Bottomless Bowls: Why Visual Cues of Portion Size May Influence Intake

Brian Wansink, James E. Painter,† and Jill North‡*

Abstract

WANSINK, BRIAN, JAMES E. PAINTER, AND JILL NORTH. Bottomless bowls: why visual cues of portion size may influence intake. *Obes Res.* 2005;13:93–100.

Objective: Using self-refilling soup bowls, this study examined whether visual cues related to portion size can influence intake volume without altering either estimated intake or satiation.

Research Methods and Procedures: Fifty-four participants (BMI, 17.3 to 36.0 kg/m^2; 18 to 46 years of age) were recruited to participate in a study involving soup. The experiment was a between-subject design with two visibility levels: 1) an *accurate* visual cue of a food portion (normal bowl) vs. 2) a *biased* visual cue (self-refilling bowl). The soup apparatus was housed in a modified restaurant-style table in which two of four bowls slowly and imperceptibly refilled as their contents were consumed. Outcomes included intake volume, intake estimation, consumption monitoring, and satiety.

Results: Participants who were unknowingly eating from self-refilling bowls ate more soup [14.7 ± 8.4 vs. 8.5 ± 6.1 oz; $F(1,52) = 8.99$; $p < 0.01$] than those eating from normal soup bowls. However, despite consuming 73% more, they did not believe they had consumed more, nor did they perceive themselves as more sated than those eating from normal bowls. This was unaffected by BMI.

Discussion: These findings are consistent with the notion that the amount of food on a plate or bowl increases intake because it influences consumption norms and expectations and it lessens one's reliance on self-monitoring. It seems that people use their eyes to count calories and not their stomachs. The importance of having salient, accurate visual cues can play an important role in the prevention of unintentional overeating.

Key words: portion size, consumption norms, food intake, consumption volume, external cues

Introduction

The size of food packaging and portions has steadily increased over the past 30 years (1–3). In relating this to consumption, it is well supported that the size of a package can increase consumption (4), as can the size of portion servings in kitchens and in restaurants (5,6). Such increases occur even when the energy density of the food is altered (7,8). This suggests that some of the impact that portion size has on intake may be related as much to perceptual factors as to physiological ones.

Most of the psychological explanations to date have been situationally specific. For instance, larger package and portion sizes have been shown to have a small influence on consumption in some cases because they imply that one will not "run out" and because they suggest a lower cost per unit (4). Unfortunately, this explanation has never explained more than 21% of the variance in consumption, nor does it explain increased consumption in environments where food is abundant and provided at no charge (such as receptions, parties, and all-you-can-eat buffets).

A more robust explanation as to why large packages and portions increase consumption may be because they suggest larger consumption norms (9). That is, the amount of food on a plate or in a bowl may implicitly suggest what might be construed as a "normal" or "appropriate" amount to consume (10–12). As a result, this amount might influence how much people expect to consume and how much they eventually consume.

Consumption Norms and Expectations

When initially presented with a reasonable-sized food portion, there is emerging evidence that people may have an approximate expectation of how much of it they intend to consume (13). For instance, 54% of American adults gen-

Received for review December 22, 2003.
Accepted in final form October 29, 2004.
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*Applied Economics and Marketing, Cornell University, Ithaca, NY; †Family and Consumer Science, Eastern Illinois University, Charleston, IL; ‡Food Science and Human Nutrition, University of Illinois, Champaign, Illinois.
Address correspondence to Brian Wansink, 110 Warren Hall, Cornell University, Ithaca, NY 14853-7801.
E-mail: Wansink@uiuc.edu

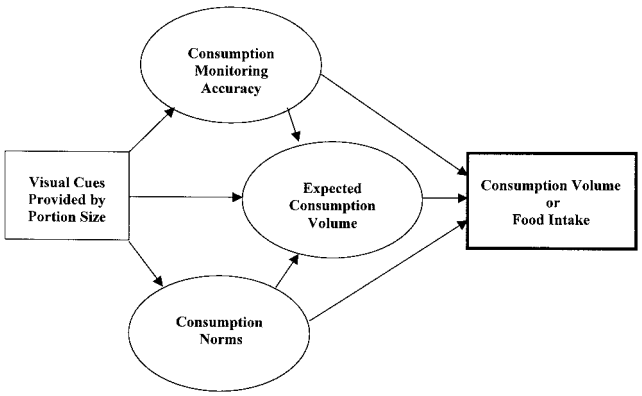

Figure 1: Mediated impact of portion size on consumption volume.

