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Can serving-size labels reduce the portion-size effect? A pilot study

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ABSTRACT

Research has shown that the bigger the portion that people are served, the more food they eat; this phenomenon is referred to as the portion-size effect. Providing objective serving-size information on food products has been shown to reduce the influence of external food cues on people's eating behavior. The current study examined whether providing objective serving-size information would also reduce the portion-size effect. 100 female participants were served either a small or large portion of pizza in the context of a taste test. The large portion was either unlabeled, labeled as "Contains 2 servings," or labeled as "Contains 4 servings." Food intake was lower when the large portion was labeled "Contains 4 servings" compared to when it was labeled "Contains 2 servings." Moreover, participants' intake in the large portion/4 servings condition was statistically similar to the intake of participants in the small portion condition. Thus, the standard portion-size effect was observed when the large portion was unlabeled or was labeled as "Contains 2 servings," but not when the large portion was labeled as "Contains 4 servings". These findings suggest that providing serving-size information can reduce the portion-size effect, but that the specific content (and not just the presence) of serving-size information is important in determining food intake.

1. Introduction

Portion size effects on food intake have received a great deal of attention from both the scientific community and the popular media. Portion sizes have increased dramatically since the 1970s (Nielsen & Popkin, 2003), and this increase in portion size has been identified as one of the main contributors to weight gain and obesity (Young & Nestle, 2002). Research has demonstrated that food intake tends to be governed by how much food people have available to them (e.g., Levitsky & Youn, 2004), and that the bigger the portion people are served, the more food they eat (e.g., Rolls, Morris, & Roe, 2002). A recent meta-analysis found that doubling the size of a portion results in a 35% increase in consumption (Zlatevska, Dubelaar, & Holden, 2014). Furthermore, the impact of portion size appears to be unaffected by other factors that would be expected to moderate the effect, such as hunger (Rolls et al., 2002) and palatability of the food (Wansink & Kim, 2005). Finding ways to reduce the portion-size effect has important implications for individuals' health and wellbeing.

One recent study tested whether psychological interventions could reduce the portion-size effect on food intake. Cavanagh, Vartanian, Herman, and Polivy (2014) assigned participants to an educational exercise that increased awareness of external factors that can influence food intake, or to a mindfulness exercise intended to increase participants' reliance on their internal sensations rather than on external food cues. Participants were then served either a small portion or a large portion of pasta for lunch. Neither of these manipulations reduced the portion-size effect; overall, participants ate 34% more pasta from the large portion than from the small portion.

An alternative approach to tackling the problem of larger portion sizes is to modify the food environment (Wansink, 2004). Specifically, Wansink and Chandon (2006) proposed that providing objective serving-size information could reduce the impact of external cues on people's food intake. They argued that, in many cases, the serving size of a portion of food is ambiguous, and consumers are thus left to draw their own inferences about how much they should eat. Others have also suggested that portion size can provide an anchor that strongly influences decisions about how much to eat (Marchiori, Papies, & Klein, 2014). Providing objective serving-size information, then, should eliminate the need for people infer the appropriate amount to eat and should reduce the reliance on external cues (i.e., portion size). In support of this hypothesis, Wansink and Chandon (2006, Study 3) showed that participants who were given a bag of granola that was labeled "contains 2 servings" ate approximately 30% less than did participants who were given a bag of granola labeled "contains 1 serving."

Building on the findings of Wansink and Chandon (2006), we conducted a pilot study to examine whether providing objective serving-size information would reduce the effect of portion size on the amount of food consumed. Participants were provided with either a

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small portion of pizza or a large portion of pizza. Furthermore, the large portion either contained no serving-size information, was labeled as containing 2 servings, or was labeled as containing 4 servings. First, we predicted that the standard portion-size effect would be observed, with participants eating more in the unlabeled large portion condition than in the unlabeled small portion condition. Second, we predicted that providing objective serving-size information would reduce the portion-size effect on participants' food intake. That is, following from Wansink and Chandon (2006), we predicted that participants given the large portion labeled "Contains 4 servings" would eat less than would participants given the large portion labeled "Contains 2 servings."

2. Method

2.1. Participants

Participants were 104 female undergraduate students at an Australian university who received either $10 or course credit for their participation. Four participants were excluded from the study (two because their food intake was more than 3 SD above the mean, and two because they did not pay attention to the task). Thus, data from 100 participants were included in the analyses below. Their mean age was 20.85 ($SD = 2.25$; range = 18–28) and their mean body mass index (BMI; kg/m^2) was 21.53 ($SD = 2.95$; range = 16.1–34.7). Of those who reported their ethnicity, 29% were Caucasian, 56% were Asian, and 14% identified as "other."

