative increments of stimuli are proportional to equal increments of sensation. Drawing on this, Chandon and Wansink (2007b) show that estimations of the size of a meal follow a compressive power function of the actual size of the meal (i.e., a power function with an exponent lower than one). In other words, underestimations become more likely and increase in magnitude as the size of the meal increases. Thus, the underestimations of large meals are bigger than the overestimations of small meals. This would suggest that mislabeling of larger food products toward a smaller direction would have a greater effect on perceived size judgments compared to mislabeling of smaller food products toward a larger direction, since the former is more labile to contextual influences.

Also, two conflicting goals are salient for consumers when making food consumption decisions (Chandon and Wansink 2007a): the hedonic goal of taste enjoyment (and possibly the urge to eat more) versus the more utilitarian goal of maintaining good health (and psychosocial motives of body image and self-presentation). In an effort to reconcile these conflicting goals, consumers may be inclined to respond to incoming information selectively to minimize guilt while satisfying their hedonic urges. Accordingly, they may be automatically more willing to believe a label that professes an item to be smaller

(vs. larger) in the range one can associate with that item. Thus, a small size item mislabeled as “large” (or “medium”) is less likely to be believed by consumers than a large size item mislabeled as “small” (or “medium”).

Based on these two arguments, we expect that when the actual size of a food item and the size label used provide inconsistent information, there will be an asymmetry in the effect of larger versus smaller size labels on consumers’ size estimations. We propose the *asymmetric size label effect*:

- H2:** Size labels will have an impact on consumers’ size estimates such that the difference between perceived size estimates will be bigger when a larger item is labeled as being smaller (vs. larger) as compared to when a smaller item is labeled as being larger (vs. smaller).

## Consumption-Related Effects of Size Labels

Postconsumption, besides the visual, verbal, and size label information about the stimuli, consumers also have sensory satiation information from the consumption experience. This should also affect consumers’ postconsumption size estimates, that is, their estimates of perceived consumption. The question is whether this sensory input will negate the size label effect or whether the effect of the size label will persist even after consumption.

How will sensory satiation information (consumption) interact with other information (e.g., size label, visual, verbal) to affect consumption estimates? We elaborate on some prior research focusing on the effect of cognitive semantic cues on sensory evaluations and, more specifically, on studies using “labels” for cognitive cues. Herz and von Clef (2001) show that verbal labels attached to odors affect consumers’ perceptual responses to them. Thus, menthol smell can be labeled “chest medicine” or “breath mint”; pine oil smell can be labeled “Christmas tree” or “spray disinfectant”; I-B Acid can be labeled “Parmesan cheese” or “vomit.” They show that a large majority of experimental participants perceive the same odor as being different when it is given two different verbal labels. Further, pleasantness evaluations for the odor are significantly different when they are labeled differently. Thus, labels affect sensory evaluations.

Another context in which labels have been shown to influence sensory evaluations is “the effect of brand names on taste and preference” (Allison and Uhl 1964; Hoyer and Brown 1990). Allison and Uhl (1964), for instance, show that beer pairs, which elicit nonsignificant taste differences in blind tests, are perceived to be different when they are presented with nonevaluative brand labels (i.e., letters).

Rolls (2005, 45), working on taste and smell, offers a neurological basis for these “label” effects. He suggests that “cognitive factors, such as a word label presented with an odor, influence the activation produced by that odor in the orbitofrontal cortex, and hence the pleasantness of the odor.” Further, Hoch and Ha (1986) show that the general ambiguity of product experience leads to a greater susceptibility

to outside influences. Within the context of judging perceived consumption, the difficulty of accurately estimating portion sizes based on visual inputs, and the ambiguity of the consumption experience, will lead consumers to rely on outside influences in forming their consumption perceptions. We propose that:

- H3:** Consumers’ perception of consumption amount (i.e., the amount consumers believe they have consumed) will be influenced by the size label, such that, consumers will believe they have consumed less when a large size item has a smaller (vs. larger) size label.
- H4:** The effect of size label on perceived consumption (hypothesis 3) will be mediated by perceived size (hypothesis 2).

If consumers want to consume a certain amount, then such a perception of smaller (vs. larger) consumption amount while eating should result in one consuming more. Also, when the urge to eat is coupled with the psychosocial concerns mentioned above, any piece of information that reduces the guilt of eating more would be used by consumers. For example, the USDA Center for Nutrition Policy and Promotion reports that people underestimate the amount of grains, fats, oils, and sweets that they consume in a day (U.S. Department of Agriculture, Center for Nutrition Policy and Promotion 2000), suggesting an inclination to distort reality for consuming more of unhealthy food items. Mislabeled larger food items as being smaller also allows for this guiltless gluttony and can affect actual consumption through perceived consumption. Thus, we propose that:

- H5:** Actual consumption will be influenced by the size label used such that greater quantities will be consumed when large sizes have smaller (vs. larger) size labels.
- H6:** The effect of size label on actual consumption (hypothesis 5) will be mediated by perceived consumption (hypothesis 3).

## Moderating Influences on the Effect of Size Labels

We additionally investigate conditions under which the effect of size labels may be reduced or increased. Dual process models predict that a person’s motivation and ability will influence whether systematic or heuristic processing will be used for integrating information (e.g., Cacioppo, Petty, and Morris 1983; Ratneshwar and Chaiken 1991; Wood, Kallgreen, and Preisler 1985).

Individuals who are under cognitive load will be limited in their ability to process all available information and will be more likely to employ heuristic processing. As discussed earlier, a person’s involvement with a judgment task can affect their motivation to be accurate (Maheswaran and Chaiken 1991) even when ability exists. In low-motivation settings, it has been shown that people engage in negligible

amounts of systematic processing and, moreover, seem to base their judgments primarily on easily processed heuristic cues if available (e.g., Borgida and Howard-Pitney 1983; Chaiken 1980; Petty and Cacioppo 1984; Petty, Cacioppo, and Goldman 1981). However, when reliability concerns are paramount, and when individuals perceive that it is important to formulate highly accurate judgments, they employ a systematic information processing strategy, carefully processing all available information (Chaiken 1980).

Thus, we propose that the reliance on size labels to provide direction in estimations is context based and is dependent on consumers' concern for accuracy about their food intake, as well as on the availability of cognitive resources for that instance.

- H7:** Availability of cognitive resources will moderate the effect of size labels on perceived size, such that the effect will be greater for people who are under cognitive load compared to people who are not under load.
- H8:** Concern for nutrition will moderate the effect of size labels on perceived size, such that the effect will be smaller for people who have a high concern for their nutrition intake compared to people with a low concern for nutrition.

Our set of hypotheses is tested in four laboratory studies and a field study. Figure 1 presents our conceptual framework and shows how our set of studies tests various aspects of the framework. Study 1 tests for the basic premise that

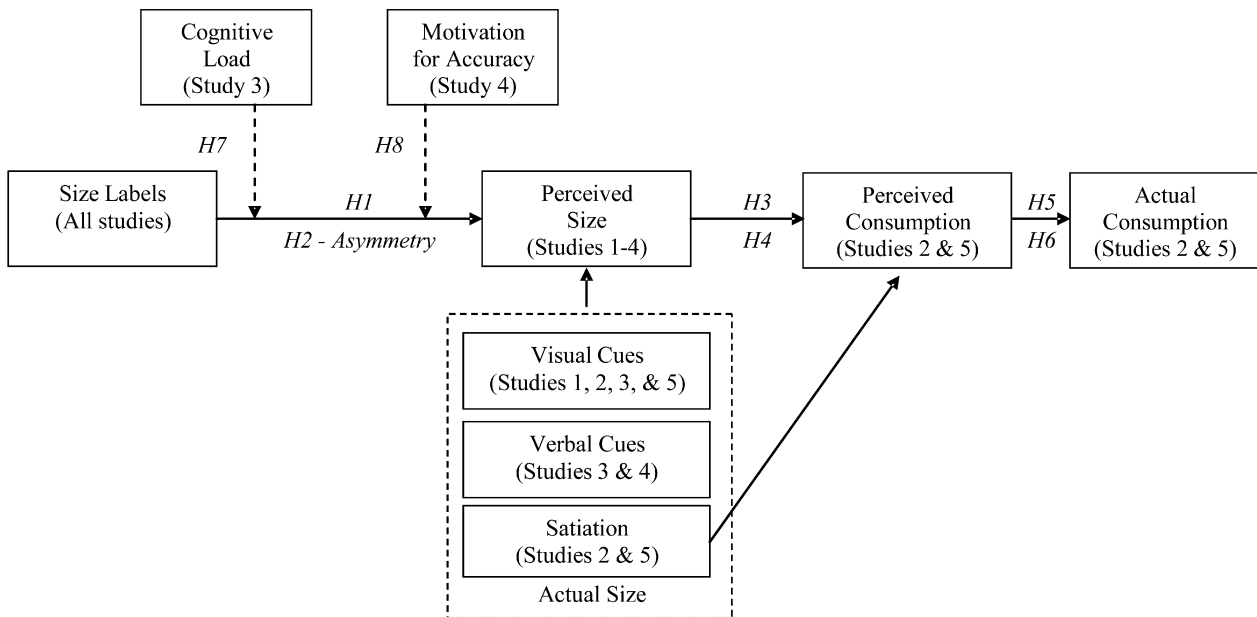
size labels affect size estimates and for the asymmetry of the effect when size labels are used inconsistently; study 2 explores how size labels affect not just perceived size but also actual consumption and perceived consumption; study 3 tests for the moderating effect of cognitive load; study 4 tests for the moderating effect of motivation for accuracy; and study 5 focuses on actual and perceived consumption using food servings in a field setting. Studies 1, 3, and 4 were conducted in the United States, whereas studies 2 and 5 were administered in Europe. We have no reason to suspect any continental differences in the effects of size labeling. Young and Nestle (2007) observe that fast food portions in Europe have also been increasing since the 1990s, demonstrating that consumers are influenced by similar marketplace realities across continents with regard to portion sizes.