erally claim that they attempt to eat until they "clean their plates" (14). For these people, there is a visual cue or benchmark they have established (a clean plate), and they eat until they either reach that benchmark or until they are otherwise sated. Just as with those people who instead intend to eat one-half or three-quarters of what they are served, all are likely to overconsume if given a larger potion size at the outset. Even if they are subsequently unable to consume what they intend, the visual cue of how much food remains would bias them in the direction of consuming past the point where they might have with a smaller, but still unconstrained, supply. As with normative benchmarks in other situations (15), the influence of this visual cue may be relatively automatic and may occur without deliberation.

Consumption Monitoring in Distracting Environments

Figure 1 illustrates that consumption norms and expectations may mediate or explain at least some part of the impact portion size has on consumption. A second element of Figure 1 is that of *consumption monitoring*. Closely monitoring how much food one consumes reduces discrepancies between perceived and actual consumption. Unfortunately, part of the influence that environmental factors—such as portion size—have on consumption is magnified because they can also bias one's estimate of how much was eaten. Even when shown that larger packages bias consumption by at least 20%, many people in laboratory and field studies wrongly maintain that they were unaffected (4). As Figure 1 suggests, not being able to effectively monitor how much they consume can lead people to rely more heavily on easy-to-monitor visual cues that are related to their consumption expectations. The early work of Pudel and Oetting (16) showed this when participants who drank soup through a tube drank less when they had visual contact with the soup than when they did not.

A distracting environment can reduce a person's ability to accurately monitor how much they eat (17), and it may lead them to overrely on visual cues (such as the fill level in a bowl) to determine when to stop eating. An overreliance on such visual cues could lead them to overeat because they are inattentive to food intake and satiety. For instance, if a person intends to eat one-half of a bowl of soup, the amount of the soup remaining in the bowl provides a visual cue that indicates whether he or she should continue eating or should stop. The convenience of such a visual cue lessens the person's need to continuously monitor their level of satiation. Unfortunately, if that cue is inaccurate, it could unknowingly lead one to overeat. This suggests the following hypothesis: altering visual cues of how much is eaten will influence intake (H1).

Visual cues can lead a person to underestimate how much they have consumed or to overestimate how much they have consumed. This can lead one to consume either more than they intended or less than they intended. It has been shown that people consistently underestimate and overconsume the amount of liquid they pour into short, wide drinking glasses compared with tall, narrow glasses that hold the same volume (18). Similarly, a size-contrast illusion could lead a person to underestimate and overconsume the amount of food on a large plate or to overestimate and underconsume the amount of food on a small plate.

In general, people are not able to estimate their energy intake accurately (6). Such estimates, along with feelings of satiation, can be influenced by the volume of food they believed they consumed (19). If people do not believe that they consumed a relatively larger volume of food, they may not feel that they are relatively more sated. While these biased visual cues lead people to unknowingly overeat, they should do so without having a commensurate impact on consumption estimates or on satiation. A second hypothesis related to visual cues is the following: when given inaccurate or perceptually biased visual cues, a person's consumption estimation and perception of satiety will be more influenced by the biased visual cue than by how much they actually consume (H2).

A person's eyes may influence how much they consume, leading them to be less influenced by physiological cues of satiation. As a result, their estimate of how much they have consumed and how sated they are may have to do more with what they *believe* they saw themselves eat and less with how much they *actually* ate.

Research Methods and Procedures

This study examined whether altering a visual cue of how much is eaten would influence intake and whether this would be reflected in consumption estimates and satiation. It was hypothesized that individuals would consume more ounces and calories when such a cue was unknowingly

altered, thus suggesting that individuals may sometimes rely on a visual point-of-reference to base cessation. [For instance, when 31 participants in a pilot study were shown an 18-ounce bowl of soup and asked to indicate what percentage of the bowl they thought they would consume during a soup-only lunch, responses ranged from 40% to 100%, with a mean of 73%. To examine this in a bit more detail, soup bowl sizes were adjusted in a cafeteria, and bowl waste was measured. The results showed that 83% of those given 12-ounce soup bowls consumed 11 to 12 ounces of soup. When given 18-ounce bowls, 61% consumed all of it, and 28% consumed within 1 ounce of one-half of it (8 to 10 ounces). In combination, this helped to suggest that two common target levels may be one-half of the bowl and all of the bowl when consuming soup. A self-refilling bowl of soup eliminated the external cue otherwise provided by an empty bowl. Based on work by Schulundt et al. (20) and Kretsch et al. (21), it was hypothesized that individuals would underestimate both the amount of food consumed and total calories consumed.

