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# Effects of product unit image on consumption of snack foods

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**Abstract**

Across a series of three studies, we demonstrate that the number of product units displayed on a package biases consumers' perceptions of product quantity (i.e., the number of snack items the package contains) and actual consumption. Specifically, we demonstrate that consumers use an anchoring heuristic to infer that packages that display a greater number of product units (e.g., 15 pretzels vs. 3 pretzels) have a higher product quantity inside. Importantly, we demonstrate that actual consumption of the food product follows this anchor judgment. The studies demonstrate that these effects are moderated by level of visual processing and that they are robust even in the presence of verbal information.


*Keywords:* Anchoring; Packaging; Food consumption

## Introduction

Research indicates that the major behavioral factor for the increased obesity epidemic of the last 30 years is an increase in dietary intake rather than a decrease in physical exercise (Van Ittersum & Wansink, 2007). This increase in dietary intake is largely caused by environmental factors like increased portion and package sizes over the last decades (Wansink, 2007). Large containers and portions implicitly suggest larger consumption norms, which ultimately leads to overeating (Van Ittersum & Wansink, 2007; Wansink, 2007). Indeed, people are not aware of the small factors that influence their consumption. For example, consumers unknowingly use presentation and packaging cues to estimate food and beverage quantity (e.g., container shape, Folkes & Matta, 2004; elongation of package, Raghubir & Krishna, 1999) and to generate consumption norms (e.g., package size, plate shape, variety; Wansink, 2007). Unwitting use of such cues can lead to biased judgments that influence consumption volume (Raghubir & Krishna, 1999; Wansink & Van Ittersum, 2003).

Although research has made great strides over the last decade in discovering how presentation and packaging cues influence quantity judgments and consumption, we are still in the process of identifying such environmental factors and documenting their behavioral influence. In this paper, we explore the effect of one such previously unidentified factor: product image. Many consumer goods packages feature a picture of the product (product image) on the front of the package. This product image is an essential part of packaging aesthetics and a representation of the product inside the package (Underwood & Klein, 2002).

In the present research, we use the snack food category to demonstrate that the number of product units displayed on the package influences consumer perceptions of product quantity, defined as the number of snack items the package contains, and actual product consumption. In the first study (Study 1) we show that the number of product units (e.g., number of cookies) displayed on the package influences consumers' perceptions of product quantity whereby the more cookies consumers see on the package the more cookies they think are inside the package. Importantly, we demonstrate that study participants anchor their consumption on the number of product units they see on the package where the more units

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displayed the more study participants consume from that package. In Study 2, we provide support for anchoring as the process behind our findings by demonstrating the effect only in a condition where study participants devote substantial attention towards the anchor. Finally, we demonstrate the robustness of the product image effect even in the presence of verbal information (Study 3a) and we also show that the effect on consumption is moderated by level of visual processing (Studies 3a and 3b).

Taken together, our studies provide a unique contribution to the literatures on heuristic (anchoring) and imagery processing, as well as packaging effects. First, we identify anchoring on the product image as a previously unrevealed systematic bias in judgment (product quantity) and behavior (consumption). Secondly, we offer the theoretical extension of anchoring effects by demonstrating that such effects may be moderated by processing differences and styles. Our findings offer insights for consumer welfare by providing further understanding of the contextual factors that affect food consumption volume.

## Conceptual framework

Recognized by marketers as an important marketing tool, packaging can communicate to consumers positive aesthetic, experiential, functional, symbolic and informational benefits. In fact, 90% of consumers make a purchase after only visually examining the front of the packaging but without physically having the product in their hands (Clement, 2007). Previous studies suggest the existence of biases in visual judgments of packaging on product quantity and volume (Folkes & Matta, 2004; Raghubir & Krishna, 1999). For instance, Raghubir and Krishna (1999) show that consumers judge a container's volume by its height and perceive elongated containers as having more of the product than shorter ones. Another study by Folkes and Matta (2004) finds that containers that attract more attention are perceived to have more of the product than same-sized containers, even when the latter is taller. Although there is no consensus why judgment biases occur, one suggested reason is that consumers develop a variety of shortcuts in order to conserve mental effort and thus, simplify judgments of how much a container holds (Folkes & Matta, 2004).

The above mentioned studies carry much theoretical and managerial significance; however, their focus of analysis has been limited only to the structural elements of packaging such as size and shape of the package. Packages also have visual elements such as image and typography that influence consumer perceptions. The research on product images is discussed next.