To demonstrate the robustness of our results, we use a variety of stimuli (pretzels, nuts, mini-sandwiches, cookies), different units of analysis for collecting participants' estimations (ounces, grams, number of pieces), and also diverse size label manipulations across the five studies ("small" vs. "medium" for studies 1 and 2, "small" vs. "large" for studies 3 and 4, and "medium" vs. "large" for study 5).

### STUDY 1: THE ASYMMETRIC EFFECT OF SIZE LABELS ON SIZE PERCEPTIONS

Our underlying premise is that size labels affect consumers' size estimates for food items even when consumers have access to other forms of information (e.g., visual, verbal,

**FIGURE 1**  
CONCEPTUAL FRAMEWORK



and sensory). Study 1 tests for this nondirectional underlying proposition (hypothesis 1) and more specifically for the asymmetric size label effect (hypothesis 2), using snack-size plates of pretzels as stimuli.

## Method

**Design.** A 2 (size label: inconsistent, consistent)  $\times$  2 (actual serving size: six, eight pieces of pretzels—1.9 oz. vs. 2.5 oz.) design was used. The first factor was manipulated between subjects and the second within subjects. Fifty-eight students participated in the experiment as part of a subject pool in a Midwestern university. We did not include a control (no size label) condition in this study, since there is no a priori hypothesis about how a size label (e.g., “small” size) should compare to a no size label condition.

Since serving size was manipulated within subjects and pretzels are easy to count (six vs. eight pieces), we used two different shapes of mini-pretzels (round and square) for the two serving size conditions. The two shapes were of the same weight. The shape-size combinations were counterbalanced.

**Procedure.** The participants were told that an established airline company was in the process of renewing its in-flight snack service and was considering two different brands of pretzels; the airline company was interested in finding the best serving format (square or round) for pretzels. In keeping with the cover story, we used snack-size plates of pretzels as stimuli in this experiment. Each participant was presented sequentially with two plates—one plate had square pretzels and one had round ones. What varied between the two plates were the serving size and the size labels of the plates. There was a 10-minute filler task between the subjects being presented with the first and the second plates. The order in which participants got the pretzels (in terms of shape and actual serving size) was counterbalanced.

After the participants read the cover story, they were presented with the first pretzel plate. For the consistent condition of size label, the plate that contained six pretzels was labeled “small snack size” and the plate that contained eight pretzels was labeled “medium snack size” (the size labels were printed on stickers with 14 font size and were attached to the edge of the plates). The opposite labeling was used for the inconsistent condition. In line with the cover story, participants answered questions on the shape and color of the pretzels and on their general pretzel consumption habits. Then they were asked to report how many ounces of pretzels they thought the plate contained. They were not allowed to pick up the plates. As such, their size judgments were based on an integration of the visual cue from the stimulus and the size label cue. After obtaining responses from the participants for the first plate, the stimulus was taken away. After a filler task on a completely disparate (and distracting) topic, participants were presented with the second plate and were asked the same questions.

## Results and Discussion

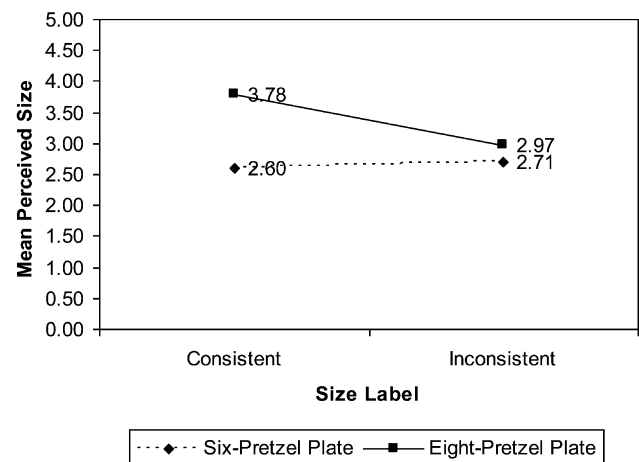
Order, shape (round or square), and gender effects were not significant ( $p > .2$ ) and are not discussed further. We used a repeated measures analysis of variance to analyze the results. Perceived size (in ounces) was the dependent variable and size label (consistent, inconsistent) and serving size (six pretzels, eight pretzels) were the independent variables. The second factor, serving size, was the repeated factor. To find support for hypothesis 1, we should obtain an interaction between size label and serving size. In order to demonstrate support for hypothesis 2 (asymmetric size label effect for preconsumption size perceptions), we further need to demonstrate that the difference in perceived size of the eight-pretzel plate when labeled “small” versus when labeled “medium” is significantly greater than the difference in perceived size of the six-pretzel plate when labeled “medium” versus “small.”

We obtained a significant main effect for the actual serving size (six pretzels  $M = 2.66$  oz.; eight pretzels  $M = 3.29$  oz.;  $F(1, 56) = 35.15, p < .01$ ); that is, participants perceived the size of the eight-pretzel plates to be larger than that of the six-pretzel plates, as one would expect. The main effect for size label was not significant ( $p > .2$ ), and we do not expect it to be. Consistent with hypotheses 1 and 2, we obtained a significant interaction effect between size label and serving size ( $F(1, 56) = 6.36, p < .05$ ; see fig. 2).

Follow-up contrast tests showed that the small pretzel plate (six pretzels) was not perceived as being significantly different in size when it was labeled medium (inconsistent label  $M = 2.71$  oz.) versus when it was labeled “small” (consistent label

FIGURE 2

RESULTS FROM STUDY 1: SIZE LABELS CAN AFFECT PRECONSUMPTION SIZE PERCEPTIONS



NOTE.—Mean perceived size: weight of pretzel plate in ounces.

$M = 2.60$  oz.,  $p > .7$ ). However, the medium pretzel plate (eight pretzels) was perceived as being marginally significantly smaller when labeled “small” (inconsistent label  $M = 2.97$  oz.) versus when labeled “medium” (consistent label  $M = 3.62$  oz.;  $F(1, 56) = 3.78$ ,  $p < .06$ ). This lends support to the asymmetric size label effect, hypothesis 2. Our results indicate that the subjects were more willing to believe the larger-sized plate being labeled “small” versus the smaller size plate being labeled “medium.”

Thus, size labels do affect preconsumption size estimations—when a larger item is mislabeled toward a smaller size, consumers perceive it to be smaller. The size label impact is not large enough to reverse the perceptions completely (i.e., the eight-pretzel plate is still perceived to contain more than the six-pretzel plate even if labeled inconsistently), but the decrease is large, especially given the small portion sizes. Another thing to note is that it is easy to count six and eight pretzels and hence to realize that the eight-pretzel plate is bigger than the six-pretzel plate even if they are labeled inconsistently (as the significant main effect of actual serving size demonstrates). With hard-to-count food items, mislabeling effects should increase. In study 2, we use mixed nuts as the stimuli; these are smaller in individual weight but larger in total number, making counting difficult. In study 2, we also measure perceived and actual consumption.

## STUDY 2: SIZE LABELS AND PRECONSUMPTION AND POSTCONSUMPTION SIZE PERCEPTIONS

In this study, we again test for the asymmetric effect of size labels on perceived size (hypothesis 2), but we also test for its effect on perceived consumption (hypothesis 3) mediated by perceived size (hypothesis 4) and on actual consumption (hypothesis 5) mediated by perceived consumption (hypothesis 6).

### Method

*Design.* We used an experimental design similar to study 1 with some modifications on the stimuli. The design was a 2 (“size label”: consistent, inconsistent)  $\times$  2 (actual serving size: 50 or 60 pieces of nuts in a package) mixed design, with the first factor manipulated between subjects and the second factor within subjects. Eighty-two students from a European university participated in the experiment as part of a subject pool.

*Procedure.* As in study 1, we used the scenario of the airline company renewing its in-flight snack service. Participants were thus informed that an airline was interested in providing tastier and more attractive options to passengers. The company wanted to choose between two competing brands of packaged mixed nuts. In accord with the cover story, two slightly different packages (with the same content of mixed nuts) were created as stimuli so that it would lead to the impression of different brands. Both pack-

ages were made of transparent plastic. What varied between the packages was that one type had a zipper seal, whereas the other type had a pressure seal, and they were of slightly different material. Participants were told that the actual packaging would be designed after the brand selection was done. The type of package was counterbalanced across the four conditions.

For the manipulation of the serving size condition, we used different numbers of mixed nuts in the packages. The “small” package contained 50 pieces (about 55 grams in weight), and the “medium” package contained 60 pieces (about 65 grams in weight). Unlike study 1, size label information was not depicted on the packages, but it was included in the questionnaires. This reduces the likelihood of two people in the experiment seeing the same quantity with different labels. For the consistent condition, the package with 50 nuts was labeled as “small” and the package with 60 nuts was labeled as “medium”; the opposite labeling was used for the inconsistent condition. Whether the actual small size (50 pieces) or larger size (60 pieces) was given to a subject first was counterbalanced across subjects.

The study was conducted in two phases, which took place one week apart. Phase 1 involved preconsumption size estimates. In week 1, participants were first told the cover story about the airline and were then presented with the first package of mixed nuts at the beginning of the experiment hour. They were asked to examine the package, and in accord with the cover story, they were instructed to respond to a set of questions on assortment, colorfulness, visual quality of package contents, and their general snack consumption habits and preferences. They were also asked to report how many grams of nuts they thought the package contained (preconsumption size estimations). For a benchmark, they were told that a candy bar (e.g., Snickers) is about 58.7 grams. Upon completion of their evaluations, the stimulus was taken away. After a series of filler tasks on disparate topics, participants were presented with the second package at the end of the experiment hour and were asked the same questions.

