# MAKING SMALL FOOD UNITS SEEM REGULAR: HOW LARGER TABLE SIZE REDUCES CALORIES TO BE CONSUMED

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## ABSTRACT

People compensate for small food unit sizes by eating more units compared to regular sized units, but the aggregate of calories people consume of smaller versus regular units is still less because each unit consumed increases perceptions of overindulgence and impulsivity. This suggests that if perceptions of a food unit's smallness could be disrupted, people may not need to compensate, resulting in a further reduction in aggregate food chosen and consumed. In a lab and field experiment, people took the fewest calories when presented with smaller versus regular-sized pizza slices (i.e., from the same pizza pie diameter) placed on a larger table that distracted their attention away from the smallness of the pizza slices. We show that unit-size effects can be altered by food frame size mechanisms like table diameter.



Keywords: food unit size, frame size, food choice, field experiment, perceptual illusion

Smaller food unit sizes increase total units consumed (compared to regular or larger food units), but not aggregate food amounts (e.g., calories; Cheema and Soman 2008; Ello-Martin, Ledikwe, and Rolls 2005; Scott et al. 2008). While people may compensate for the smallness of the food units by choosing and consuming more total unit numbers, each additional unit chosen and consumed increases self-perceptions of overindulgence and impulsivity—effectively preventing aggregate consumption of smaller units from reaching those of regular food units (Van Kleef, Kavvouris and van Trijp 2014; Cheema and Soman 2008). This suggests that if it were possible to disrupt perceptions of a food unit's smallness, food choice and consumption may be more in line with larger food units (i.e., less total units chosen and consumed). This research posits that this disruption can occur by shifting attention away from the smallness of food units and towards the largeness of a table on which the small units are placed.

Previous research suggests food saliency implies attentional focus, which can be easily modified by the context in which a food resides—such as food container opaqueness and food distance from a target person (e.g., Wansink, Painter and Lee 2006; Wansink 2004). This suggests that external cues closely related to food (e.g., plate, bowl and spoon sizes) may shift attentional focus towards or away from the targeted food, thereby playing a role in attenuating or facilitating food consumption. Likewise, previous research of frame-size effects referencing the Delboeuf illusion (1865) regarding attentional breadth and contextual cueing has demonstrated that behaviors are guided and constrained by stimuli in the environment that compete for visual attention and awareness (Chun 2000; Gable and Harmon-Jones 2008).

Generally, broad attentional referencing is initiated by default. We suggest that table size is an overlooked physical food context that can bias attention towards or away from a target food. The table on which a food resides may interact with that food's unit size such that

smaller tables may allow greater focus on how a food is divided (e.g., regular pizza slices vs. smaller pizza slices), while larger frames may distract attention away from food unit size. The implication of this interaction is the focus of this research—namely, a further reduction of small food unit size choice when these units are placed on large versus small tables because of the reduced saliency of food unit size (e.g., its smaller size).

There are several key contributions of this research. By investigating unit size and frame-size effects together, we provide evidence of a novel food choice effect explained by attentional bias towards a larger food frame at the expense of smaller food units resulting in further decreased food choice of small units compared to when these same sized units are placed on a smaller frame. Past unit size research did not consider frame-size effects, while prior frame size research mainly considered perceptions of identical unit sizes (or measured self-serving amounts) framed in larger or smaller dinnerware. As such, this research examines larger and smaller food units framed by larger and smaller table diameters.

Through a lab and a large field experiment, we divided round pizza pies of the same diameter into smaller versus regular slices (e.g., sixteenths or eighths) and placed the pizza pies on round tables of a larger or smaller diameter (e.g., about twice as big as the pizza pie or only slightly bigger than the pizza pie). We measured attention to frame over unit size, perception of the size of the pizza slices (unit size perception), the number of pizza slices chosen (number of units chosen) and the associated calories to be consumed.

## THEORETICAL FRAMEWORK

In a natural environment there are many target objects—when frequently paired with a specific context—that can help facilitate quick identification of that target object (e.g., "contextual cueing"; Henderson and Hollingworth 1999; Chun and Jiang 1998). For example,

in a complex visual scene such as a party, it would be more difficult to find where a pizza was located if it were paired with an unexpected context (e.g., placed on a couch) rather than an expected context (e.g., placed on a table). While this contextual cueing can facilitate object recognition there is an attentional cost. That is, while providing an expected contextual cue (i.e., table) for a target object (i.e., pizza), the features of that context must be processed as well. This can draw attention away from features of a target object, especially when a context has salient attributes (e.g., color, size, shape, orientation, etc.; Saenz, Buracas and Boynton 2002). Thus, contextual cues (e.g., sizes of bowls, plates spoons, and tables) have the potential to facilitate or attenuate consumption (e.g., Van Kleef, Shimizu and Wansink 2012; Wansink and Cheney 2005). This suggests that attentional focus can easily shift toward or away from a target food. Indeed, prior research indicates that peripheral distractions (e.g., larger table size) may decrease attention to a target object (Frederickson 2001; Gable and Harmon-Jones 2008).

Food unit size research suggests that people choose fewer calories to be consumed when units are smaller (Ello-Martin, Ledikwe, and Rolls 2005; Cheema and Soman 2008), neutral to table size. When considering food unit size research in conjunction with visual attentional bias research (e.g., Henderson and Hollingworth 1999; Chun and Jiang 1998), we expect food served on smaller tables to yield results consistent with food unit size research because table size would not distract from typical food unit size observations. On the other hand, food served on a larger table should enhance food unit size effects because a larger table size is likely to draw attention away from food unit size, so that people perceive less distinction between and take closer to the same number of smaller versus regular units. In other words, when a larger table shifts attention away from the smallness of a food unit size, people will be more likely to base consumption choices as if the unit size was not distinctly smaller (i.e., people will not compensate for a smaller food unit size). That is, for many

products consumed frequently, there are regular unit sizes (i.e., pizza slices, cookies, burgers, ice cream scoops, etc.). Thus, people may notice (when a table size is negligible) or be distracted from noticing (when a table size is larger) when units are smaller than what they have come to consider a regular size.