### *The product image as a packaging cue*

Many studies of consumer behavior and advertising demonstrate the importance of the product image on consumer attitudes and beliefs about the product (Larsen, Luna, & Peracchio, 2004; Peracchio & Meyers-Levy, 2005; Yang, Zhang & Peracchio, 2010). Specifically in packaging, the product image performs an informational function that directly affects consumer beliefs about the product (Underwood & Klein, 2002). The product image can create positive beliefs about the intrinsic attributes of the product, especially in categories for highly experiential products such as food (Underwood & Klein, 2002). Prior research has shown that the product picture might elicit representations of sensory information (e.g., smell, taste) and increased cognitive associations (e.g., more available attitudinal judgments; MacInnis & Price, 1987; Underwood & Klein, 2002). In sum, the product image can be a very diagnostic cue for consumers given its accessibility for judgment and choice (Kisielius & Sternthal, 1986). However, to date no one has looked at how the number of product units on the package influences product inferences. In consumer packaged foods, even within category and within brands, the number of product units displayed on the image can vary widely. As just one example, Nabisco sells packages of Nilla wafers flagship cookie with five cookies on the image and packages with a heap of cookies too jumbled and numerous to count. We propose that the number of product units in the image can systematically bias consumer judgment. In particular, we propose that consumers apply the anchoring heuristic as a strategy for estimation of product quantity where the more units consumers see in the image, the more they think are inside the package. More importantly, we next suggest that consumers anchor their consumption on the number displayed on the package where the more units they see, the more they consume from the package. Next, we present background on the anchoring heuristic from which we derive our propositions.

### *Anchoring*

Judgments tend to be influenced by an initial impression, perspective or value (Epley & Gilovich, 2006) and human judgment under uncertainty is often influenced by salient judgmental anchors (Mussweiler & Strack, 2001a). The resulting "anchoring effects" are defined as effects produced by any judgment that is assimilated to an anchor value (see Wegener, Petty, Blankenship, & Detweiler-Bedell, 2010 for a review). Originally introduced by Tversky and Kahneman (1974), anchoring is the psychological process by which a salient but uninformative number is presented to study participants which subsequently influences their estimation judgments to be close to the anchor. Research has shown that people use this heuristic to make judgments and solve a variety of estimation problems (Chapman & Johnson, 2002).

Anchors could be self-generated (internal anchors) or experimenter-provided (external anchors; Epley, 2004). Extensive work by Mussweiler & Strack (1999, 2001b) and Strack & Mussweiler (1997) has demonstrated that anchoring effects in the standard anchoring paradigm, where anchors are experimenter-provided, are produced by enhanced accessibility of anchor-consistent information. When an anchor is made salient in a task or it is considered relevant for the judgment, study participants choose it as a comparison standard.

Thereafter, target values are assimilated towards the anchor value, producing an anchoring effect (Mussweiler & Strack, 1999).

Anchors are variously presented and activated in different paradigms and bias judgments in different domains (Epley, 2004). In consumer behavior research, anchoring has been shown to influence inventory estimates (Chandon & Wansink, 2006) and purchase quantity decisions (Wansink, Kent, & Hoch, 1998). In the study most directly relevant to the present research, Raghubir and Krishna (1999) demonstrated that consumers use the height of the package to anchor their volume estimates. For example, taller glasses are estimated to hold more beverage than shorter glasses with the same width (Raghubir & Krishna, 1999). Thus, there is evidence that consumers do use packaging cues as anchors to infer what the container, or the package, can hold. We contribute to this literature on automatic anchoring cues by introducing a previously unexplored anchor: the number of units displayed on the package. Specifically, we expect consumers will anchor their estimates of how much product the package holds (product quantity) on the number of units pictured in the package image.

Thus, we propose the following hypothesis:

**H1.** Packages with more product units displayed on the package will be perceived to contain more product quantity than packages with fewer product units displayed on the package.

In addition to product quantity, consumption is also influenced by many environmental factors, and particularly visual cues such as package size, variety and plate size (Wansink, 2007). These visual cues or anchors can lead to systematic bias in food consumption, and usually do so outside of consumers' awareness. For example, people unintentionally eat more out of larger bowls, or containers of food, than out of smaller ones—even when the food is rated as relatively unfavorable in taste (Wansink, 2007). Van Ittersum and Wansink (2007) review how several of these visual cues can increase or decrease consumption. For example, part of the influence that large plates or bowls have on consumption is due to the Delboeuf illusion, or the relative size relationship between two concentric circles (the food portion of a plate is the inner circle and the edge of the plate is the outer circle; see Van Ittersum & Wansink 2007 for specifics of this illusion). Likewise, Raghubir and Krishna (1999) demonstrated consumption effects of a visual packaging cue, namely that the more elongated the container, the more actual consumption increases. In other words, automatic anchoring on the vertical or height dimension of containers leads to greater consumption.

In sum, visual contextual cues or anchors can unknowingly bias the quantity of food we consume in one sitting. However, none of the studies on these visual biases in consumption has looked at the product units on the package as such a biasing cue. We extend this literature by proposing that the number of product units displayed on the package is a visual anchor that influences how much a person consumes from that package. Stated formally:

**H2.** Individuals will consume more from packages with more product units displayed than from packages with fewer product units displayed on the package.

We test H1, the effect of product image on product quantity judgments, in Studies 1a, 1b and 1c. We test H2, the effect of product image on consumption, in Study 1c and Studies 2 and 3.

## Study 1: more is merrier

### *Study 1A*

#### *Method*

Thirty-seven undergraduate business students from a large Northeastern university participated in the study that was run as a two condition (number of product units displayed on package: four cookies vs. seven cookies) between-subjects design.