Phase 2 involved actual consumption and postconsumption size estimates. In week 2, a similar procedure was repeated, except that in this phase, we collected data on perceived consumption (to test hypotheses 3 and 4) and on actual consumption (to test hypotheses 5 and 6), using only the larger-size nut package (i.e., 60 nuts package labeled “small” vs. “medium”). Participants were asked to eat as much as they wanted from the package. They were given as much time as they wanted for eating, and the stimulus was taken away before the questionnaires were given to the subjects. Taking away the stimulus ensured that consumption was complete before the participants reported their perceived consumption.

Since the stimulus was a lightweight plastic packet, we noticed that subjects had an urge to pick up the packet. As such, in this study subjects were allowed to pick up the stimuli, and all except two subjects did so, providing them additionally sensory information in the form of weight and

also volume. Participant identities (using numbers) were noted on the packages before collecting them; each package was later weighed, and this amount was subtracted from the initial weight to deduce the actual consumption. Following a series of questions in line with the cover story, participants were asked to report how many grams of nuts they thought they had consumed (perceived consumption).

## Results and Discussion

Eight participants were not present in all phases of the study and were removed. Further, three participants did not want to eat from the stimuli as part of the taste test in the consumption phases and were also removed. This screening left us with seventy-one participants. We used repeated measures analysis of variance tests for the dependent variable of perceived size and a series of analysis of variance tests for perceived consumption and actual consumption.

*Preconsumption Perceived Size Estimates.* Similar to study 1, perceived size (in grams) was the dependent variable and size label (consistent, inconsistent) and serving size (50 or 60 pieces of nuts) were the independent variables. The second factor, serving size, was the repeated factor. Gender, the order of type of package received (zipper-seal or pressure-seal), and the order of getting the small or large packages first were not significant predictors for preconsumption size estimates ( $p > .2$ ) and are not analyzed further for this phase. To find support for hypothesis 2 (asymmetric size label effect for preconsumption size perceptions), we should obtain an interaction between size label and serving size.

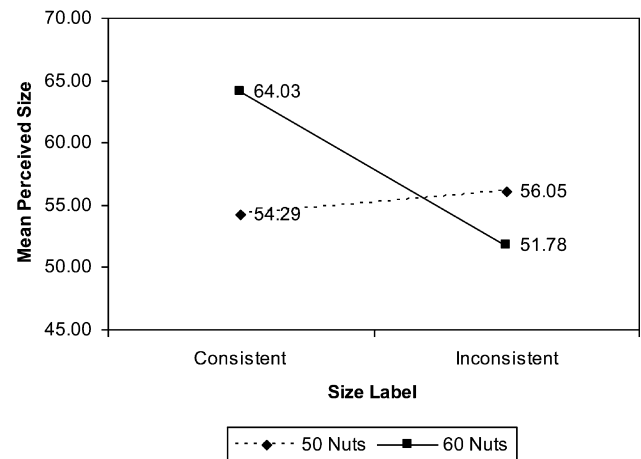
We obtained a marginally significant main effect for the actual serving size (60 pieces  $M = 57.13$  grams; 50 pieces  $M = 55.28$  grams;  $F(1, 69) = 2.90, p < .1$ ). The main effect for size label was not significant ( $p > .3$ ). More importantly, we obtained a significant interaction effect between size label and serving size ( $F(1, 69) = 19.06, p < .01$ ), which is consistent with hypothesis 2 (see fig. 3).

Delving further into the asymmetric size label effect, follow-up contrast tests for the size label and serving size interaction showed that the small nuts package (50 pieces) was not perceived as different when it was labeled "medium" (inconsistent label  $M = 56.05$  grams) compared to when it was labeled "small" (consistent label  $M = 54.29$  grams,  $p > .7$ ). However, when the medium nuts package (60 pieces) was labeled "small" (inconsistent label), the perceived weight was 51.78 grams, whereas it was 64.03 grams when it was labeled "medium" (consistent label;  $F(1, 69) = 5.51, p < .05$ ), lending strong support to our predicted asymmetric size label effect, hypothesis 2.

Note also that in this study size labeling brought about a reversal in perceived size. When size labeling was consistent with actual serving size, the 60-nuts package was perceived to contain 9.74 grams more than the 50-nuts package ( $F(1, 69) = 16.34, p < .01$ ). However, when size labeling was inconsistent with actual serving size, the 50-nuts package (labeled as "medium") was perceived to contain 4.27 grams

FIGURE 3

RESULTS FROM STUDY 2: SIZE LABELS CAN AFFECT PRECONSUMPTION SIZE PERCEPTIONS



NOTE.—Mean perceived size: weight of mixed nuts package in grams.

more than the 60-nuts package (labeled as "small"; 50 pieces  $M = 56.05$  grams, whereas 60 pieces  $M = 51.78$  grams;  $F(1, 69) = 4.06, p < .05$ ). Thus, size labels can even result in a reversal of relative sizes so that the perceived size of a larger package may be judged to be less than that of a smaller package.

But, does the asymmetric size label effect result in greater consumption, that is, do people consume more when a large food item is labeled "small" versus when it is labeled "medium"? Further, can people's perceptions of consumption amount be affected by the use of different labels for the same quantity of food? These questions are explored next, using phase 2 of our data collection and focusing on the larger-sized nuts package (60 pieces).

*Perceived Consumption.* Hypothesis 3 suggests that perceived consumption will be less when a large-size package is labeled smaller (vs. larger). Such directional predictions on perceived consumption can be explored holding actual consumption constant. However, since actual consumption varied in this study, we computed a measure that controls for actual consumption so that a directional prediction is possible (see also Raghurir and Krishna [1999] for a similar adjustment). We compute perceived consumption error:

$$\text{Perceived Consumption Error} =$$

$$\text{Perceived Consumption} - \text{Actual Consumption.}$$

This measure of perceived consumption focuses on perceived consumption compared to what people actually consumed. Perceived consumption error is larger (and positive)



when people think they consumed much more than they actually did, and it is larger (and negative) when they think they consumed much less than they actually did. On a continuous scale, going from positive to negative, perceived consumption error should be smaller in magnitude as people think they consume less than they actually did. Thus, per hypothesis 3, the perceived consumption error should be less when the nuts package is labeled smaller (vs. larger).

We conducted an ANOVA with perceived consumption error as the dependent variable and size label and gender as the independent variables. Gender was included in the model based on the reasoning that males and females exhibit different behavior when it comes to consumption amount. Consistent with hypothesis 3, participants' perception of consumption amount (vs. their actual consumption) was significantly lower when the package was labeled as "small" (error  $M = 6.2$ ; perceived consumption  $M = 46.30$  grams; actual consumption  $M = 40.10$  grams), compared to when it was labeled as "medium" (error  $M = 24.03$ ; perceived consumption  $M = 53.90$  grams; actual consumption  $M = 29.87$  grams;  $F(1, 67) = 5.35, p < .05$ ). Main effect for gender and its interaction with size label were not significant for perceived consumption error ( $p > .7$ ).

To test hypothesis 4, that the effect of size label on perceived consumption is mediated by perceived size, we followed Baron and Kenny's (1986) approach. We find that (1) size labels significantly affect perceived consumption (see results for perceived consumption error reported earlier); (2) size labels also significantly affect the proposed mediating variable, perceived size (see results for preconsumption size estimates reported earlier); and (3) the effect of size labels on perceived consumption is no longer significant when the analysis incorporates the proposed mediating variable as a covariate, whereas the effect of the mediating variable is significant. For this last analysis, we conducted an ANCOVA with perceived consumption error as the dependent variable, size label as the independent variable, and perceived size as the covariate. Size label was no longer significant ( $p > .1$ ), whereas the covariate (perceived size) was significant ( $F(1, 68) = 7.11; p < .01$ ), indicating that we have full mediation (Sobel  $z = 1.89; p < .05$ ). This suggests that, while participants were eating from the nuts package, their preconsumption perceptions of size were lower for those who received the package labeled as "small" (vs. "medium"; supporting hypothesis 2), and hence, they thought they consumed less (compared to what they actually consumed, supporting hypotheses 3 and 4).

**Actual Consumption.** To test for hypothesis 5, that size labels have an impact on actual consumption, we conducted an ANOVA with actual consumption as the dependent variable and size label and gender as the independent variables. We obtained a significant main effect for size label. Consistent with hypothesis 5, participants who received the package labeled as "small" ( $M = 40.10$  grams) ate significantly more than those who received the package labeled as "medium" ( $M = 29.87$  grams;  $F(1, 67) = 7.91, p < .01$ ). We also find that, on average, male participants ate 9.31

grams more than females (males  $M = 40.22$  grams vs. females  $M = 30.91$  grams;  $F(1, 67) = 7.15, p < .01$ ). However, the interaction effect of gender with size label was not significant; that is, size labels had similar effects for men and for women ( $p > .4$ ).