Corresponding to previous research findings associated with unit-size effects, and attentional bias and visual contextual cueing, we predict that food unit size and frame size will interact in such a way that people choose the fewest calories to be consumed when the table size is larger and unit size is smaller. In other words, we predict that a larger frame size will enhance the unit-size effect. Formally, we hypothesize that:

H1: Frame size will moderate the effect of unit size on unit size perception, number of units chosen and calories to be consumed.

(A) A larger (smaller) frame size will cause people to pay more attention to frame size (unit size) over unit size (frame size).

(B) When frame size is smaller (negligible), people will perceive smaller units as noticeably smaller than regular units; they will choose a greater number of smaller versus regular units, but will still result in a reduction of total calories to be consumed (i.e., in line with the traditional food unit-size effect).

(C) However, when frame size is larger, people will perceive smaller units as more similar in size to regular units; they will then choose closer to the same number of smaller versus regular units, decreasing total calories to be consumed even more (i.e., frame size enhances the traditional unit-size effect).

## STUDY 1: PIZZA LAB EXPERIMENT

*Participants and Method*

We first tested our predictions with an online vignette survey using 123 United States participants from the Amazon Mechanical Turk community (44% female; 28.7 years old on average; range 19 to 39 years old). We used a 2 (frame size: smaller [negligible] vs. larger) x 2 (unit size: smaller [sixteenths] vs. regular [eighths]) between-subjects design, presenting each participant with one of four randomly assigned images, each with the same pizza pie diameter: (1) a round pizza sliced into eighths sitting on a table only slightly bigger in diameter than the pizza pie (smaller frame size and regular unit size, N = 26); (2) a round pizza sliced into sixteenths sitting on a table only slightly bigger in diameter than the pizza pie (smaller frame size and smaller unit size, N = 32); (3) a round pizza sliced into eighths sitting on a table about twice the diameter of the pizza pie (larger frame size and regular unit size, N = 36); or (4) a round pizza sliced into sixteenths sitting on a table about twice the diameter of the pizza pie (larger frame size and smaller unit size, N = 29); see figure 1.

[INSERT FIGURE 1 HERE]

We measured the number of units chosen by asking participants, "How many total pieces would you eat?" while the pizza/table image was visible. Calories to be consumed was calculated as number of units chosen × calories per slice (we used 400 calories per slice for regular eighths and 200 calories per slice for smaller sixteenths, though any constant would give equivalent results for calories). After a page break but still making the pizza/table image visible, we then asked participants to rate on a 7-point scale (1 = much smaller than normal to 7 = much bigger than normal) unit size perception as, "Please rate the pizza slices as smaller or bigger than normal." We also measured attention to frame over unit size as "Which

grabbed your attention more?" with "size of the table" and "size of the individual slices" at each end of a 7-point bipolar scale.

Next, we performed manipulation checks. We checked the frame size manipulation by asking, "If you had to measure across the length of the whole table (i.e., the diameter of the whole table), how many inches across do you think the table would be?" We checked the unit size manipulation by asking, "If you had to guess the number of calories per slice of pizza, how many calories do you think each pizza slice would be?" Note that the unit size manipulation check assesses absolute size estimates while the unit size perception measure assesses relative size perceptions compared what is normal. The same pizza/table image was presented again on the pages on which the participants completed the manipulation checks and unit size perception measures. Participants could not return to previous pages.

Last, we asked participants to report on a number of variables we used as covariates including their gender, age, height, weight (we calculated body mass index [BMI] as 703 × weight/height$^2$), dieting ("I am currently dieting." on a 7-point scale; 1 = strongly disagree to 7 = strongly agree), pizza appeal ("To what extent do the pizza slices seem…" on a 7-point bipolar scale with "not appetizing" and "very appetizing" on either end) and hunger ("How hungry are you at this moment?"; on a 7-point bipolar scale with "not at all hungry" and "extremely hungry" on either end). We also measured the covariates imagination, social skill, attention to detail, attention switching and communication, traits which have been shown to affect visual illusions like those in our studies (Baron-Cohen et al. 2001; Happé and Frith 2006). Each covariate had ten items rated on a five-point agree/disagree scale: imagination (e.g., "If I try to imagine something, I find it very easy to create a picture in my mind."; $\alpha$ = .73), social skill (e.g., "I prefer to do things with others rather than on my own."; $\alpha$ = .87), attention switching (e.g., "I prefer to do things the same way over and over again."; $\alpha$ = .68),

attention to detail (e.g., "I tend to notice details that others do not."; α = .80), and communication (e.g., "I enjoy social chit-chat."; α = .77).

*Analyses and Results*

We ran ANOVA regression models for the manipulation checks and the following dependent variables: attention to frame over unit size, unit size perception, number of slices taken and calories to be consumed. We ran mediation analyses to test whether unit size perception mediated number of slices taken. The dependent variable and mediation models included the following covariates: gender, BMI, dieting, hunger, pizza appeal, imagination, social skill, attention switching, attention to detail, and communication. Results for covariates are available upon request. We removed as outliers nine participants who indicated they would eat greater than half the pizza. Two participants had missing data.

*Manipulation checks*. A frame size manipulation check confirmed that participants perceived the larger table to measure a greater number of inches than the smaller table ($M_{larger}$ = 43.5 vs. $M_{smaller}$ = 22.3; $F(1, 98) = 52.56$, $p < .001$). Neither unit size ($F(1, 98) = .32$, $p = .58$) nor the interaction of unit size with frame size ($F(1, 98) = .03$, $p = .86$) significantly affected the frame size manipulation check.