Participants and Design

Fifty-four participants (72% male), with a mean age of 22.5 years (range, 18–47 years) and a mean BMI of 24.9 kg/m^2, were recruited from a large Midwestern university to participate in a study involving soup. Participation was voluntary. The study had Institutional Review Board approval, and participants were treated in accordance with American Psychological Association guidelines. This experiment was a between-subject design with one factor and two visibility levels: 1) accurate visual cue (normal bowl) vs. 2) biased visual cue (self-refilling bowl).

Procedure

Individuals were recruited by a recruiter or in response to a flyer. Individuals were informed that their participation required eating a soup-only lunch and completing a questionnaire. A reminder e-mail was sent before the participants' scheduled appointment, and it included directions to the cafeteria.

To reduce the artificiality of the study and to introduce a degree of distraction, subjects were run in groups of four. It is important to acknowledge that social facilitation can influence consumption (22), leading people to eat more with familiar companions (23,24) and to eat less with strangers. Because the objective of this study was to compare the two conditions (self-refilling vs. normal bowls), any mean shift in consumption caused by social facilitation should be constant across both conditions and was not a point of comparison. Self-reported measures of social facilitation and familiarity were examined to confirm that there was no difference between these conditions.

With the issue of social facilitation in mind, groups were scheduled for one of three eating times (11:00 AM, 12:00 PM, or 1:00 PM) on each of the experimental days. On the day and time they were assigned, they were met by a research assistant in an adjoining room at the appointed time. Details were not provided about the study, but because the bowls used in the study were different colors (either green or blue balanced across both conditions), and because they were asked color-related questions as a distracter task before the study, people generally believed the study was about how bowl color influenced taste perceptions.

Participants were scheduled four per session to maintain a meal-type setting. During each session, two participants received the treatment (self-refilling) bowl, and two received the control (normal) bowl. Participants were assigned random seating. They were instructed to eat the soup and not to move the placement of the bowl from its predesignated place on the table.

After being seated, they were told that they would be eating a new recipe of tomato soup for lunch and were told to enjoy as much soup as they wanted. After 20 minutes, respondents were thanked and were given a questionnaire asking them to rate the soup and to estimate how much they believed they ate (in ounces and in calories). After this, they were asked a series of questions measured on nine-point scales about how sated they are, how hungry they were before starting the study, whether they generally try to eat until their bowl is empty, and whether they believed their consumption was influenced by the presence of others. Consistent with Rolls (25) and Inman (26), the satiety questions were asked using semantic differential scales (e.g., 1 = not hungry; 9 = hungry), and the remaining questions were asked on scales anchored by strongly disagree (1) and strongly agree (9). Although premeal hunger ratings are important, it was a concern that taking these measures would bias the results by cueing respondents to the issue of consumption volume. For this reason, respondents were randomized to be certain that different degrees of hunger would be randomly and evenly distributed across the two conditions. In addition, a retrospective measure of prestudy hunger was taken and was used as a covariate in the analyses.

The actual volume of soup consumed was determined by comparing the combined weight of the soup remaining in the caldron, the tubing, and in the soup bowl with the soup that was originally available. The difference indicated the amount of soup eaten.

Apparatus

A "self-refilling soup bowl" was the main apparatus used in the experiment. This involved a heavy 1.9 × 1.2-m restaurant-style dining table (4.6 cm thick) that was designed to accommodate four bowls. Two soup bowls were diagonally placed on each of the longer sides of the table.

Food-grade tubing connected the underside of a bowl to its corresponding pot. Six quarts of soup were required for proper function of the apparatus. For the ratio of soup in the pot to soup in the bowl to remain constant, the pot was slightly elevated above the bowl. This ensured that the soup flowed at a slow but constant rate. A manual drain was connected to the conduit underneath the table for draining and measurement purposes. Any air pockets were eliminated before each trial so as not to interfere with the passage of the soup.