To test hypothesis 6, that the effect of size labels on actual consumption is mediated by perceived consumption, we again followed Baron and Kenny's (1986) approach. We find that (1) size labels significantly affect actual consumption (see results for actual consumption reported earlier); (2) size labels also significantly affect the proposed mediating variable—perceived consumption error (see results for perceived consumption error reported earlier); and (3) the effect of size labels on actual consumption is no longer significant when the analysis incorporates the proposed mediating variable as a covariate, whereas the effect of the mediating variable is significant. For this last analysis, we conducted an ANCOVA with actual consumption as the dependent variable, size label and gender as the independent variables, and perceived consumption error as the covariate. The gender main effect on actual consumption was significant ( $F(1, 66) = 8.15, p < .01$ ), but its interaction with size label was not significant ( $p > .3$ ). Size label was now only marginally significant ( $F(1, 66) = 3.80, p < .1$ ), whereas the covariate (perceived consumption error) was significant ( $F(1, 66) = 13.19, p < .01$ ). The Sobel test also shows support for the mediation (Sobel  $z = 2.03; p < .05$ ). This suggests that, while participants were eating from the nuts package, the perception of consumption amount was lower for those who received the package labeled as "small" (vs. "medium"; hypothesis 3), and hence, they could guiltlessly consume more (hypotheses 5 and 6).

**Discussion.** Thus, study 2 shows that size labels affect preconsumption size estimations and may even result in a reversal in the estimations when used inconsistently with actual size: when a larger food item is labeled "smaller," consumers perceive it to be less in size versus a smaller food item labeled "larger." Further, consumers' perception of the amount they consumed is lower (vs. actual consumption) when the stimulus has a smaller versus a larger label. In that case, they also consume a larger quantity. This is where the health- and public policy-related implications of this work gain considerable importance, since the study demonstrates that smaller labels may lead consumers to eat more without even being aware of it, causing unintended and uninformed overconsumption.

The study 2 results show that perceived size estimates mediate the effect of size labels on perceived consumption and that perceived consumption (controlling for actual consumption) mediates the effect of size labels on actual consumption. In the next two studies, we test for moderating influences on the size label effect, ability through cognitive load in study 3 and consumer motivation to be accurate through a nutrition consciousness scale in study 4.

### STUDY 3: EFFECT OF SIZE LABELS UNDER COGNITIVE LOAD

In this study, we introduce a cognitive load in the form of a secondary task. Per the main tenets of dual process models, we expect the size label effect to be greater under load than without load, since cognitive capacity will be further limited under load (hypothesis 7). The study also tests hypothesis 2 (asymmetric effect of size labels on size estimates).

#### Method

**Design.** A 2 (size label: consistent, inconsistent)  $\times$  2 (actual size: eight, 10 pieces of mini-sandwiches)  $\times$  2 (cognitive load: load, no load) between-subjects design was used. Two hundred and twenty-four students from a Midwestern university participated in the experiment as part of a subject pool for course credit.

**Stimuli.** Mini-sandwiches were prepared using two regular slices of bread and jelly, which were later cut into pieces of eight. For the small condition of the actual size manipulation, eight pieces of mini-sandwiches were put in a small disposable bowl, and for the large condition, 10 pieces of mini-sandwiches were put in an identical bowl. The bowls were later sealed with see-through plastic wrap. Two pieces of information were affixed onto the bowls of mini-sandwiches: size label and additional nutrition information.

For the consistent condition of the size label manipulation, a piece of paper was attached to the bowl with the label SMALL for the eight-piece bowl and with the label LARGE for the 10-piece bowl. The opposite labeling was used for the inconsistent condition. Additional nutrition information consisted of the actual amount of calories (240/300), calories of fat (80/100), total fat (8/10 grams), total carbohydrate (30/38 grams), and sugar (16/ 20 grams) for the eight-piece and the 10-piece bowls, respectively. This information was provided as a manipulation test for load—subjects under cognitive load were expected to pay less attention to the nutrition information.

**Manipulation of Cognitive Load.** Before being given the target questionnaire, the participants under the cognitive load condition were given a separate task. In this task, subjects were presented with a page listing the contact information for 16 children in a fifth-grade class. They were asked to try and remember which name went with which family name. Additionally, they were told that, in order to make the task more difficult (but also more realistic), they also needed to do a secondary task—take a taste test and respond to a “Secondary Task Questionnaire.” After they completed this secondary task, they would be given a memory test on the children’s names. They were free to look at the page of names while doing the “secondary” task, which was actually meant to be the target primary task.

Similar types of secondary tasks have been shown to be cognitively taxing in earlier research (Gilbert, Giesler, and Morris 1995; Gilbert and Hixon 1991; Spencer, Fein, and

Wolfe 1998). The memory test asked six questions on the names of students in the fifth-grade class (e.g., What is Jay’s last name?). To keep the time identical across the two cognitive load conditions, subjects under the no load condition were given a series of unrelated questions (i.e., simple brand attitude responses) both at the beginning of the study and during the memory test phase.

**Procedure.** Concurrently with the cognitive load manipulation phase (and the unrelated questions for the no cognitive load condition), the participants were presented with the bowl of mini-sandwiches for evaluation, disguised as a “secondary task.” The cover story for this target task was similar to the one used in studies 1 and 2, that an airline company was considering the introduction of a bowl of mini-sandwiches as a snack option. When the participants were finished with evaluating the stimuli, the bowls were taken away and the participants were given the target questionnaire packet, with critical size perception questions, a nutrition information test, and other control questions. See figure 4 for the overall flow of procedure. The subjects were not allowed to pick up the bowls.

#### Results and Discussion

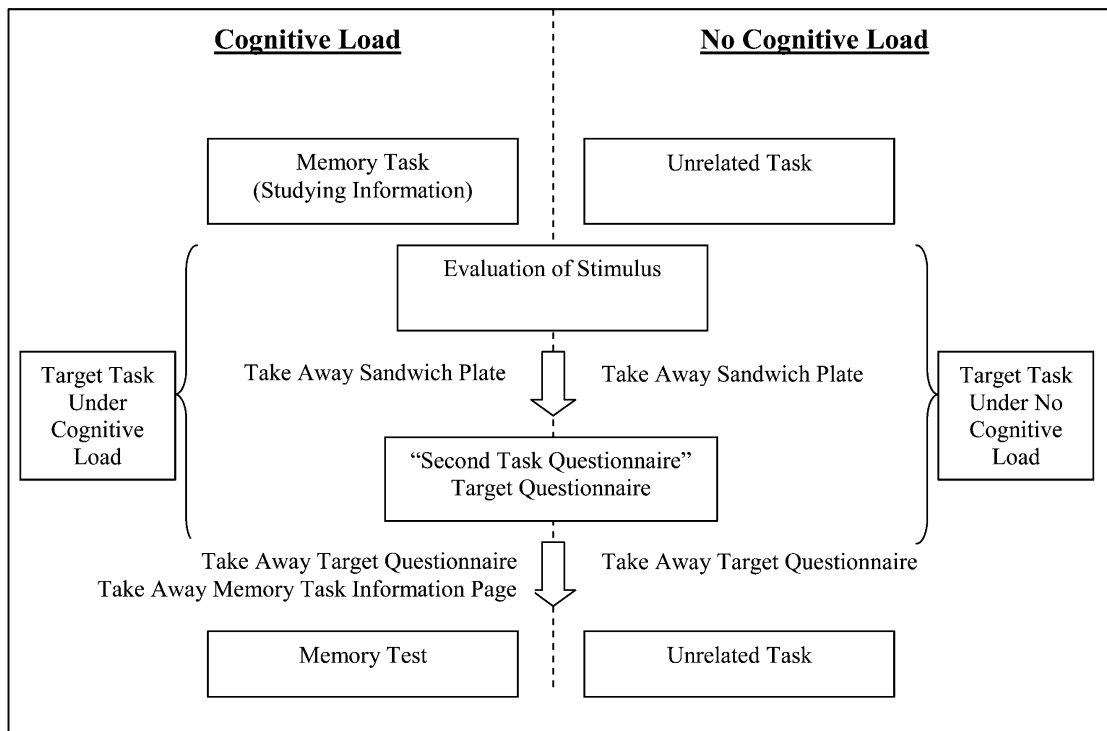
Gender effects were not significant and are not discussed any further (as in previous studies with perceived size as the dependent variable). We first look at the results of the nutrition information test as a manipulation check for cognitive load. As expected, we see that participants making their evaluations under cognitive load scored significantly lower on the nutrition test compared to participants under no cognitive load (load  $M = 2.36$  correct answers out of 5; no load  $M = 2.98$  correct answers out of 5;  $F(1, 222) = 23.37, p < .01$ ). This provides support that the load manipulation was successful.

We used analysis of variance to analyze the results. Perceived size (in number of mini-sandwich pieces) was the dependent variable, and size label (consistent, inconsistent), actual size (eight or 10 pieces of mini-sandwiches), and cognitive load (load, no load) were the independent variables. Per our main proposition regarding the effect of size labels on size perceptions, and replicating studies 1 and 2, we should observe a strong size label effect on size estimations (i.e., a size label  $\times$  actual size interaction). We also expect an asymmetry (hypothesis 2), where the size label effect will be stronger when the large actual size stimulus is called “small” (compared to when the small stimulus is called “large”). Additionally, we expect the size label effect to be stronger under the load condition.

We obtained a significant main effect for the actual serving size (large size  $M = 9.18$  pieces; small size  $M = 7.63$  pieces;  $F(1, 214) = 47.40, p < .01$ ). The main effect for size label was also significant (consistent  $M = 8.95$  pieces; inconsistent  $M = 7.89$  pieces;  $F(1, 214) = 46.13, p < .01$ ). The main effect for load was not significant ( $p > .4$ )—we have no hypotheses for these effects.

In terms of the interactions, as predicted, we obtained a

FIGURE 4  
STUDY 3 PROCEDURE



significant three-way interaction between size label, actual size, and load ( $F(1, 214) = 5.06, p < .05$ ). Also, as predicted, we obtained a significant interaction between size label and actual size ( $F(1, 214) = 43.13, p < .01$ ), indicating that size labels have different effects on perceived size depending on the actual size of the item. We also obtained a significant two-way interaction between size label and cognitive load ( $F(1, 214) = 5.06, p < .05$ ), suggesting that the effect of size label varies under load versus no load. The interaction between actual size and load was not significant ( $p > .5$ ). To further investigate how the size label effect varies under load versus no load, we next performed follow-up contrasts within the load and no load conditions (see fig. 5 for cell means).

