Consumer Usage of Ultra-Concentrated Products

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Product and package innovations frequently result in smaller packages with greater product potency. This widespread phenomenon of product “ultra-concentration” is present in numerous product categories including laundry detergent, medication, and energy drinks; however, ultra-concentration and its impact on consumption behavior has not been examined. This research explores the circumstances under which consumers overuse ultra-concentrated products, and which cues help them consume the prescribed amount. Two experiments demonstrate that though consumers understand the required amount to use, they tend to significantly over-consume ultra-concentrated products. Conflicting hypotheses examine the role of perceptual distortions and anchoring and adjusting to explain these consumption patterns.

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Symposium Summary

Effects of Supersizing and Downsizing Packages on Consumption: Marketing and Policy Implications

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Extended Abstracts

"Downsize in 3D, Supersize in 1D: Effects of the Dimensionality of Package and Portion Size Changes on Size Estimations, Consumption, and Quantity Discount Expectations"

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Marketers have significantly supersized package and portion sizes because it can increase consumer expenditures. However, supersizing has been under attack by regulators and consumer advocacy groups because it can lead to over-consumption. On the other hand, downsizing can help marketers hide unit price increases but is not liked by consumers. In addition, retailers are pushing manufacturers to change the shape of their packages (e.g., to switch to rounder bottles) to reduce the environmental cost of package waste. In these circumstances, the issue of how consumers respond to changes in both the size and shape of portions and packages has become important for marketers who seek to increase the purchase and consumption of their products, as well as for consumers and regulators who are concerned about improving size estimations and reducing overconsumption.

In this research, we examine how the dimensionality of changes in portion and package sizes influences consumers’ estimations of product volume, size of resized doses that they produce for consumption, their preference for buying supersized or downsized packages and portions, and price discounts expected and offered for buying larger sizes.

Research in psychophysics (Stevens 1986) has shown that the subjective experience of physical intensities (e.g., weight, volume) follows an inelastic power function of their actual magnitude, which means that people underestimate the magnitude of size changes. Research has also shown that size estimations are even less elastic when estimating changes in volume (3D change) than when estimating changes in areas (2D change) or lengths (1D change) (Frayman and Dawson 1981). Drawing on these findings, we make the following hypotheses. First, size estimations are more elastic when packages change in one dimension (e.g., height) than when they change in two or more dimensions (e.g., height and diameter). Second, consumers’ willingness to pay for larger package sizes—and hence their quantity discount expectations—are influenced by their biased size estimations and follow an inelastic function of actual size. Third, providing size information reduces but does not eliminate the effects of package dimensionality. Finally, this effect of dimensionality leads consumers to pour more product into and out of conical (vs. cylindrical) containers.

Study 1 examined consumers’ perceptions of package size when it changes in 1D vs. 3D. The study involved 2 between-subjects size change dimensionality conditions (1D vs. 3D) and 6 within-subjects package sizes (a candle of 50, 100, 200, 400, 800, 1600 grams). Participants saw the pictures of 6 sizes of a candle increasing either in 1D (height) or in 3D (height and diameter). Participants knew the size of the smallest candle (50 g) and had to estimate the remaining 5 sizes. We found that size estimations followed an inelastic power function (with a power exponent b smaller than 1) and that estimations were even less elastic when size changed in 3D (b=.63) than when it changed in 1D (b=.87).

Study 2 examined the effect of size change dimensionality on willingness to pay for size increases and the effect of providing size information. The study involved 6 within-subject sizes, 2 between-subject dimensionality conditions (1D vs. 3D), 2 between-subject size information availability conditions (size info available vs. unavailable) and a control condition. The participants saw 6 sizes of two actual products (vs. pictures as in Study 1), wool and dishwashing detergent, which increased either in 1D or in 3D. Participants in the unavailable-information condition saw the products and provided both size estimations and WTP for each size of each product. Participants in the available-information condition knew the actual product sizes and only provided their WTP for each size. Participants in the control condition knew the actual sizes of the products but did not see them and only provided their WTP for each size. We found that, as in Study 1, size estimations were inelastic, especially when size increased in 3D (b=.68) vs. 1D (b=.93). Partly due to size estimations, WTP also followed an inelastic power function, with lower elasticity in 3D (b=.56) than in 1D (b=.72), and dimensionality influenced WTP even when the actual package sizes were available (b=.69 in 3D vs. b=.83 in 1D).

Study 3 examined the effect of resizing dimensionality on consumption dosage. The participants increased or decreased the doses of three products provided in three containers (a vodka glass, a cocktail glass, and an infant syrup cup). In the 1D condition, the participants used cylindrical containers, in which product volume changed only in height (1D). In the 3D condition, the participants used conical containers, in which product volume changed in height and diameter (3D). Because the participants were less sensitive to size changes in 3D than to size changes in 1D, they poured more of each product into and out of conical (vs. cylindrical) containers.