Two of the opposing diagonal soup bowls were large bowls that held 18 ounces (510.3 grams) of soup. The other two opposing diagonal soup bowls were identical in size and appearance except that they had been modified to be continuously refilled from a soup pot at the end of the table. Under each of the two self-refilling bowls, 2-cm holes had been drilled through the 4.6-cm-thick table. Through this hole, food-grade rubber tubing was used to connect the pots of soup with each of the two self-refilling soup bowls. For each of the two self-refilling bowls, holes had been drilled in the bottom of the bowls, and flush metal connections were installed that allowed the tubing to be connected to the bowls through a bayonet mounting.

The pots of soup were individually connected to each of the soup bowls through a gravity-feed mechanism. The levels of the soup in the caldrons were adjusted to be the corresponding heights of fill levels of self-refilling bowls. As a person ate from one of these bowls, the bowl would slowly and almost imperceptibly refill itself. The refill rate could be modified. If it refilled too slowly, people could conceivably finish their soup before it refilled. If it refilled too quickly, people would be aware that the bowls had been modified. The flow was set at a moderate level that resulted in the bowls refilling in ~20 minutes. Because each study was to last 20 minutes, this generally meant that the soup in the self-refilling bowls would still decrease, but at a much slower rate (~60%) than the unmodified bowls. To insure that those in the control condition would have the opportunity to consume as much soup as they wanted, their bowls were refilled by a server once the volume of the bowls had dropped to a quarter full. In this way, every person was able to eat as much as they wanted, and there were no ceiling effects.

Analyses were conducted using either ANOVAs (SPSS 11.0) or Pearson correlations (with two-tailed tests of significance). As expected, there was no difference between the groups because of the random assignment to the two conditions. That is, there were no differences between retrospective measures of consumption [5.37 vs. 5.43; $F(1,51) = 0.016$, $p = 0.90$], nor were there differences in age, sex, or BMI. Although these individual characteristics were not the focus of this study, additional analyses in the following section explore the impact they had as covariates.

Results

Recall that it was expected that those who had unknowingly been given the self-refilling soup bowls (the biased visual cue) would eat more than those given normal soup bowls (H1), but they would not estimate themselves to having eaten any more, nor would they perceive themselves to be more sated (H2). Both hypotheses were confirmed.

ANOVAs (SPSS 11.0) indicated that people who were in the self-refilling condition ate more soup [14.7 vs. 8.5 ounces; $F(1,52) = 8.99$; $p < 0.01$] than those eating from normal soup bowls (Table 1). This difference represented an increase of 73% in amount of soup consumed and an increase of 113 calories (267.9 vs. 154.9 calories).

This general finding was robust across all types of individuals. Sex and BMI were not significant when included as covariates, indicating that this effect was consistent across men and women and across people with different BMIs. Whereas there were no differences between retrospective measures of consumption [5.4 vs. 5.4; $F(1,51) = 0.02$, $p = 0.90$], those who had retrospectively rated themselves as hungry before the meal ate more than those who had rated themselves as less hungry. However, when included together as covariates in the ANOVA, the effect of the visual cue was still significant [$F(1,49) = 4.7$; $p < 0.05$]. An ANOVA using only measures of premeal hunger as covariates indicated that premeal hunger influenced consumption [$F(1,50 = 5.8$; $p = 0.02$], but showed that the effect of the cue was still significant [$F(1,50) = 10.6$; $p < 0.01$].

It was believed that participants used the fill level of soup in the bowl as an indication of how much they would consume. This tendency was observed in a pilot study and was consistent with the typical behavior of many individuals in this study—61% strongly agreed with the statement "I usually eat until I reach the bottom of the bowl," and 61% also strongly agreed with the statement "I always try to clean my plate (or bowl) at home." This aspiration of eating until the bowl is empty is one that could not be attained in the context of this study, yet the reference point it presents can still influence consumption. During the poststudy debriefing, many of those in the refillable condition noted that it seemed impossible to "finish their soup" or to "eat all of it."

Despite consuming 73% more, those participants eating from the self-refilling bowl did not believe themselves to have consumed any more soup than those in the control condition (Figure 2). Those eating from normal bowls believed they had eaten 32.3 calories fewer than they actually ate (122.6 estimated vs. 154.9 actual calories). In contrast, those eating from self-refilling bowls believed they had eaten 140.5 calories fewer than they actually ate (127.4 estimated vs. 267.9 actual calories).