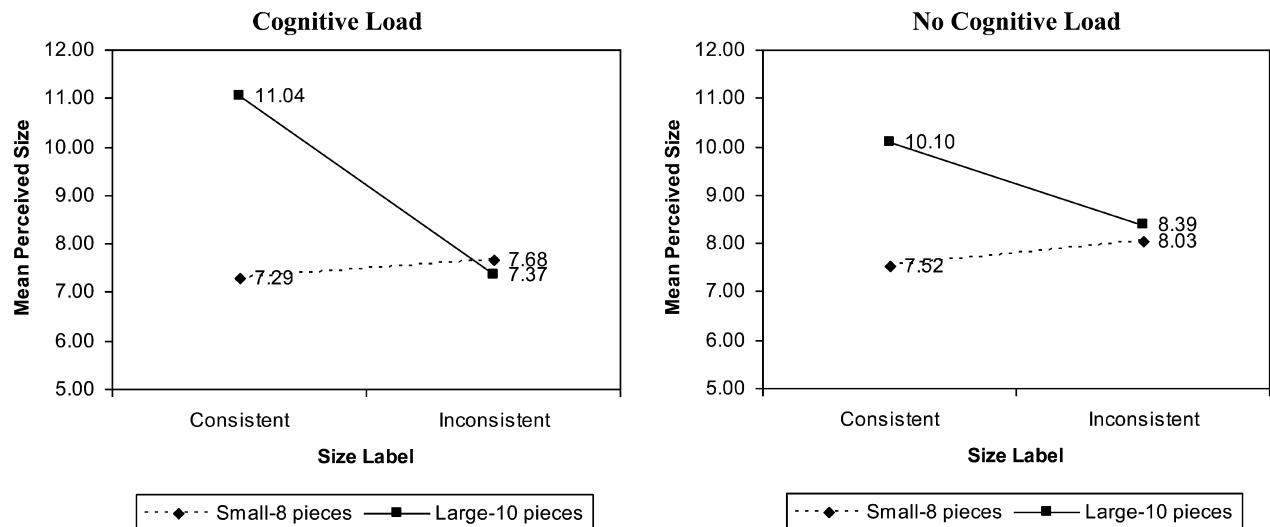
Within the no load condition, we obtained a significant main effect for actual size (large size/no load  $M = 9.25$  pieces; small size/no load  $M = 7.78$  pieces;  $F(1, 214) = 21.68, p < .01$ ), which was qualified by a significant interaction between actual size and size label ( $F(1, 214) = 12.42, p < .01$ ). The main effect for size label was not significant ( $p > .1$ ). Consistent with hypothesis 2, follow-up contrasts show that for the no load cells, size label is significant within the large size condition but not within the small size condition (see fig. 5). When the 10-piece bowl is labeled as "small," estimates are significantly lower ( $M = 8.39$  pieces), as compared to when it is labeled "large" ( $M = 10.10$  pieces;

$F(1, 214) = 15.34, p < .01$ ). However, when the eight-piece bowl is labeled "large" ( $M = 8.03$  pieces), estimates are not significantly higher, as compared to when it is labeled as "small" ( $M = 7.52$  pieces,  $p > .2$ ). Thus, our "asymmetric size label effect" (hypothesis 2) is once more supported. The no load condition, in fact, replicates previous studies in design. Next, to find support for our cognitive load moderation hypothesis (hypothesis 7), we need to demonstrate that this effect is stronger within the load condition.

Within the load condition, we again obtain a significant main effect for actual size (large size/load  $M = 9.21$  pieces; small size/load  $M = 7.49$  pieces;  $F(1, 214) = 26.20, p < .01$ ), and a significant interaction between actual size and size label ( $F(1, 214) = 36.75, p < .01$ ). We also observe a significant main effect for size label (inconsistent/load  $M = 7.53$  pieces; consistent/load  $M = 9.17$  pieces;  $F(1, 214) = 21.68, p < .01$ ). We do not have a hypothesis for this effect. Again, consistent with hypothesis 2, follow-up contrasts show, for the load cells as well, that size label is significant within the large-size condition but not within the small-size condition (see fig. 5). When the 10-piece bowl is labeled as "small" ( $M = 7.37$  pieces), estimates are significantly lower, as compared to when it is labeled "large" ( $M = 11.04$  pieces;  $F(1, 214) = 57.97, p < .01$ ). However, when the eight-piece bowl is labeled "large" ( $M = 7.68$  pieces), estimates are not significantly

FIGURE 5

RESULTS FROM STUDY 3: COGNITIVE LOAD EXACERBATES THE SIZE LABEL EFFECT



NOTE.—Mean perceived size: number of mini-sandwich pieces.

higher, as compared to when it is labeled as “small” ( $M = 7.29$  pieces,  $p > .4$ ). Thus, our “asymmetric size label effect” (hypothesis 2) is once more supported for the load condition as expected.

To find support for our moderation hypothesis, we need to demonstrate that the decrease in the perceived size of the 10-piece bowl when it is labeled large versus small is greater within the load condition compared to the no load condition. While we cannot directly test for this difference of the differences effect, we see that (i) the perceived size of the 10-piece bowl when labeled “large” is significantly greater in the load condition, compared to the no load condition (large size/consistent/load  $M = 11.04$  pieces; large size/consistent/no load  $M = 10.10$  pieces;  $F(1, 214) = 4.09$ ,  $p < .05$ ) and also that (ii) perceived size of the 10-piece bowl when labeled “small” is significantly smaller in the load condition, compared to the no load condition (large size/inconsistent/load  $M = 7.37$  pieces; large size/inconsistent/no load  $M = 8.39$  pieces;  $F(1, 214) = 5.05$ ,  $p < .05$ ). Together, (i) and (ii) provide support for hypothesis 7. Under normal conditions, participants were subject to the biasing effect of size labels, and this effect seems to be exacerbated under cognitive load (when capacity is limited). In summary, study 3 replicates the asymmetric effect of size labels on size perceptions. Additionally, it shows that the effect is stronger when individuals’ cognitive capacity is limited.

In studies 1 and 2, experimental participants were exposed to the visual stimuli and size label. They were provided with further nutrition information as a verbal supplement in study 3. However, what would happen if participants did not have visual information on the stimuli, and instead, the size in-

formation (e.g., number of ounces or number of grams) is given to them with a verbal cue? Will a size label effect still be in evidence? We explore this in study 4.

#### STUDY 4: EFFECT OF MOTIVATION FOR ACCURACY ON THE SIZE LABEL EFFECT

In this study, subjects are not given the actual product but are given verbal information about the food item. This scenario is consistent with any menu-based food and drink selection where the stimuli are described by written information only and are not physically present (and most often also not accompanied by a picture). We also test here the effect of motivation for accuracy (hypothesis 8).

For the stimuli, we chose a product that is frequently purchased and consumed by consumers—Oreo cookies. We also chose a portion size that our subjects buy very often: snack-size Mini Oreos—the package that is found in vending machines in university campuses that has approximately 13 mini-cookies (around 40 grams). These mini-cookies are of standard size across all vendors. Subjects were given the serving size information (in grams) and were asked to estimate the number of Oreo mini-cookies. Subjects were also given a size label. We wanted to see if size labels would affect people’s perception of the number of Oreo mini-cookies and if motivation for accuracy moderates any effect of size label.

We operationalize motivation for accuracy through the General Nutrition Consciousness of the participants. This measure is designed to be an overall index of the degree to which respondents are concerned about nutrition intake and how this reflects on their daily life. We used a reduced form

of the 17-item scale developed by Saegert and Young (1982). We specifically focused on five items reflecting respondents' everyday practice-based concern for estimating nutrition intake accurately. The five items used in our scale are: "I watch and listen for the latest information about nutrition practices"; "I eat the recommended daily amount of the food groups in the food pyramid"; "I limit the amount of fat in my diet to one-third or less of my total daily calorie intake"; "I read the nutrition labels on packaged foods for nutritional content and to ensure fat and salt are at or below an acceptable level"; and "I try to make sure for the food that I eat to have high nutritional value."

Respondents indicated their frequency of engaging in these nutrition-conscious activities on 4-point scales anchored at "never" to "always." Subjects scoring high on this scale should have a greater tendency to correctly learn about the nutrition content of food items, and their motivation for accuracy should be higher.

## Method

**Design.** A 2 (size label: small, large)  $\times$  2 (serving size information given to participants: 30 grams, 50 grams)  $\times$  2 (nutrition consciousness: high, low) design was used. The first two factors were manipulated between subjects, whereas the last factor was a measured variable. Two hundred students from an introductory marketing management class participated in the experiment as part of a subject pool in a Midwestern university.

**Procedure.** Participants were told that an airline company was considering the sales of Mini Oreo packages as a snack option on its flights. They were then asked to review the information given to them about the packages and to respond to a set of questions. Participants were informed that the packages contained "Mini Oreo Chocolate Sandwich Cookies." Information provided about serving size and size label depended on the condition that the respondents were assigned to and was conveyed within the text. Respondents were not presented with actual package samples or pictures of the stimuli.

After reviewing this information, participants were asked to indicate the number of cookies they thought the package contained. We also included an option where participants could check off that they had never tried Oreos before (and could then be excused from the study), but no one in our sample exercised this option. After that, subjects responded to a set of questions in line with the cover story and completed the nutrition consciousness scale. It was important to collect nutrition consciousness measures at the end of the study, so that it would not affect participants' responses to questions of interest.