A unit size manipulation check confirmed that participants perceived the sixteenths to have fewer calories than the eighths ($M_{sixteenths}$ = 207.32 vs. $M_{eighths}$ = 244.98; $F(1, 98) = 3.82$, $p = .05$). Neither frame size ($F(1, 98) = .17$, $p = .68$) nor the interaction of unit size and frame size ($F(1, 98) = .03$, $p = .87$) significantly affected the manipulation check.

*Attention to frame over unit size*. The model was significant for attention to frame over unit size ($F(1, 98) = 3.41$, $p < .001$). As expected, there was a significant main effect of frame size on attention to frame over unit size ($M_{larger}$ = 5.7 versus $M_{smaller}$ = 3.6; $F(1, 98)$ =

25.80, $p < .001$). There was no interactive effect of frame size and unit size ($F(1, 98) = .46$, $p = .50$) nor was there a main effect for unit size ($F(1, 98) = 2.72$, $p = .102$) on attention to frame over unit size.

*Unit size perception*. The model was significant for unit size perception ($F(1, 98) = 9.04$, $p < .001$). As expected, there was a significant interactive effect of frame size and unit size on unit size perception ($F(1, 98) = 4.60$, $p = .04$). Follow-up contrasts indicated that when the pizza was served on a smaller table, participants perceived the unit size of smaller sixteenths ($M_{sixteenths} = 1.9$) to be smaller than regular eighths ($M_{eighths} = 4.0$; $F(1, 98) = 54.64$, $p < .001$); i.e., they perceived the eighths to be normal in slice (4.0 on a 7-point scale) and the sixteenths to be 53% smaller (they were actually 50% smaller). When pizza was served on a larger table, they also perceived the regular eighths to be normal in size ($M_{eighths} = 3.9$); but, in contrast to participants seeing the smaller table, they perceived the smaller sixteenths to be only 36% smaller ($M_{sixteenths} = 2.5$; $F(1, 98) = 21.01$, $p < .001$); that is, closer in size to the regular eighths. See figure 2, panel A. Unrelated to our hypotheses, there was a main effect for unit size ($F(1, 98) = 75.21$, $p < .001$) but not for frame size ($F(1, 98) = 1.57$, $p = .21$) on unit size perception.

[INSERT FIGURE 2 HERE]

*Number of units chosen*. The model was significant for number of units chosen ($F(1, 98) = 56.77$, $p < .001$). As expected, there was a significant interactive effect of frame size and unit size on number of units chosen ($F(1, 98) = 7.78$, $p = .006$). Follow-up contrasts indicated that when the pizza was served on a smaller table, participants chose 52% more units from a pizza pie divided into smaller sixteenths ($M_{sixteenths} = 3.2$) versus regular eighths ($M_{eighths} = 2.1$; $F(1, 98) = 18.41$, $p < .001$) , consistent with the traditional unit-size effect. However, when pizza was served on a larger table, they chose the same number of smaller sixteenths ($M_{sixteenths} = 2.2$) versus regular eighths ($M_{eighths} = 2.0$; $F(1, 98) = .12$, $p = .73$),

having perceived them as closer in size. See figure 2, panel B. Unrelated to our hypotheses, there was a main effect for unit size ($F(1, 98) = 13.74$, $p < .001$) and frame size ($F(1, 98) = 11.23$, $p = .001$) on number of units chosen.

*Calories to be consumed*. The model was significant for calories to be consumed ($F(1, 98) = 7.22$, $p < .001$). As expected, there was a significant interactive effect of frame size and unit size on calories to be consumed ($F(1, 98) = 4.25$, $p = .042$). Follow-up contrasts indicated that when the pizza was served on a smaller table, participants chose 20% fewer calories to be consumed from a pizza pie divided into smaller sixteenths ($M_{sixteenths} = 666.2$) versus regular eighths ($M_{eighths} = 829.5$; $F(1, 98) = 6.54$, $p = .02$). However, when pizza was served on a larger table, they choose 45% fewer calories to be consumed from a pizza divided into smaller sixteenths ($M_{sixteenths} = 431.0$) versus regular eighths ($M_{eighths} = 779.6$; $F(1, 98) = .64$, $p = .85$). See figure 2, panel C. Unrelated to our hypotheses, there was a main effect for unit size ($F(1, 98) = 34.88$, $p < .001$) and frame size ($F(1, 98) = 10.57$, $p = .002$) on calories to be consumed.

*Mediation results for unit size perception*. Next, we report mediation results using bootstrap analyses with 1,000 repetitions (Zhao, Lynch, and Chen 2010). Unit size perception mediated the role of the frame size and unit size interaction on calories to be consumed (indirect effect = .03, 95% confidence interval = .00, .14, $p = .05$). In other words, changes in unit size perception explain why frame size and unit size affect overall calories to be consumed.

*Discussion*. We supported our hypothesis. When the pizza pie was sitting on a table not much larger in diameter than the pizza pie (the smaller frame size condition), participants perceived a smaller sixteenths pizza slice as about half the size of a regular eighth pizza slice, choosing a greater number smaller sixteenths versus regular eighths to consume, consistent with the traditional unit-size effect. In this situation, the attentional scope was narrowed to the

unit size of the pizza. However, by placing the pizza pie on a larger table, participants perceived significantly less size difference between smaller sixteenths compared with regular eighths, chose the same number of sixteenths versus eighths, and reduced the calories they would consume significantly further, enhancing the unit-size effect. The findings demonstrate how the attentional scope was broaden to include the pizza slice size as well as the frame size with which the pizza was placed (i.e., on a larger table) as the frame served as additional visual contextual cue to be observed.

## STUDY 2: PIZZA FIELD EXPERIMENT

*Aim*

The purpose of study 2 was to replicate the lab experiment findings in a field experiment. Per the nature of a field experiment design, we did not measure any variables. As such, we could not include covariates in the study 2 analyses. We manipulated frame size and unit size in a way similar to study 1.