Study 4 consisted of two field experiments examining how the dimensionality of size change in real product packages affects people’s supersizing (Study 3a) and downsizing (Study 3b) decisions. In Study 3a, participants made a choice between a control beer or cider in a 22 Cl mug and a target brand which was either in a similar 22 Cl mug (control condition) or in a 33 Cl mug, supersized in 1D (height) or in 3D (height and diameter). The choice share of the target brand was significantly higher in the 1D condition (100%) than in the 3D (68%) or the control (55%) condition. In Study 3b, consumers chose between regular-size packages of regular Coke (50 Cl) and popcorn (94 Cl) and smaller packages of diet Coke (33 Cl) and popcorn (63 Cl) downsized in 1D or in 3D. We found that participants were more likely to choose the downsized option in the 3D condition (69%) than in the 1D condition (48%).

The final study was a field survey of the prices of regular and large product packages supersized in 1D or in 3D. Across 70 pairs of regular and supersized packages in 4 product categories (cosmetics, sandwiches, beverages and snacks), we found that the elasticity of price to size change was lower for packages supersized in 3D (.55) than for packages supersized in 1D (.88).

In sum, we found that people underestimate the magnitude of package and portion size changes, especially when they occur in
Providing size information helps consumers improve their price expectations and make better resizing decisions, even if it doesn’t eliminate dimensionality effects. Finally, we showed that these effects explain why supersizing is more effective in 1D and downsizing is more effective in 3D.

### References


“Packaging Cues that Frame Portion Size: The Case of the Red Potato Chip”  
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What leads people to continue eating past the point of satiety (Rozin et al. 1998)? First, they might ineffectively monitor how much they have eaten (Chandon and Wansink 2007); second, they may simply eat what they believe is an appropriate amount for that situation (Geier, Rozin, and Doros 2006; Wansink 2004); third, they may be engaged in a semi-automated habitual activity, which simply continues until interrupted. A solution to all three of these problems could take the form of various types of markers which would call attention to food intake.

An increasing amount of research suggests that people use visual indications to tell them when to stop eating (Wansink 2006). A serving portion creates a consumption norm, which indicates to people when they should stop eating (Geier, Rozin, and Doros 2006). To some extent, this is what small-size portions (e.g., 100-calorie packages) do. When people reach the end of a small package they need to decide whether to continue eating by opening another package. This interrupts their hand-to-mouth behavior and forces them to consider whether they want more. Such interrupts reduce consumption of food and improve estimations of the food intake (Wansink, Painter, and Lee 2006). Less “intrusive” segmentation cues may not interrupt consumption, but simply call attention to norms and the amount consumed.

This research examines whether inserting “segmentation cues” within a package can reduce total intake of a snack within a single sitting. We propose that the use of consumption markers decrease intake of a food because: 1) they call attention to eating, 2) they provide consumption norm cues, and 3) they break the eating script by introducing a pause. Our study investigates whether visually segmenting snack food in a package will decrease how much a consumer would call attention to food intake.

The study involved a 3-level between-subject design where 59 undergraduate respondents were randomly given one of 3 different tubes of potato chips (11 grams each, 10 calorie/ chip) while watching a documentary video. The consumption interrupt or segmentation-framing cue was a red-colored potato chip of the same size and composition as the ordinary yellow ones. Two pilot studies showed that the red chip was treated as a “regular” potato chip, except subconsciously with regard to its effect as a segmentation marker. The chips were emptied from the tube and then replaced. In one group, red-colored chips were used to mark every group of seven chips (i.e., every seventh chip was colored red) (7-marker group). In the second group, red-colored chips marked every group of fourteen chips (14-marker group). The control group had no red chips in the tube. Following the program, the respondents estimated how many chips they ate, how many calories they consumed, and how many chips they usually ate when watching a one-hour show. Finally, they were asked to provide their gender, height, weight, and the number of hours since their last meal.

As anticipated, the inclusion of a divider had a dramatic influence on how many chips were consumed. Participants in the control condition on average ate 45 chips, those with 14-chip segments ate 24 chips, and those with 7-chip segments ate 20 chips. The simple use of any segmenting divider significantly reduced intake by about half, regardless of whether the dividers were present at intervals of 7 or 14 chips. There was no significant difference between the 7 and 14 dividers. The control group overestimated their actual intake significantly more than 7- and 14-marker groups, in which the participants were reasonably accurate in estimating their intake (33 vs. 19 vs. 24 chips, respectively, p<.001).

These results present evidence that segmentation cues and/or consumption interrupts may help reduce intake and improve estimates of calories consumed. The effects are substantial in size (around 50%). Further research is needed to determine what types of segmentation cues are most effective and in what contexts. Our results have important policy implications. Small reductions in food intake, maintained over months, can lead to substantial weight losses over years. If using consumption interrupt strategies cuts 200 calories out of a person’s daily intake, it translates into the cut of 20 pounds in one year. Thus, small interruptions to mindful eating can provide large aggregate results. Helping consumers understand and develop their own segmentation cues could be an effective way to reduce mindless eating.