## Results and Discussion

Although nutrition consciousness can be treated as a continuous variable (Fitzsimons 2008; Irwin and McClelland 2003), we treated it here as a categorical variable, given the

specific predictions that we have for individuals differing in motivation (similar to Smeesters, Mussweiler, and Mandel 2010) and to keep the presentation of the results for the two moderators compatible. Nevertheless, all the results from the reported ANOVAs are highly similar to those using regression analyses.

Accordingly, we first performed a median split on the nutrition consciousness measure, so that participants scoring higher than or equal to the median value of 2.20 (on a 4-point scale) were classified as high in nutrition consciousness and those scoring lower than 2.20 as low; we use these as operationalizations for high and low motivation for accuracy in food size estimation.

We conducted an analysis of variance, with perceived size (in number of Mini Oreo pieces the package contains) as the dependent variable and size label ("small," "large"), serving size information (30, 50 grams), and nutrition consciousness (high, low) as the independent variables. We obtained a marginally significant main effect for the serving size information provided to the participants (50 grams  $M = 11.33$  pieces; 30 grams  $M = 10.21$  pieces;  $F(1, 196) = 3.27, p < .10$ ). The main effect for size label was also significant (large  $M = 11.30$  pieces, small  $M = 10.23$  pieces;  $F(1, 196) = 3.92, p < .05$ ). The main effect for nutrition consciousness was not significant ( $p > .9$ ). There were no hypotheses for these effects.

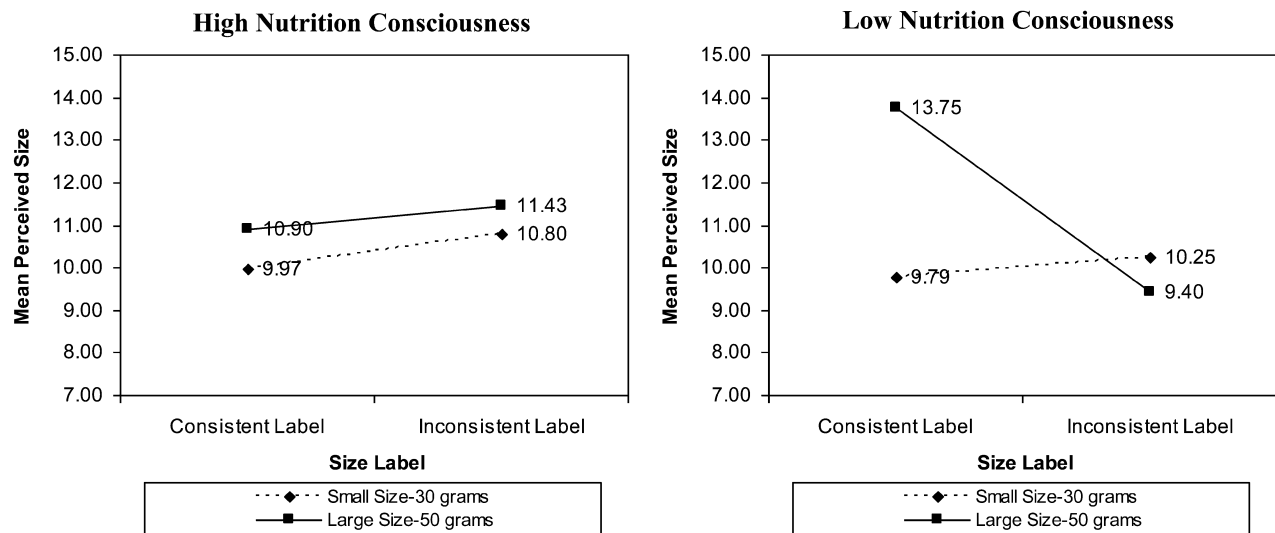
As predicted, however, we obtained a significant three-way interaction between size label, serving size information, and nutrition consciousness ( $F(1, 196) = 4.15, p < .05$ ). The interaction between size label and nutrition consciousness was marginally significant ( $F(1, 196) = 3.06, p < .10$ ). The other two two-way interactions were not significant ( $p > 0.3$ ). Further analyzing the three-way interaction, we next looked at size label and serving size information effects (main effects and interactions) within the low and high nutrition consciousness conditions (see fig. 6 for cell means).

Within the low nutrition consciousness condition, we obtained a significant main effect for size label (large label/low nutrition consciousness  $M = 11.84$  pieces, small label/low nutrition consciousness  $M = 9.59$  pieces;  $F(1, 196) = 6.06, p < .05$ ), which was qualified by a significant interaction between serving size information and size label ( $F(1, 196) = 3.95, p < .05$ ). Consistent with hypothesis 2, follow-up contrasts show that size label is significant within the large size condition but not within the small size condition (see fig. 6). When the 50 grams snack package is labeled "small" ( $M = 9.40$  pieces), estimates are significantly lower, as compared to when it is labeled "large" ( $M = 13.75$  pieces;  $F(1, 196) = 9.55, p < .01$ ). However, when the 30 grams snack package is labeled "large" ( $M = 10.25$  pieces), estimates are not significantly higher, as compared to when it is labeled as "small" ( $M = 9.79$  pieces,  $p > .7$ ). Thus, our "asymmetric size label effect" (hypothesis 2) is once more supported.

As in study 2, again we obtain a reversal (directional, this time) in relative perceived size, so that the larger package size (50 grams) labeled "small" is perceived to contain fewer

FIGURE 6

RESULTS FROM STUDY 4: HIGH MOTIVATION FOR ACCURACY EXTENUATES THE SIZE LABEL EFFECT



NOTE.—Mean perceived size: number of Mini Oreos.

mini-cookies ( $M = 9.40$  pieces) versus the smaller package size (30 grams) labeled “large” ( $M = 10.25$  pieces;  $p > .2$ ).

Within the high nutrition consciousness condition, however, the main effect for size label was not significant ( $p > .8$ ) nor was the interaction of size label and serving size information ( $p > .4$ ). Together, the results show strong support for hypothesis 8, that the size label effect is extenuated when consumers have a high desire to be accurate in their perceptions.

In summary, we find that even when subjects are given direct information on serving sizes (e.g., in grams), size labels still have an impact on perceived size estimates so that larger sizes are considered smaller if labeled small (vs. larger). This is in accordance with the greater ease of evaluability of size labels, discussed in our conceptual development, compared to not only sensory cues but also other forms of semantic information. However, nutrition concern moderates the size label effect such that when consumers care more about food size estimation accuracy (their nutrition and energy intake), they are less likely to rely on size labels as a simplifying heuristic. In the next study, we report a field test that investigates the effect of size labels on actual and perceived consumption.

### STUDY 5: DO SIZE LABELS INFLUENCE CONSUMPTION VOLUME AND PERCEIVED CONSUMPTION? A FIELD STUDY

We now use a controlled field study to explore the effects of size labels on perceived consumption (hypothesis 3) and actual consumption (hypothesis 5).

### Method

Participants were 76 executives, with a fairly diverse age range, who met for a full-day executive training program in a European university. Typically in this program participants are given two coffee breaks during the day with refreshments. An arrangement was made with the catering company (with the permission of the college administration, as well as of the professor giving the training) to replace the food during the morning coffee break with our stimuli. Accordingly, plates of cookies were prepared that contained 15 pieces (about 80 grams in total). Size labels were attached to each plate that stated that this was either a “medium” size or a “large” size portion, and the plates were placed on tables organized outside the training room.

During their break, participants were instructed to move toward the tables. Each table contained only one type of size label condition so that participants would not see different labels for identical portions. Particular care was taken to make sure men and women were equally distributed across both conditions. It was verbally announced that the catering company was conducting a quick customer satisfaction study and that they would be asked a short series of questions after the break. Coffee and tea were served by two wait staff, so that participants did not leave their seats during the process. At the end of the break, people were asked to note their names on the index cards placed on the tables, leave their plates as is, and go back to the training room. They were then presented with a very short survey asking them to indicate (in grams) the cookie amount they thought there was in the total portion and how much they thought they had con-

sumed. They also indicated how “sufficient” the portion was for such occasions, on a scale ranging from 1 (extremely insufficient) to 7 (extremely sufficient). We included this subjective measure in this study to control for any possible effects of the difficulty participants might face in reporting size in objective units. Finally, the plates were weighed, and this weight was subtracted from the initial weight to provide an indication of what participants had actually consumed. Actual consumption measures later showed that five participants had not consumed any cookies, and they were removed from the analyses reported next.

## Results and Discussion

We wanted to see if labeling a product as “medium” would encourage people to eat more versus when it was labeled as “large.” Furthermore, we wanted to see if the people who ate more were aware of this fact. That is, we wanted to examine the effect of size labels on actual and perceived consumption.

We first conducted an analysis of variance with the subjective measure of “sufficiency” as the dependent variable, size label as the independent variable, and gender as a covariate. Neither the main effect of gender ( $p > .8$ ) nor its interaction with size label ( $p > .6$ ) were significant. The main effect of size label was significant—the respondents perceived the same plate to be “more sufficient” (i.e., larger in size) when it was labeled as a “large” portion, as compared to when it was labeled as a “medium” portion (medium  $M = 4.08$ , large  $M = 4.94$ ;  $F(1, 66) = 7.03$ ,  $p < .05$ ). In keeping with our earlier results, again size labels influence both objective and subjective size estimates.