*Participants and Method*

We tested our predictions in a business college student lounge between 11am and 2pm on a Friday in the middle of the semester, after placing signs for "free pizza" throughout the business college building earlier that morning. Utilizing a 2 (frame size: smaller vs. larger) x 2 (unit size: smaller [sixteenths] vs. regular [eighths]) between-subjects design, we set up four round tables against the back wall of the student lounge. Each table was one of two diameters and each round pizza was divided into smaller or regular unit sizes (all inches given in diameters): (1) a 24-inch round table with a 14-inch pizza sliced in regular eighths (smaller frame size and regular unit size, N = 55); (2) a 24-inch round table with a 14-inch

pizza sliced in smaller sixteenths (smaller frame size and smaller unit size, N = 56); (3) a 48-inch round table with a 14-inch pizza sliced in regular eighths (larger frame size and regular unit size, N = 55); and (4) a 48-inch round table with a 14-inch pizza sliced in smaller sixteenths (larger frame size and smaller unit size, N = 56). We served only cheese pizza (no meat or vegetable toppings) with an average of 1,968 calories per pizza, according to the pizza caterer, whose brand was unobservable to the participants.

During the experiment, 219 participants approached the student lounge through an entry way blocked to traffic by a front table, where a research assistant ("front table assistant") had tickets that participants could exchange for free pizza at one of the four tables in the back of the room. Each ticket was pre-labeled "A", "B", "C", or "D," in sequence on a large ticket roll. The front table assistant gave each participant (in turn from the front table queue of waiting participants) a ticket from the ticket roll (no students were permitted to return for a second ticket) and told him/her to go to the table labeled with the same letter, for the alleged purpose of queue efficiency. The front table assistant regulated participant flow so that participants waited in queue behind the front table where they could not observe others' choices at the back tables (this would seem reasonable to participants because there was not room for more than one participant at each back table due to the placement of study tables in the middle of the room). As a field experiment, we designed the layout for realism (business school departments often offered similar free pizza giveaways in order to attract potential students to their majors). Tables were spaced across a fifty-foot wall span to reduce the possibility of participants in a condition observing other tables' experimental conditions.

A sign in front of each table stated that participants could request as many slices as they like (no refills were permitted). Each table was served by two research assistants. One research assistant asked the participant how many slices he or she would like and served that many slices onto the participant's plate. After the participant left, the assistant replenished the

pizza pie from a nearby food warmer so that the next participant saw a whole pizza when making his or her choice. The second assistant simultaneously took the participant's ticket, then left to an area of the room the participants could not see, wrote down the number of slices the participant had requested, and placed the ticket into a box to be counted later.

Though we did not watch each participant to see if they consumed what they took, we did generally observe that participants ate all of the pizza slices they took at the study tables in the middle of the room. Number of units chosen was the number of pizza slices each participant chose, based on ticket information. Calories to be consumed were the number of units chosen multiplied by calories per slice (246 calories per slice for regular eighths and 123 calories per slice for smaller sixteenths).

*Analyses and Results*

We again ran ANOVA regression models for the dependent variables: number of slices taken and calories to be consumed. There were no covariates because of the nature of the field experiment. We removed as outliers three participants who took greater than half the pizza. No participants had missing data.

*Number of units chosen*. The model was significant for number of units chosen ($F(3, 215) = 40.5$, $p < .001$). As expected, there was a significant interactive effect of frame size and unit size on number of units chosen ($F(1, 215) = 4.1$, $p = .04$). Follow-up contrasts indicated that when the pizza pie was served on the smaller table, participants chose 63% more slices when sliced into smaller sixteenths (M = 2.6 slices) versus regular eighths (M = 1.6 slices; $F(1, 215) = 44.77$, $p < .001$). By comparison, when the pizza pie was served on the larger table, the unit-size effect on the number of slices chosen was attenuated; participants chose only 35% more slices when presented with smaller (M = 2.3 slices) versus larger pizza slices (M = 1.7 slices; $F(1, 215) = 14.03$, $p < .001$), significantly smaller than the 63%

increase for participants in the smaller frame size condition (p = .04). See figure 3, panel A. Unrelated to our hypotheses, there was a main effect for unit size (F(1, 215) = 54.3, p < .001) but not for frame size (F(1, 215) = 1.1, p = .30) on number of units chosen.

[INSERT FIGURE 3 HERE]

*Calories to be consumed*. The model was significant for calories to be consumed (F(3, 215) = 10.7, p < .001). As expected, there was an interactive effect of frame size and unit size on calories to be consumed (F(1, 215) = 3.36, p = .06) with marginal significance. Follow-up contrasts indicated that when pizza was served on the smaller table, participants chose 17% fewer calories when presented with smaller (M = 323 calories) versus larger pizza slices (M = 389 calories; F(1, 215) = 6.31, p = .01). In comparison, when pizza was served on a larger table, the unit-size effects were even stronger for calories to be consumed; participants chose 32% fewer calories when presented with smaller (M = 281 calories) versus larger pizza slices (M = 416 calories; F(1, 215) = 25.5, p < .001), a greater calorie reduction compared with the 17% reduction for participants in the smaller frame size condition (p = .06). See figure 3, panel B. Note that people chose to consume 42 fewer calories for smaller units on the larger table compared to smaller units on the smaller table, with marginal significance (*p* = .07). Unrelated to our hypotheses, there was a main effect for unit size (F(1, 215) = 28.74, p < .001) but not for frame size (F(1, 215) = .16, p = .69) on calories to be consumed.