Across all diners, the amount they consumed was correlated ($r = 0.29$) with the number of ounces they believed they consumed ($r = 0.31$), as well as with the number of

Table 1. Biased visual cues unknowingly influence overconsumption*

	Visual cues of consumption		
	Accurate visual cue (normal soup bowls)	**Biased visual cue (self-refilling soup bowls)**	***F* test (1,52)**
Actual consumption volume			
Actual ounces of soup consumed	8.5 ± 6.1	14.7 ± 8.4	8.99§
Actual calories of soup consumed	154.9 ± 110.3	267.9 ± 153.5	8.99§
Estimated consumption volume			
Estimated ounces of soup consumed	8.2 ± 6.9	9.8 ± 9.2	0.46
Estimated calories of soup consumed	122.6 ± 101.0	127.4 ± 95.6	0.03
Consumption monitoring*			
"I carefully paid attention to how much I ate"	4.9 ± 2.3	5.3 ± 2.4	0.69
"I carefully monitored how much soup I ate"	4.7 ± 2.5	4.7 ± 2.8	0.00
"I usually eat until I reach the bottom of the bowl"	6.2 ± 2.1	6.6 ± 2.5	0.31
"I always try to clean my plate (or bowl) at home"	6.4 ± 2.2	6.1 ± 2.7	0.20
Presence of others*			
"If other people keep eating, I am more likely to also"	5.5 ± 2.4	5.4 ± 2.7	0.03
"Eating with other people distracted me from how much I was eating"	4.7 ± 2.8	4.6 ± 2.5	0.00
Self-perceptions of satiety†			
"How hungry are you right now?"	3.4 ± 2.1	3.0 ± 1.9	0.63
"How full are you right now?"	5.7 ± 1.9	5.1 ± 2.7	1.03
"How nauseated are you right now?"	3.3 ± 2.3	2.6 ± 2.0	1.47
"How much food do you think you could eat right now?"	7.1 ± 1.7	7.0 ± 1.8	0.04

Values are means ± SD.
* Measured with agreement scales (1 = strongly disagree; 9 = strongly agree).
† Measured with semantic differential scales (e.g., 1 = a little; 9 = a lot).
‡ $p < 0.05$.
§ $p < 0.01$.

calories they believed they consumed (Table 2). In further examining this relationship by condition, those who were given normal soup bowls were reasonably more accurate at estimating their calorie intake ($r = 0.67$) than with those given self-refilling bowls ($r = 0.12$). This also corresponds to the smaller gap between how much they consumed vs. how much they believed they consumed (122.6 estimated vs. 154.9 actual compared with 127.4 estimated vs. 267.9 actual calories). This difference in the correlation can be partly attributed to people anchoring on the size of the bowl because they did not believe it possible to consume more than the bowl could hold. During the debriefing, people were asked how they made their estimates. One common estimation method for those in the refillable condition was to estimate how much the soup bowl held and then to use that as an upper limit of much they consumed. Those in the nonrefillable condition could not do this because once their bowls dropped to the point at which they were only 25% full, they were refilled by the server. As a result, it was clear to them that they possibly could have consumed more. Indeed, of the 11 individuals who estimated that they had consumed ≥16 ounces of soup, only 2 of them were in the self-refilling condition.

In addition to participants in the self-refilling bowl condition being inaccurate in their consumption estimates, there were no significant correlations between how much they attended to ($r = 0.19$) or monitored ($r = 0.07$) their intake and what they actually consumed. Furthermore, although they ate 73% more, those eating from the bottomless bowl did not perceive themselves as feeling any more sated than those who had eaten from a normal one. Table 1 indicates that, even though people ate an average of 113 more calories from the self-refilling bowls, they were no more likely to say they were hungry (3.0 vs. 3.4), full (5.1 vs. 5.7), nau-