We next conducted an analysis of variance with actual consumption as the dependent variable, size label as the independent variable, and gender as a covariate. Women ate significantly less than men (female  $M = 26.11$  grams; male  $M = 34.14$  grams;  $F(1, 66) = 4.56$ ,  $p < .05$ ). However, the gender-label interaction was not significant ( $p > .8$ ), so that women ate less than men in both size label conditions. This analysis indicated that those executives given the cookie plate labeled as “medium” size ate 12.02 grams more than those for whom the same plate was labeled as a “large size,” supporting hypothesis 5 (medium  $M = 24.71$  grams, large  $M = 36.73$  grams;  $F(1, 66) = 8.29$ ,  $p < .05$ ).

What is interesting is that this effect flipped when the same analysis was repeated with perceived consumption (measured as perceived consumption error; i.e., perceived consumption – actual consumption, as in study 2). An analysis of variance with perceived consumption error as the dependent variable, size label as the independent variable, and gender as a covariate demonstrated this reversal. As expected, participants’ perception of consumption amount (vs. their actual consumption) was significantly lower when the plate was labeled as “medium,” compared to when the same plate was labeled as “large” (medium  $M = 6.38$  grams, large  $M = 34.78$  grams;  $F(1, 66) = 5.26$ ,  $p < .05$ ), supporting hypothesis 3. The main effect for gender and its interaction with size label were not significant for perceived consump-

tion error ( $p > .4$ ). (We do not test for the mediation hypothesis in this study since perceived size measurements were collected postconsumption.) The fact that even when consumers ate more they were not aware of it has major implications for overeating and potential obesity problems.

## CONCLUSION

We propose and demonstrate that size labels affect size judgments and also that they affect actual and perceived consumption. An implication of our results is that consumers can continue to eat large sizes that are labeled as small and feel that they have not consumed too much. This can result in unintended and uninformed overconsumption, which can clearly have dire consequences for health reasons. We also show that the impact of size labels is moderated by the availability of people’s cognitive resources and their nutrition consciousness. When cognitive capacity is limited with engagement in external tasks (which characterize everyday life), the degree of the size label effect is enlarged. Moreover, the biasing influence of size labels persists even in the presence of information on actual size or nutrition content. However, consumers who are internally more concerned about being accurate about nutrition intake are less prone to the size label effect. Hence, making consumers more nutrition conscious may reduce the effect of size labels that marketers adopt and prevent the potential adverse consequences of mislabeling.

The results of study 1 provide support for our contention that the semantic size label cue can provide an easy direction in making size judgments for product categories where there is difficulty in processing actual size information from the visual stimuli. Study 2 extends the results of study 1 by showing the impact that size labels have on perceived and actual consumption. It also demonstrates that the size label effect on perceived consumption is mediated by perceived size and that the size label effect on actual consumption is mediated by perceived consumption. Study 3 demonstrates the increase in the size label effect when consumers are engaged in other tasks. Study 4 shows that even when simple and direct actual size information (verbal information) is provided to consumers, they may still be subject to the biasing influence of size labels in their size judgments and that this effect can only be extenuated when motivation to be accurate is high. Thus, evidence from studies 1–4 together demonstrates the robust effect of size labels in the presence of alternative forms of information. In studies 2 and 4, we also obtain a reversal of relative sizes, such that the larger food item labeled “smaller” is perceived to be less in size versus the smaller food item labeled “larger.”

In the final study (study 5), we use a field experiment to explore the effects of size labeling on actual and perceived consumption in the field. We find that the use of different size labels for the same product affects the amount people consume. Furthermore, consumers may not even be aware of the effect of the size label on their consumption behavior (perceived consumption). This implies that consumers can follow a pattern of consuming larger sizes that are labeled

as being smaller and not even realize how much they have consumed. Such behavior is clearly ridden with significant health ramifications, and size labels could be contributing to the rampant obesity problems in the United States. Thus, stricter size labeling laws and more vigilant monitoring of marketers' use of size labels may be needed, especially considering the limited cognitive resources available to consumers for routine food choice and consumption behavior during their other everyday endeavors.

The studies together also suggest that since consumers are trying to balance the conflicting goals of hedonic enjoyment of consuming large quantities and the utilitarian and psychosocial motives of maintaining good health and body image, and self-presentation, they are more willing to accept a larger item as being "small" if labeled as such by marketers. This allows them to mitigate guilt about their increased consumption. However, when the reverse happens, when a small item is labeled as "large," the opposite effect takes hold, and consumers do not readily accept it. As such, the size label has a smaller effect on size perceptions in the latter case. This is supported by the compressive power function explanation of Chandon and Wansink (2007b). We call this asymmetric effect "guiltless gluttony." Previous research indicates that such an urge to consume more without guilt is not limited to overweight consumers. The USDA Center for Nutrition Policy and Promotion report indicates a common inclination for people to underestimate the amount of unhealthy food items consumed in a day and to overestimate the daily consumption of recommended food items. Thus, the asymmetric "guiltless gluttony" effect we demonstrate is not limited only to certain types of consumers but may be more common.

Across our studies, respondents were asked to indicate their estimations using mostly objective measures (i.e., grams, ounces, number of pieces). In retrospect, this allows us to observe differences from actual size and reflect on the accuracy of their estimations. In study 1, perceived size was overestimated in all conditions. We believe that the absence of a benchmark and the inherent nature of the stimuli itself (i.e., a relatively small portion across all conditions) may have played a part in this. In studies 2, 3, and 4, respondents were relatively accurate in their estimations, except for the conditions where the larger-sized portions were inconsistently labeled "smaller." For these specific conditions, perceived size was underestimated. The results of study 5 do not lend themselves to such comparisons, since perceived size measures were taken postconsumption and therefore are not fully reliable. The dominant observation across studies 2–4 is in line with the asymmetric effect of size labels on size perceptions demonstrated in this article and also with the power function explanation of Chandon and Wansink (2007b). However, we do not have specific hypotheses about the level of accuracy in comparison to actual size, and we cannot arrive at any conclusions since we do not systematically test for it. This could be a potential avenue for further inquiry.

Our results are important for consumers and for public policy officials, since we establish that the biasing effect of

size labels is most pronounced when the concern to be accurate on nutrition intake is not high and when the capacity to process information is limited. Situations in which everyday food items are purchased and consumed would mimic these conditions.

Since size labels can (mis)lead food perceptions of consumers, marketers need to be careful in their adoption of new labels. The Fair Packaging and Labeling Act of 1966 states that its purpose is "to ensure that the labels of consumer commodities adequately inform consumers about their contents (and) . . . facilitate value comparisons by consumers" (Wolken, Derrick, and Fise 1979). There is already increased pressure from the media on governing authorities (such as the FDA) to examine and control food labels more closely. As such, we suggest that managers should exert extreme care when introducing new size labels and should pretest them to see whether the size label connotation matches the actual product. Unwittingly using a size label that connotes a different size perception from what the actual product has could result in serious negative consequences for the firm if recognized as deliberate by public policy officials, consumers, or the media. To return to our earlier example, 32 ounces of soda being labeled "large" in McDonalds and Kentucky Fried Chicken versus being labeled "medium" in Wendy's could result in very different actual and perceived consumption. Note that 32 ounces of Coke provides 225 calories and that 3,500 excess calories typically converts to one pound of human body fat (Nielsen and Popkin 2006). Thus, drinking excess soda can quickly result in weight gain (besides bringing on the negative effects of excess caffeine).

An important question that follows from a public policy perspective is whether consumers can be educated to avoid this effect and if so how. The main tenets of dual process models regarding the integration of various informational cues emanating from the stimulus, together with our empirical findings, illustrate that inclusion of more information is not always the best remedy for adverse labeling effects. Future research should direct effort at uncovering how consumers can be motivated to use more comprehensive perceptual processes when arriving at their product size judgments. This is beneficial from a public policy perspective, considering the significant implications of the effects for health, but also from the firm's perspective. Over the long run, helping consumers better control their consumption could not only reduce the likelihood of adverse regulations but also help promote more favorable attitudes toward the brand (Wansink and Chandon 2006).

Concurrently, other forms of cues should also be incorporated into systematic inquiry. In this article, we explored the integration of the semantic cue of size label, other verbal information, and the sensory cues of vision and satiation. An effort toward a more detailed classification and examination of sensory and other types of information describing the size of a stimulus and exploring the moderating influences on the choice of cues may provide valuable extensions to this research. On a related account, regarding the evaluability of the



cues, we focus on the relative size judgments of stimuli presented sequentially to people. It would be interesting to explore whether the effects still exist when consumers can see alternative stimuli simultaneously. This is especially relevant since various sizes are often displayed in stores (e.g., small, medium, and large size glasses for soda or coffee in fast food outlets).

This article focuses on food categories. Labeling effects should also be examined in other product categories. For example studying label effects for clothing could yield valuable insights about perceptions of body image. In the clothing industry, misleading labeling practices also exist—marketers often label the same size as a 12 versus a 16 to make consumers feel thinner (Kinley 2003).

Product size is also often correlated with price in the real world. One of the motivations behind increasing portion sizes in the marketplace is usually stated as marketers' motives to signal increased value to consumers (Volken et al. 1979). If consumers view larger sizes as having better value, they would be more likely to purchase them. Furthermore, research by Wansink (1996) has shown that in some circumstances, larger package sizes encourage greater use than do smaller package sizes. However, this effect of package size on usage volume is conditional on a decrease in the product's perceived unit cost. The concepts of price and value were outside the scope of this article; it would be interesting to study the interactive effects of size labeling and price/perceived value on consumers' purchase and consumption patterns.

This article brings attention to the fact that the labeling of a product can have a major effect on consumer perceptions of that product. It therefore deserves further attention by researchers, marketers, and public policy officials.