## GENERAL DISCUSSION

In one lab and one field experiment, we examined the interaction of unit size and frame size on food choice. The same diameter pizza (sliced into sixteenths or eighths) was placed on tables twice as large as or just barely larger than the pizza pie, and we assessed people's unit size perceptions, attention to frame over unit size, the number of slices they chose, and their overall calories to be consumed. We found the traditional food unit effect

when the pizza pie was placed on a smaller table; and we found an enhanced unit effect when the pizza pie was place on a larger table. Specifically, when choosing from a pizza pie sitting on a smaller table, people (a) perceived (accurately) the smaller pizza slices were about half as small as the regular pizza slices, and (b) chose more of the smaller versus regular slices, resulting still in fewer calories, in line with the traditional unit-size effect. However, choosing from a pizza pie placed on a larger table amplified the traditional unit-size effect such that people (a) perceived (inaccurately) the smaller pizza slices as more similar in size to the regular pizza slices, and (b) chose even fewer of the smaller slices (almost equal to the number of regular sized slices chosen), resulting in a further decrement in calories to be consumed. This happened because—compared to people choosing from small tables—attentional scope shifted away from the smallness of the pizza slices and towards the largeness of the table on which it was placed resulting in people perceiving the smaller pizza slices as closer to regular in size.

*Future Research*

This paper suggests possible other avenues of research regarding how size perceptions of food units can be changed to facilitate public health. First we do not know, for example, how other facets of tables can impact unit size perceptions resulting in differential consumption—such as table color, shape, and height. Second, researchers may want to test whether (and how) perceptions of a food (and its associated units) can be changed to be more or less indulgent, possibly resulting in enhancing (or dampening) the effects we see in our research. Third, it is not understood well how to scale food units larger or smaller than regular so that people still perceive the larger or smaller food units to be regular. If this could

be achieved, an incremental decrease (or increase) of calories could result without consumer dissatisfaction or feeling restrained (or indulgent).

Finally, in our field experiment, we do not know to what extent participants noticed the table diameter and unit size presented at other tables so that choices were either side-by-side or independent, though we did place tables about ten feet from each other, and the results did replicate in a lab study where other participants' choices were unobservable. Also in the field experiment, since participants had to speak their requested number of slices to a server, it is possible that self-presentation was at play, especially for those in the smaller slices condition. We recommend that participants be allowed to serve themselves in future studies. Last, we do not measure actual consumption in either study, but only choice. We recommend future laboratory and field experiments that can more precisely measure consumption in addition to choice.

*Larger Theme: Mindless Eating*

Environmental factors significantly (and frequently unknowingly) drive consumption (Wansink 2004). Beyond varying motivational factors contributing to smaller portion decisions (i.e., neurophysiological and psychological; Reimann, MacInnis, and Antoine Bechara 2016), plate (bowl) sizes (Zlatevska, Holden, and Dubelaar 2016), cutlery (i.e., spoons and forks; Szocs and Biswas 2016), and plate material (i.e., what the plate is made of; Block, Williamson, and Keller 2016) differentially affect consumption, as highlighted in this special issue. Considering the current ubiquity of obesogenic environments (Giskes et al. 2011), understanding how to modify these environments holds the promise of increasing public health without simultaneously decreasing perceived consumer choice (e.g., Pham, Mandel, Morales 2016). In this research, we suggest one way this could occur is by simply changing the table size on which smaller food unit sizes are served. In doing so, we attempt

to alter the all-to-common phenomenon of mindless eating to mindlessly eating better (Wansink, 2006).

For many indulgent products consumed frequently, there are regular unit sizes (i.e., pizza slices, cookies, burgers, ice cream scoops, etc.). Thus, people can easily notice when units are smaller than what they have come to consider a regular size resulting in an increase in the number of units they choose. Attenuating smaller unit consumption, however, are perceptions of overindulgence and constraint as the number of food units consumed increases (Van Kleef, Kavvouris and van Trijp 2014). This would suggest that smaller food units may result in increased unit choice, but still less total calories to be consumed (as compared to regular units)—as found in our studies when food is placed on a small table. In contrast, when perceptions of smaller food units are disrupted by a large table, there is no longer a need to compensate for this smallness (i.e., consuming more units) resulting in even less food unit choice and consumption (as compared to choosing smaller units on small tables).

In addition to contributing to work on the behavioral science of eating (van Ittersum and Wansink 2016; Wansink and van Ittersum 2016), these findings contribute to the unit size, perceptual illusion, and consumption norm literatures:

1. Unit Size: We replicate the unit-size effect, introducing the moderating effect of frame size. While unit-size effects have been explained primarily by consumption constraint (Cheema and Soman 2008) and impulsiveness and appropriateness (Van Kleef, Kavvouris and van Trijp 2014), our results suggest that unit-size effects may also be explained by perceptual illusions (Van Ittersum and Wansink 2012).
2. Frame size: We extend existing work on dinnerware diameter to explore table diameter. Further, Van Ittersum and Wansink (2012) hypothesize that frame size biases consumption because the relative gap between the edge of the food

and the edge of the dinnerware causes food to appear proportionately smaller. We show that perceptual illusions may persist past the edge of the dinnerware to include further outer concentric frames like a table, acting differently than dinnerware frames by causing smaller items to appear similar in size to regular-sized ones.

3. Consumption norm: We provide evidence that perception of different sized food unit sizes as regular can occur not only through labeling (e.g., Just and Wansink 2014), but also by a seemingly unrelated environmental factor of an eating occasion—such as table size. That is, because people may focus on the largeness of the table at the expense of the smallness of the food units, smaller food units are not identified as small as they really are so that people do not need to compensate (i.e., in terms of food unit choice) for the smaller size.

Practically, these results suggest ways to help to reduce unhealthy and increase healthy food consumption. For example, in the field experiment people chose the fewest number of calories when the pizza pie was sliced into smaller unit sizes and served from a larger table (i.e., they chose 42 fewer calories compared to when pizza was sliced into smaller unit sizes and served from the smaller table, with marginal significance; $p = .07$). This would suggest that institutions, like school cafeterias, consider serving food like pizza pies in smaller portions and on large tables. Conversely, if the results we found hold with healthier foods that naturally come in smaller portions (e.g., carrot sticks), these results suggest serving them from a smaller table to increase selection and consumption.