2.2. Portion size manipulation

Participants were randomly assigned to either a small portion condition or large portion condition. Those allocated to the small portion condition were served a plate containing 200 g of cheese pizza presented as 12 bite-sized pieces, and those allocated to the large portion condition were served a plate containing 400 g of cheese pizza presented as 24 bite-sized pieces. The same plate size was used in all conditions.

2.3. Labeling manipulation

Before being served the pizza, all participants were given a laminated pizza packaging to evaluate on various dimensions (e.g., color, font style, esthetic appeal), and were told that this was the packaging from the pizza that they would be tasting during the experimental session. For the small-portion condition and one of the large-portion conditions, the packaging included no information about the number of servings. For the other two large-portion conditions, the packaging either included the statement "Contains 2 servings" or included the statement "Contains 4 servings." (According to the manufacturer, 1 serving = 100 g of pizza).

2.4. Procedure

Participants signed up for a study on "product advertising and taste perceptions" and were asked not to eat for 3 h prior to their experimental session. Experimental sessions took place between 11 am and 3 pm. Participants were randomly assigned to one of four conditions: small portion/no label (S; $n = 26$), large portion/no label (L; $n = 26$), large portion/2 servings label (L2; $n = 23$), or large portion/4 servings label (L4; $n = 25$). (The two unlabeled conditions represent the standard portion-size manipulation.) After participants provided written consent, they rated their initial hunger on a 10-cm visual analogue scale anchored *Not at all hungry* and *Extremely hungry*. Next, they were given the pizza packaging, which they were asked to evaluate on different aspects of its design. Participants were then served either a small or large portion of pizza, which they were told was the pizza from the package that they had just evaluated, and were asked to taste and rate the pizza on a variety of dimensions (e.g., how salty, how crunchy). Participants were told that they should feel free to eat as much as they want in order to make accurate taste ratings. Participants were then left alone for 12 min to make their taste ratings. After the 12 min had elapsed, the experimenter entered the room to remove the plate of pizza. Plates were re-weighed to determine the total amount of pizza consumed (in grams).

Participants were then given a questionnaire packet to complete. Among several filler items, they were asked to indicate how many standard servings they thought they were given (which served as a manipulation check for participants in the L2 and L4 conditions), and to provide some basic demographic information including their age, height and weight (used to calculate their BMI), and ethnicity. Finally, participants were probed for suspicion using a funnel debriefing procedure (Bargh & Chartrand, 2000); none guessed the hypotheses.

3. Results

To test the effectiveness of the random assignment, a set of one-way ANOVAs was conducted with pizza condition as the independent variable and with participants' age, BMI, and initial hunger ratings as the dependent variables; there were no group differences for any of those variables ($ps > .20$). Initial hunger was significantly correlated with total food intake ($r = .27$, $p = .01$), and was therefore included as a covariate in the food intake analysis; age ($r = -.10$, $p = .34$) and BMI ($r = .17$, $p = .10$) were not related to the amount of food eaten.

3.1. Manipulation check

A one-way ANOVA on participants' estimates of how many standard servings of pizza they were given (L2 and L4 conditions only) confirmed the effectiveness of the manipulation, $F_{(1,46)} = 11.83$, $p = .001$, $\eta_p^2 = .21$. Participants in the L2 condition provided lower estimates of how many servings they were given ($M = 2.52$, $SD = 0.73$) than did participants in the L4 condition ($M = 3.28$, $SD = 0.79$).

3.2. Food intake

Mean pizza consumption for each of the four groups is displayed in Fig. 1. As predicted, a one-way ANCOVA revealed that pizza consumption varied by condition, $F_{(3,95)} = 3.45$, $p = .02$, $\eta_p^2 = .10$. Planned contrasts indicated that participants in the S condition ate significantly less than did participants in the L condition ($p = .04$) and participants in the L2 condition ($p = .004$), but did not differ from participants in

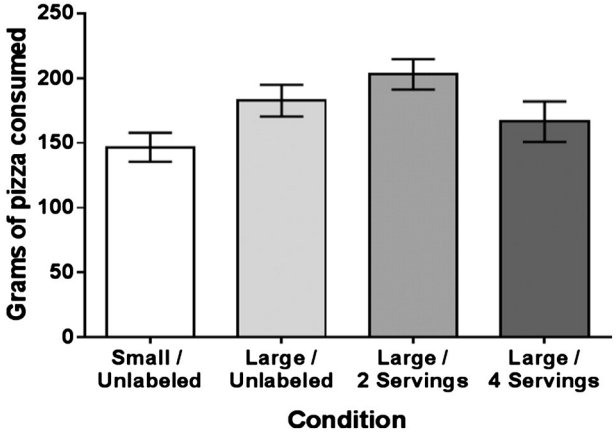

Fig. 1. Grams of pizza consumed per condition. Error bars represented standard error of the mean.

the L4 condition ($p = .40$). Furthermore, participants in the L4 condition ate significantly less than did participants in the L2 condition ($p = .04$), and ate slightly (but non-significantly) less than did participants in the L condition ($p = .25$). (The overall pattern was the same when the outliers were included in the analyses.)