## REFERENCES

- Allison, Ralph I. and Kenneth P. Uhl (1964), "Influence of Beer Brand Identification on Taste Perception," *Journal of Marketing Research*, 1 (August), 36–39.
- Baron, Reuben M. and David A. Kenny (1986), "The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations," *Journal of Personality and Social Psychology*, 51 (June), 1173–82.
- Borgida, Eugene and Beth Howard-Pitney (1983), "Personal Involvement and the Robustness of Perceptual Salience Effects," *Journal of Personality and Social Psychology*, 45 (September), 560–70.
- Cacioppo, John T., Richard E. Petty, and Katherine J. Morris (1983), "Effects of Need for Cognition on Message Evaluation, Recall, and Persuasion," *Journal of Personality and Social Psychology*, 45 (October), 805–18.
- Chaiken, Shelly (1980), "Heuristic versus Systematic Information Processing and the Use of Source versus Message Cues in Persuasion," *Journal of Personality and Social Psychology*, 39 (November), 752–66.
- Chaiken, Shelly, Akiva Liberman, and Alice H. Eagly (1989), "Heuristic and Systematic Information Processing within and beyond the Persuasion Context," in *Unintended Thought*, ed. James S. Uleman and John A. Bargh, New York: Guilford.
- Chandon, Pierre and Brian Wansink (2007a), "The Biasing Health Halos of Fast Food Restaurant Health Claims: Lower Calorie Estimates and Higher Side-Dish Consumption Intentions," *Journal of Consumer Research*, 34 (October), 301–14.
- (2007b), "Is Obesity Caused by Calorie Underestimation? A Psychophysical Model of Meal Size Estimation," *Journal of Marketing Research*, 44 (February), 84–99.
- Dickson, Peter R. and Alan G. Sawyer (1990), "The Price Knowledge and Search of Supermarket Shoppers," *Journal of Marketing*, 54 (July), 42–53.
- Fitzsimons, Gavan J. (2008), "Death to Dichotomizing," *Journal of Consumer Research*, 35 (June), 5–8.
- Gilbert, Daniel T., Brian R. Giesler, and Kathryn E. Morris (1995), "When Comparisons Arise," *Journal of Personality and Social Psychology*, 69 (August), 227–36.
- Gilbert, Daniel T. and Gregory J. Hixon (1991), "The Trouble of Thinking: Activation and Application of Stereotypic Beliefs," *Journal of Personality and Social Psychology*, 60 (April), 509–17.
- Herz, Rachel S. and Julia von Clef (2001), "The Influence of Verbal Labeling on the Perception of Odors: Evidence for Olfactory Illusions," *Perception*, 30 (March), 381–91.
- Hoch, Stephen J. and Young-Won Ha (1986), "Consumer Learning: Advertising and the Ambiguity of Product Experience," *Journal of Consumer Research*, 13 (September), 221–33.
- Hoyer, Wayne D. and Steven P. Brown (1990), "Effects of Brand Awareness on Choice for a Common, Repeat-Purchase Product," *Journal of Consumer Research*, 17 (September), 141–48.
- Hsee, Christopher K. (1996), "The Evaluability Hypothesis: An Explanation for Preference Reversals between Joint and Separate Evaluations of Alternatives," *Organizational Behavior and Human Decision Processes*, 67 (September), 247–57.
- Irwin, Julie R. and Gary H. McClelland (2003), "Negative Consequences of Dichotomizing Continuous Predictor Variables," *Journal of Marketing Research*, 40 (August), 366–71.
- Kinley, Tammy (2003), "A Fat Price Tag Can Bring a Slimmer Size: A Perfect 10? No Such Thing Really," *Seattle Post*, October 28, E1.
- Krishna, Aradhna, Imran S. Currim, and Robert W. Shoemaker (1991), "Consumer Perceptions of Promotional Activity," *Journal of Marketing*, 55 (April), 4–16.
- Life Sciences Research Office, Federation of American Societies for Experimental Biology (1995), *Third Report on Nutrition Monitoring in the United States* (Nationwide Food Consumption Survey 1977–78), Washington DC: U.S. Government Printing Office.
- Livingstone, M. Barbara and Alison E. Black (2003), "Markers of the Validity of Reported Energy Intake," *Journal of Nutrition*, 133 (March), 895–920.
- Maheswaran, Durairaj and Shelly Chaiken (1991), "Promoting Systematic Processing in Low-Motivation Settings: Effect of Incongruent Information on Processing and Judgment," *Journal of Personality and Social Psychology*, 61 (July), 13–25.
- Mitchell, Vincent-Wayne, David Lennard, and Peter McGoldrick (2003), "Consumer Awareness, Understanding, and Usage of Unit Pricing," *British Journal of Management*, 14 (June), 173–87.
- National Alliance for Nutrition and Activity (2002), "From Wallet to Waistline: The Hidden Costs of Super Sizing," <http://www.jscpnet.org>.
- Nielsen, Samara Joy and Barry M. Popkin (2006), "Patterns and Trends in Food Portion Sizes, 1977–98," *Journal of the American Medical Association*, 289 (January), 450–53.

- Petty, Richard E. and John T. Cacioppo (1984), "The Effects of Involvement on Responses to Argument Quantity and Quality: Central and Peripheral Routes to Persuasion," *Journal of Personality and Social Psychology*, 46 (January), 69–81.
- (1986), *Communication and Persuasion: Central and Peripheral Routes to Attitude Change*, New York: Springer-Verlag.
- Petty, Richard E., John T. Cacioppo, and Rachel Goldman (1981), "Personal Involvement as a Determinant of Argument-Based Persuasion," *Journal of Personality and Social Psychology*, 41 (November), 847–55.
- Prelec, Drazen, Birger Wernerfelt, and Florian Zettelmeyer (1997), "The Role of Inference in Context Effects: Inferring What You Want from What Is Available," *Journal of Consumer Research*, 23 (June), 118–25.
- Raghubir, Priya and Aradhna Krishna (1999), "Vital Dimensions in Volume Perception: Can the Eye Fool the Stomach?" *Journal of Marketing Research*, 36 (August), 313–26.
- Ratneshwar, S. and Shelly Chaiken (1991), "Comprehension's Role in Persuasion: The Case of Its Moderating Effect on the Persuasive Impact of Source Cues," *Journal of Consumer Research*, 18 (June), 52–62.
- Rolls, Edmund T. (2005), "Taste, Olfactory, and Food Texture Processing in the Brain, and the Control of Food Intake," *Physiology and Behavior*, 85 (May), 45–56.
- Saegert, Joel and Eleanor A. Young (1982), "Distinguishing between Two Different Kinds of Consumer Nutrition Knowledge," *Advances in Consumer Research*, 9 (1), 342–47.
- Shuren, Jeffrey (2005), "Food Labeling: Serving Sizes of Products That Can Reasonably Be Consumed at One Eating Occasion," *Food and Drug Administration Federal Register*, 70 (April), 17011–4.
- Smeesters, Dirk, Thomas Mussweiler, and Naomi Mandel (2010), "The Effects of Thin and Heavy Media Images on Overweight and Underweight Consumers: Social Comparison Processes and Behavioral Implications," *Journal of Consumer Research*, 36 (April), 930–49.
- Smiciklas-Wright, Helen, Diane C. Mitchell, Sharon J. Mickle, Joseph D. Goldman, and Annetta Cook (2003), "Foods Commonly Eaten in the United States, 1989–1991 and 1994–1996: Are Portion Sizes Changing?" *Journal of the American Dietetic Association*, 103 (January), 41–47.
- Spencer, Steven J., Steven S. Fein, and Connie T. Wolfe (1998), "Automatic Activation of Stereotypes: The Role of Self-Image Threat," *Personality and Social Psychology Bulletin*, 24 (November), 1139–52.
- Stevens, Stanley Smith (1986), *Psychophysics: Introduction to Its Perceptual, Neural, and Social Prospects*, Oxford: Transaction Books.
- U.S. Department of Agriculture, Center for Nutrition Policy and Promotion (2000), "Consumption of Food Group Servings: People's Perceptions versus Reality," *Nutrition Insight*, <http://www.usdagov/cnpp>.
- (1989–99, 1994–96, 1998), "Continuing Survey of Food Intake by Individuals," <http://www.usdagov/cnpp>.
- Wansink, Brian (1996), "Can Package Size Accelerate Usage Volume?" *Journal of Marketing*, 60 (July), 1–14.
- Wansink, Brian and Pierre Chandon (2006), "Can 'Low-Fat' Nutrition Labels Lead to Obesity?" *Journal of Marketing Research*, 43 (November), 605–17.
- Wolken, John D., Frederick W. Derrick, and Mary Ellen Fise (1979), "Economy Size Labels and Consumer Welfare," *Journal of Consumer Affairs*, 13 (Winter), 346–58.
- Wood, Wendy, Carl A. Kallgreen, and Rebecca M. Preisler (1985), "Access to Attitude-Relevant Information in Memory as a Determinant of Persuasion: The Role of Message Attributes," *Journal of Experimental Social Psychology*, 21 (January), 73–85.
- Young, Lisa R. and Marion Nestle (1995), "Portion Sizes in Dietary Assessment: Issues and Policy Implications," *Nutrition Reviews*, 53 (June), 149–58.
- (1998), "Variation in Perceptions of a 'Medium' Food Portion: Implications for Dietary Guidance," *Journal of the American Dietetic Association*, 98 (April), 458–59.
- (2002), "The Contribution of Expanding Portion Sizes to the US Obesity Epidemic," *American Journal of Public Health*, 92 (February), 246–50.
- (2003), "Expanding Portion Sizes in the US Marketplace: Implications for Nutrition Counseling," *Journal of the American Dietetic Association*, 103 (February), 231–34.
- (2007), "Portion Sizes and Obesity: Responses of Fast-Food Companies," *Journal of Public Health Policy*, 28 (July), 238–48.