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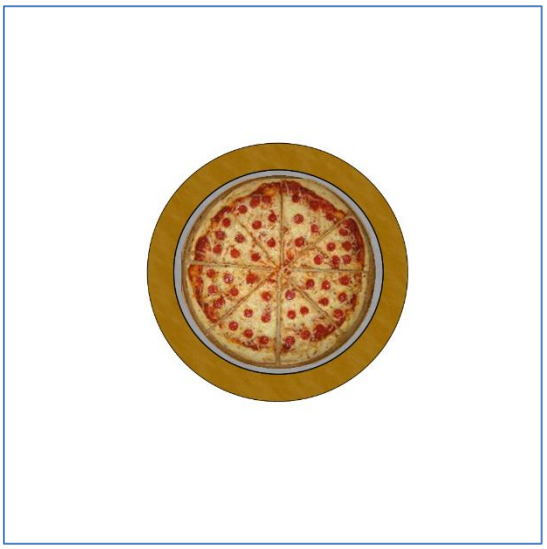
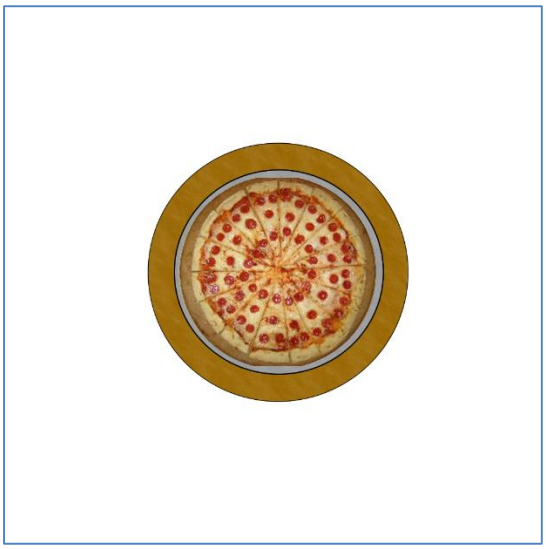
FIGURE 1

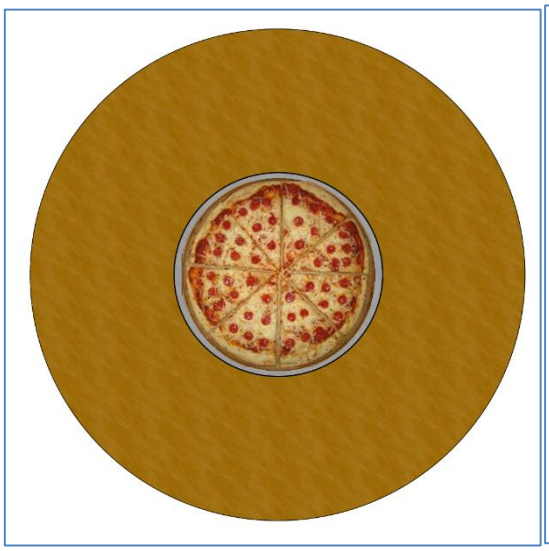
STUDY 1 STIMULUS



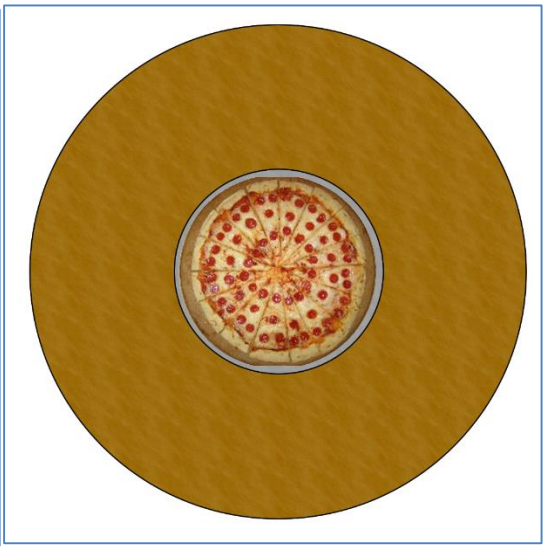
Frame size: smaller table diameter
Unit size: regular eighths



Frame size: smaller table diameter
Unit size: smaller sixteenths



Frame size: larger table diameter
Unit size: regular eighths



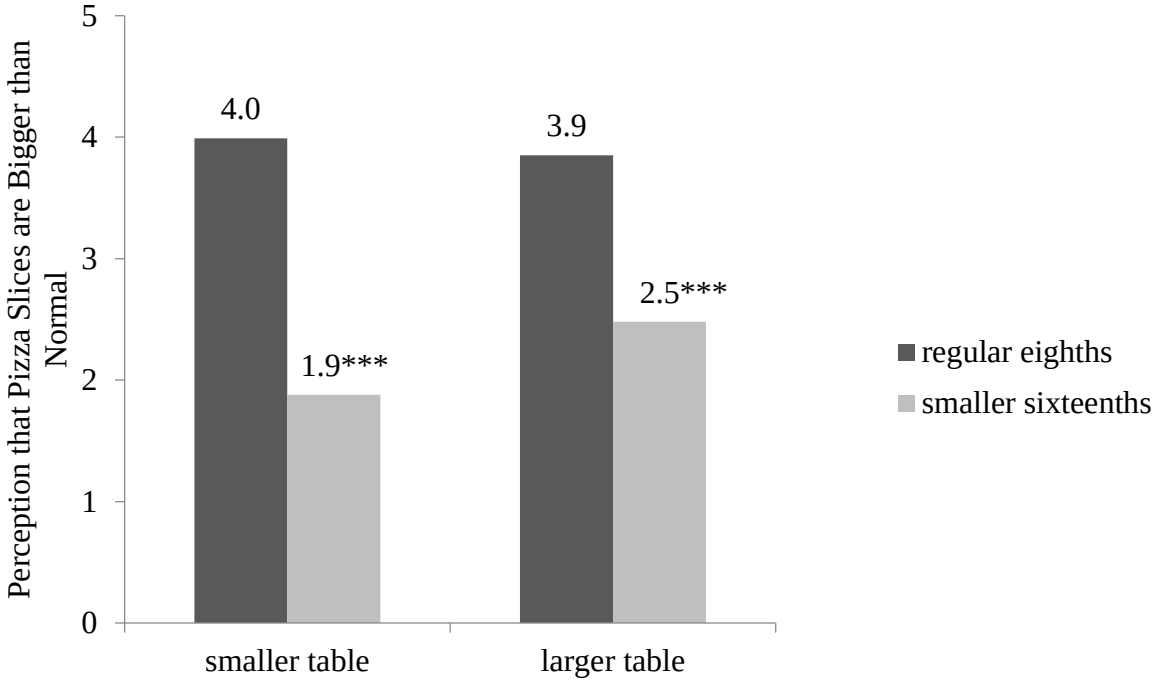
Frame size: larger table diameter
Unit size: smaller sixteenths