4. Discussion

Consistent with past research, we found a standard portion-size effect: Participants ate 27% more when they were served a large (unlabeled) portion of pizza than when they were served a small (unlabeled) portion of pizza. The primary aim of the current study, however, was to determine whether providing objective information about the number of servings contained in a portion of food would reduce the effect of portion size on the amount of food consumed. When the large portion of pizza was labeled as "Contains 4 servings," intake was lower than when the pizza was as labeled "Contains 2 servings." Thus, the nature of the information provided influenced how much participants ate; labeling the pizza with a higher number of servings decreased food intake relative to labeling the pizza with a lower number of servings. This finding parallels the findings of Wansink and Chandon (2006) who found that labeling a package of granola as containing 2 servings resulted in lower intake than when the package was labeled as containing 1 serving. Importantly, we also extend these findings by demonstrating that intake in the L4 condition did not differ from intake in the small portion condition. This is the first evidence indicating that labeling can reduce the portion-size effect. Note, however, that the difference between the unlabeled large portion condition and the two labeled large portion conditions was not statistically significant, and this may have been due to low power (the differences were in the small-to-moderate range).

The findings of the present study, along with those of Wansink and Chandon (2006), are consistent with accumulating evidence indicating that the way food is presented can influence how much people eat. For example, research suggests that packaging a quantity of food as three separate units decreases food intake compared to packaging the same quantity of food as a single unit (Kerameas, Vartanian, Herman, & Polivy, in press), and that segmenting a tube of potato chips using visual dividers (different colored chips) reduces consumption and improves intake estimation (Geier, Wansink, & Rozin, 2012).

For consumers, making judgments about serving size, the number of servings contained within food products, or the appropriate amount to eat can be a challenging task, and providing objective serving-size information can aide consumers in those decisions. The potential for food labels to influence people's eating behavior, however, relies on people noticing, recognizing, and understanding the labels. Unfortunately, consumers can face considerable difficulty in interpreting the information presented on labels, which can interfere with their ability to identify appropriate food portions (Bryant & Dundes, 2005). People's ability to interpret this information is improved by presenting clear and simplified front-of-pack labeling on food products, as was done in the present study. Furthermore, research suggests that there is a disparity between people's typical portion size and recommended serving sizes on food products (Bryant & Dundes, 2005). Providing labels that more closely mirror consumers' actual food beliefs and behaviors could help consumers better regulate their food intake and control their body weight. Moreover, addressing this disparity is important to ensure that future studies on consumer intake produce meaningful results and are not misleading.

This pilot study represents an initial demonstration that providing serving-size labeling on a food product can reduce the portion-size effect on people's food intake. Although the findings are promising, some limitations should be noted. First, the sample was relatively small (limiting our power to detect some potentially meaningful differences) and was limited to undergraduate females who were either Asian or Caucasian (limiting the generalizability of the results). Second, participants were not perfectly accurate in their reports of how many servings of pizza they were provided. It may be that some participants did not believe that the pizza they were served came from the package they evaluated. Future research should replicate these effects with a food that participants consume directly from the package to strengthen the connection between the serving-size information and the food itself. Future research is also needed to extend the present findings to more ecologically valid eating contexts, as well as other food types and labeling formats, and to determine what type of label information influences consumption for which type of people. Finally, future research is needed to identify the mechanisms underlying the effect of labeling on food intake. Research suggests that portion size and other external food cues can provide a norm of appropriate food intake, which in turn influences how much people eat (Kerameas et al., in press; Vartanian, Sokol, Herman, & Polivy, 2013; Wansink, 2004). Future research should test whether serving-size labels also influence norms of appropriate intake and, in turn, how much people eat.

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Contributors

All authors contributed to the design of the study. SS and LRV conducted the analyses and wrote the first draft of the manuscript. All authors contributed to and have approved the final manuscript.

Conflict of interest

All authors declare that they have no conflicts of interest.

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