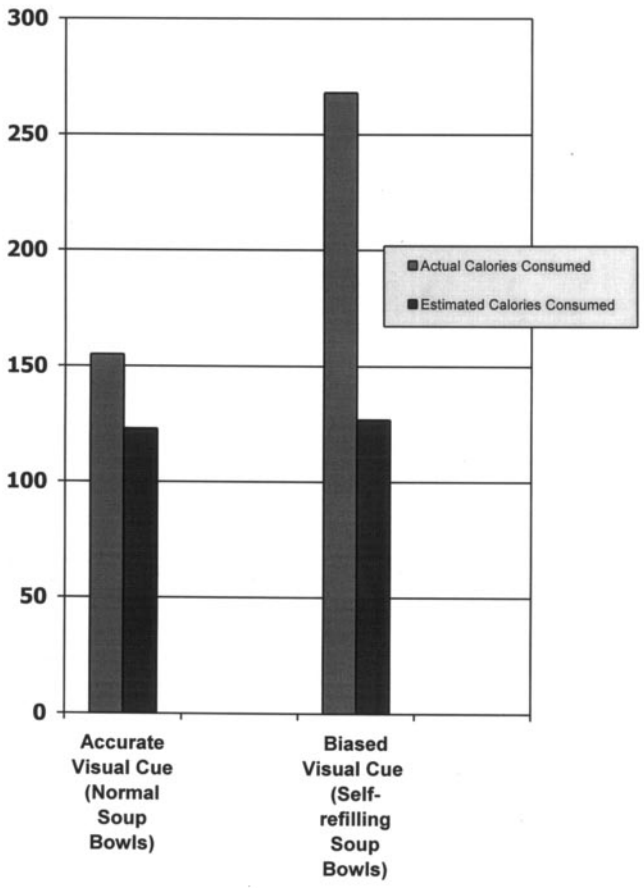

Figure 2: Biased visual cues provided by self-refilling soup bowls increased intake but not the perception of intake.

seated (2.6 to 3.3), or could eat more (7.0 vs. 7.1) than those who ate from normal bowls (based on 9-point scales). This further underscores the divorce of actual consumption from oral metering and gastric status.

To investigate whether the presence of others might provide an alternative explanation of the findings, we compared the self-reported measures taken after the study and found no significant differences (see Table 1). Those with the refillable bowl were no more likely to agree with the statement, "If other people keep eating, I am more likely to also" than those in the control condition [5.5 vs. 5.4; $F(1,52) = 0.03$, $p = 0.86$]. They were also no more likely to agree with the statement, "Eating with other people distracted me from how much I was eating" [4.6 vs. 4.7; $F(1,52) = 0.00$, $p = 0.98$]. The answers to these ratings were also uncorrelated with actual consumption. Any directional tendency would suggest that, if there was a slight social facilitation effect, it would conservatively influence the results by inflating the amount eaten in the control group. Those with the refillable bowl seemed unaffected by the presence of others, and this was consistent with their comments during debriefings.

Discussion

Modeling consumption volume is complex because the psychological mechanisms that mediate it are not as deliberate and logical as they are impulsive and veiled. By understanding possible consumption defaults—such as those presented by visual cues—we can better illuminate and influence the involvement processes that unknowingly influence food consumption. This study is one step in that direction.

These findings are consistent with the main idea that portion size can influence intake in two ways. First, the amount of food on a plate or in a bowl provides a visual cue or consumption norm that can influence how much one expects to consume and how much one eventually consumes. When there was an accurate visual cue as to how much one had eaten, people stopped eating at an earlier point than when there was a biased visual cue of what they had eaten.

A second way the amount of food on a plate or bowl can influence consumption is when its visibility lessens the extent to which one self-monitors his or her consumption. This study showed that biased visual cues of how much has been eaten (or how much remains) influenced consumption volume but had no impact on estimated consumption and on reported satiation. Although this study was conducted with a calorically dilute food, there is emerging evidence that our visual estimations of volume can also be found in more calorically dense foods (19,27).

In lieu of monitoring how much one is eating, people rely on visual cues or rules-of-thumb (such as eating until a bowl is empty) to determine how much to consume, and they eat until they reach that point or until they become sated. This can lead to ineffective monitoring and overconsumption. For instance, when weight-vigilant teenagers underestimated the volume of a beverage they had just poured into a glass, 93% still ended up consuming all of the beverage they had poured (18).

More research is required in this area. Although a pilot study has indicated that people can base their consumption on visual cues (such as an empty soup bowl) and although this was reinforced by many participants, the actual percentage of soup left in the bowl could not be calculated because they had refilled themselves by the time the participants left the room. Future studies can investigate this area of consumption cues by addressing the challenge of how they can encourage participants to articulate their consumption intentions in a manner that does not result in consumption-related demand effects.