Note: Images shrunk to fit this page. Each of the actual images was presented four times this size.

FIGURE 2

STUDY 1: FRAME SIZE CHANGES THE WAY UNIT SIZE AFFECTS INTENT

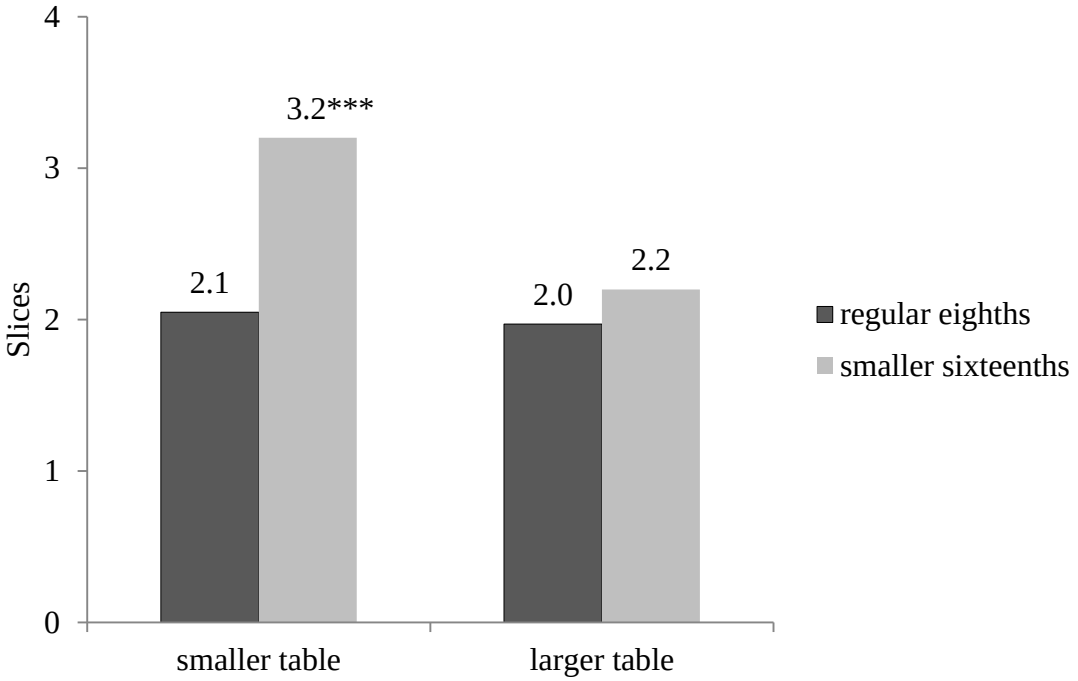
Panel A: Unit Size Perception




***Versus regular eighths significant at $p \leq .001$.

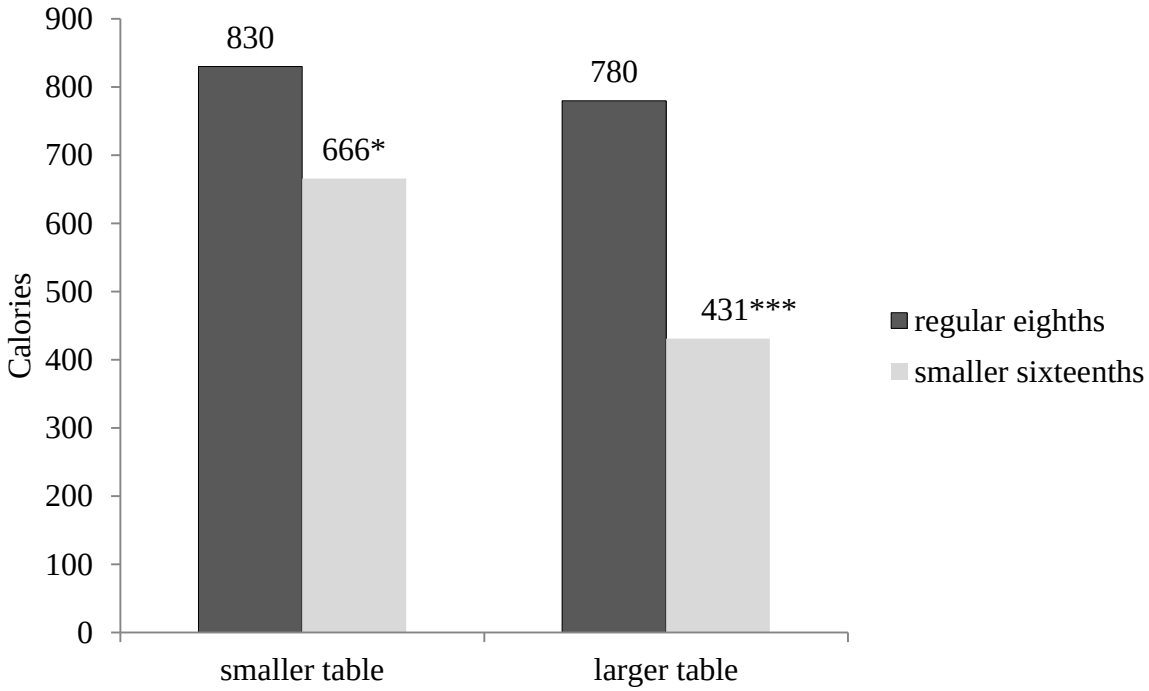
Note: Participants perceived smaller sixteenths versus regular eighths as 2.1 points smaller when presented on the smaller table versus 1.3 points smaller when presented on a larger table; the difference between 2.1 and 1.3 is significant, $p < .05$.