### References


“Consumer Usage of Ultra-Concentrated Products”  
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Ultra-concentrated products, often offered in smaller packages with greater potency, are available in various categories including medications, detergents, and beverages. We explore when consumers overuse ultra-concentrated products, and which cues communicate potency.

Three factors influence consumption of ultra-concentrated products: prior usage behavior, package size, and product potency.
Consumers anchor on their prior usage and fail to adjust appropriately, leading to over-consumption (Tversky and Kahneman 1974). Consumers use more of a product when dispensing from larger packages than smaller ones (Wansink 1996). We propose that product potency changes exert a unique force that causes consumers to overuse ultra-concentrated products. We explore which cues signal potency changes, and examine how these cues translate to consumption.

Study 1 examined whether consumers overuse higher potency products, and which cues assist consumers in using the prescribed quantity. It was a 2 (bottle size: large, small) × 2 (recommended regular-strength quantity: yes, no) × 2 (ultra-concentrated defined: yes, no) between-subjects experiment, N=338. The dependent variable was the amount of ultra-concentrated detergent used, relative to regular-strength detergent usage.

Participants viewed a 200 oz. regular-strength detergent bottle, an ultra-concentrated detergent bottle, and a list of items in one laundry load. Bottle size was operationalized with the ultra-concentrated bottle as either large (200 oz.) or small (100 oz.); the regular-strength bottle was always 200 oz., and the regular and ultra-concentrated bottle caps were identical. Recommended regular-strength quantity reflected whether or not a recommended use amount was given for the regular-strength detergent. For example, in conditions providing a recommended regular-strength amount, an entire capful was identified as the amount required for the laundry load, and participants indicated how much ultra-concentrated detergent they would use for this load; otherwise, participants indicated regular-strength quantity and the corresponding ultra-concentrated quantity they would use to wash this load. Ultra-concentration was operationalized by either indicating that the “ultra-concentrated detergent is two-times as strong as regular-strength detergent”, or the packages were labeled as ultra-concentrated with no definition. The dependent variable was the percentage of over-/under-usage of ultra-concentrated product, relative to usage of the regular-strength product. For example, if a participant used one cup of regular-strength detergent and three-fourths of a cup of ultra-concentrated detergent for the same load, the over-consumption rate would be reflected as 25%; if a participant used exactly half the amount of the regular-strength when using the ultra-concentrated detergent, the over-usage rate would be 0%. Under-usage is reflected in a negative percentage.

In the result, we found that participants over-consume the ultra-concentrated product relative to the regular-strength version (M=12.24%). Participants over-consume by more from a large ultra-concentrated package (M=16.70%) than a small one (M=7.94%); however, participants significantly overuse both the large bottle size and the small bottle size. Hence, a bottle size reduction slows consumption, but does not eliminate the effect.

When the regular-strength recommended usage quantity is one full cup, participants use 8.25% more than one-half cup using the ultra-concentrated version. When participants indicate both the amount they would use of the regular-strength and ultra-concentrated detergent, they overuse the ultra-concentrated detergent by 15.99%. That is, when given freedom to demonstrate their usage behavior of both regular and ultra-concentrated strengths, participants overuse by significantly more. Verbally defining ultra-concentrated as ‘2 × as strong as regular-strength’ should help consumers use one-half as much ultra-concentrated detergent, relative to regular-strength. However, there was no consumption difference when ultra-concentrated was defined versus not defined, although both over-usage rates were significantly greater than zero (M=10.97% and 13.45%, respectively).

Study 2 examined how trust influences consumption. It was a between-subjects experiment with 2 trust conditions (high trust, low trust), N=386. The trust factor manipulated the information source communicating “ultra-concentrated strength is two times as strong as regular-strength,” Consumer Reports in the high trust condition and an advertisement in the low trust condition. The dependent variables were identical to study 1, plus measures of perceptions of regular and ultra-concentrated products.

In the result, participants significantly over-consumed the ultra-concentrated detergent in both the high (M=9.7%) and low trust (M=26.8%) conditions; and the directional difference in consumption rates (p=.092) indicates that consumers’ trust in potency cues may influence their consumption. Participants trusted and believed Consumer Reports more than advertisements. Interestingly, even though participants perceived that potency levels of ultra-concentrated products are higher than regular-strength products; and that greater adverse effects are possible from using too much ultra-concentrated product relative to using too much regular product; consumers were not convinced that differences in effectiveness exist between ultra-concentrated and regular-strength products.

In these studies consumers persistently overused the more potent product. Understanding what factors drive wasteful consumption rates and what cues help consumers more accurately use products has marketing theory, practice, and public policy implications.

References