These findings build on prior work (16) by showing that individuals can base their satiation on visual cues related to portion size. In effect, people use their eyes to count calories and not their stomachs. Those shown biased visual cues had satiety ratings that were uncorrelated with actual consumption. While all participants underreported actual intake, this

Table 2. Correlates with actual consumption volume*

	Correlations with actual consumption volume		
	Those eating from normal soup bowls (n = 23)	**Those eating from self-refilling soup bowls (n = 31)**	**All participants (n = 54)**
Estimated consumption volume			
Estimated ounces of soup consumed	$r = 0.38$†	$r = 0.33$†	$r = 0.29$†
Estimated calories of soup consumed	$r = 0.67$‡	$r = 0.12$	$r = 0.31$†
Consumption monitoring			
"I carefully paid attention to how much I ate"	$r = 0.09$	$r = 0.19$	$r = 0.19$
"I carefully monitored how much soup I ate"	$r = -0.01$	$r = 0.07$	$r = 0.04$
"I usually eat until I reach the bottom of the bowl "	$r = 0.10$	$r = 0.21$	$r = 0.19$
"I always try to clean my plate (or bowl) at home "	$r = 0.31$	$r = 0.13$	$r = 0.09$
Presence of others			
"If other people keep eating, I am more likely to also"	$r = 0.21$	$r = 0.09$	$r = 0.13$
"Eating with other people distracted me from how much I was eating"	$r = -0.01$	$r = 0.07$	$r = 0.04$

* All scaled questions are measured 1 = strongly disagree to 9 = strongly agree.
† $p < 0.05$.
‡ $p < 0.01$.

was particularly strong with those given a biased visual cue (self-refilling bowls). This is consistent with the inaccuracies Schulundt et al. (20) have shown across various food recall methods. These reported differences across methods may be attributed to the absence of visual cues. Once a food is eaten, it typically leaves no visible accounting record of itself.

Consistent with the findings of others (28), these results suggest that nonobese individuals are no more or less influenced by external cues (such as the visibility of portion size) than are obese people. One caveat, however, is that this study may not have had sufficient BMI variation to be conclusive on this issue. The BMI of participants in this study was 24.9 kg/m^2, with a range from 17.3 to 36.0 kg/m^2, and an SD of 3.8 kg/m^2. A second caveat is related to total meal consumption in the presence of others. While an objective of this study was to investigate the impact of these cues in a reasonably realistic environment (compared with feeding people through a tube), few people eat soup-only meals with three other individuals. Adding a wider variety of foods might increase overall consumption and moderate the dramatic difference in calorie consumption that was found with this soup-only meal. Furthermore, people eating alone are likely to eat a different amount than those eating with others (22–24). In all of these cases, however, the comparative impact of biased visual cues (self-refilling soup bowls) should be robust.

Knowing why portion size influences consumption is important for two reasons. First, knowing this can lead to modifications in portion sizes that suggest more modest consumption norms, and it can lead to profitable "win-win" packaging that can make self-monitoring easier (such as snack foods that are portion-wrapped within a larger bag). Second, knowing why portion size influences consumption is also important because it indicates that consumption norms and monitoring may be at the core of many other activities that can unknowingly influence consumption (29). This will allow a more focused and systematic investigation of related factors (such as social facilitation or self-efficacy) in the future.

This refillable soup bowl study shows that people can overrely on visual consumption cues when determining how much to eat. However, just as these cues can lead a person to overeat—as in this study—they may also be used as an intake-suppression technique. For instance, using smaller than normal size plates, bowls, and glasses might lead people to believe they had a full portion and make them less likely to ask for an extra (compensating) serving. Similarly, bulk snack products that are repackaged by a watchful parent into smaller portions and sealed into zip-lock baggies may provide the visual cue that leads a child to believe he or she has had a full serving of a snack when it was actually a fraction of what they might typically eat.

Salient, accurate visual cues can play an important role in reducing unintentional overeating. Just as a smaller-than-average empty bowl of soup can lead people to believe they have probably had enough to eat, so may this be in other contexts. The empty wine bottle on the table may remind guests they have had enough to drink, and the empty peanut shells in front of one person and the empty chocolate kiss wrappers in front of another provide accurate visual cues that they have already had their snacks.

Acknowledgments

This study was internally funded by the Julian Simon Research Chair at the University of Illinois at Urbana-Champaign.

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