Panel B: Number of Units Chosen




***Versus regular eighths significant at $p \leq .001$.

Panel C: Calories to be consumed



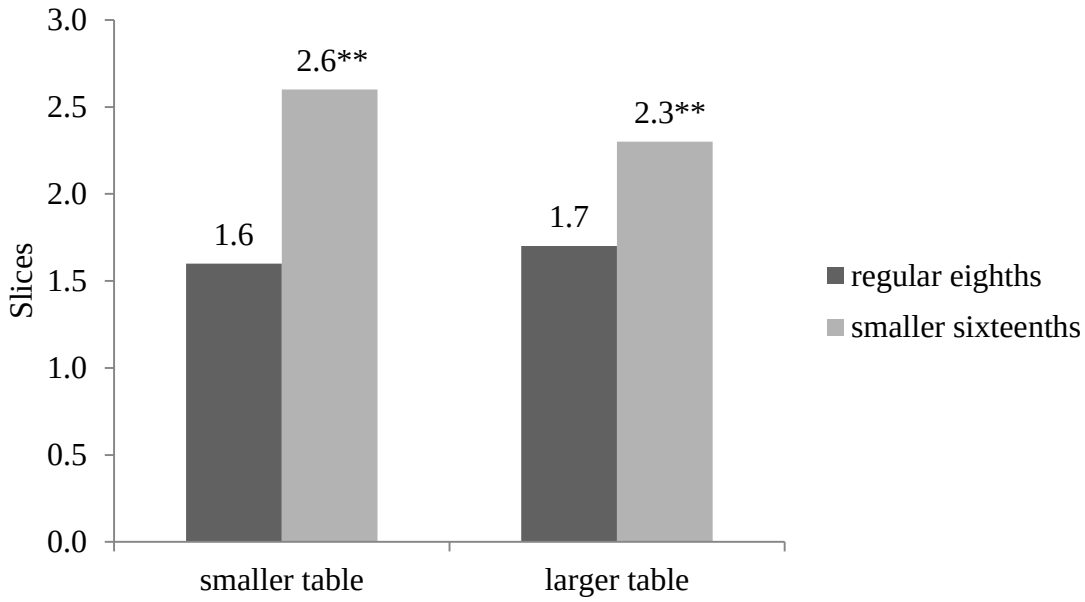

*Versus regular eighths significant at $p \leq .05$.

***Versus regular eighths significant at $p \leq .001$.

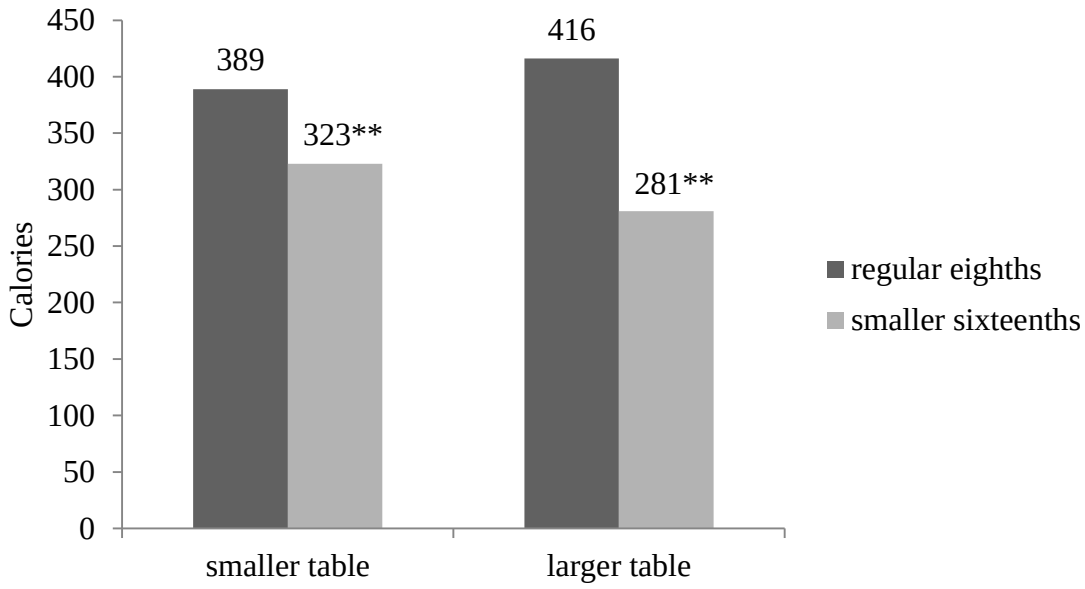
FIGURE 3

STUDY 2: FRAME SIZE CHANGES THE WAY UNIT SIZE AFFECTS CHOICE

Panel A: Number of Units Chosen




Panel B: Calories to be consumed




**Versus regular eighths significant at $p \leq .01$.

Note: For the smaller table, participants chose 66 fewer calories of smaller sixteenths versus regular eighths. For the larger table, they chose 135 fewer calories of smaller sixteenths versus regular eighths; the difference between 135 and 66 is marginally significant, p = .06.