Participants were randomly assigned to one of two conditions: a package of chocolate chip cookies with four cookies displayed on the picture or a package with seven cookies on the picture (see Appendix A). After viewing the manipulated graphics of the product packages, participants completed the questionnaire. Participants first rated the perceived product quantity in the package by indicating how many cookies, in total, they thought the package held. Serving size was also measured as a preliminary proxy for consumption with an open-ended response to the query "How many cookies should a person eat in one sitting?".

#### *Results and discussion*

Supporting H1, study participants thought that the package that displayed more product units contained more quantity than the package that displayed fewer product units. An ANOVA with number of cookies on the package as a between-subjects factor revealed a significant main effect on product quantity such that the package with the seven cookies was perceived to hold more cookies ($M_7$=71.55) than the package with the four cookies ($M_4$=19.65, $F(1, 35)=6.93$, $p<.05$). Additionally, study participants thought there were more cookies in a serving from the package that displayed seven cookies compared to the package that displayed four cookies ($M_7$=6.60 vs. $M_4$=4.41; $F(1, 35)=4.83$, $p<.05$). One sample *t*-tests confirm that the sample means are not significantly different than the target numbers, 4 or 7, thus supporting the use of product units as anchors in judgment.

Study 1a provides initial evidence that the number of product units on the package influences product quantity. In this study, only the number of cookies was varied; the cookies were the identical size in each condition. However, a picture of seven cookies might imply a greater total weight than a picture of four cookies (e.g., if one cookie weighs 15 grams, then 7 cookies weigh 105 grams while 4 cookies weigh 60 grams). In the natural environment, there is a correlation between weight and overall size of an object (Charpentier, 1891; Ellis & Lederman, 1993). Therefore, in order to rule out the competing explanation that weight rather than number of units might account for the effect, we ran a second study where we kept the total grams equal across conditions by varying the size of the cookie.

*Study 1B*

*Method*

One hundred and twenty-one undergraduate business students from a large Northeastern university participated in the study that was run as a two condition (number of product units displayed on package: four cookies vs. seven cookies) between-subjects design. The procedure for Study 1b was identical to that of Study 1a with a few exceptions. First, all participants were presented with a color image of the target brand (Milka) as well as two control packages (LU and Bahlsen). The control images were graphically manipulated to be approximately 30% smaller (LU) and approximately 30% bigger (Bahlsen) than the manipulated target (Milka) package. Both LU and Bahlsen depicted two cookies on the image, and these images were held constant across conditions. This enabled us to display the package relative to other existing packages, as would occur naturally on a store shelf.

As mentioned above, participants were randomly assigned to one of the two image conditions for Milka. In the first condition, the image on the package displayed 4 large cookies; in the second condition the image displayed 7 small cookies. Please see Appendix A for the product images.

To provide an alternative and corroborating quantity judgment method, participants rated their visual perception of package size by indicating how big they thought the package is relative to the other control packages (on a 20-point notched scale with LU and Bahlsen as the endpoints); consumers rely on visual perception of package size as an alternative quantity judgment method (Gupta, Tandon, Debnath & Rominger, 2007). Study participants were next asked to fill in an open-ended question indicating how many cookies they thought were in a serving from the target brand. Size of the cookies was measured on a 7-point scale (1=extremely small, 7=extremely big). Familiarity with the brand was measured with two yes/no questions ("Have you tried this brand before"/"Have you seen this brand before?"), and attractiveness of the package were measured on a 7-point scale. After completing the survey, participants were debriefed and thanked for their participation.

*Results and discussion*

Analyses were conducted with number of cookies on the package as a between-subject factor and familiarity as a covariate. Note that there was no effect of familiarity or attractiveness of the package on any of the dependent measures ($Fs<1$).

Results support H1. An ANOVA revealed a significant main effect of product quantity ($F(1, 118)=5.69$, $p<.05$), such that the package with the seven cookies was perceived as bigger in size than the package with the four cookies ($M_7=9.93$, $M_4=8.55$). Consistent with study 1a, study participants thought there were more cookies in a serving from the package that displayed seven cookies ($M_7=5.50$) compared to the package that displayed 4 cookies ($M_4=3.74$, $F(1, 118)=4.55$, $p<.05$).

Study participants accurately estimated that the cookies on the package with the seven cookies were smaller than the cookies on the package with the four cookies ($M_7=3.33$ vs. $M_4=3.79$, $F(1, 118)=4.03$, $p<.05$). However, despite this, study participants still thought the package with more cookies looked bigger and had a larger serving size.

The results from Study 1b confirm the robustness of the results from Study 1a. Even after we changed the size of the cookies across conditions, we still observe the same pattern of results we saw in Study 1a. In the following study, we sought to provide evidence that product unit image independently influences actual consumption and thus confirm H2, as well as to demonstrate that the effect maintains even when participants view a three-dimensional package.

*Study 1C*

*Method*

Seventy-seven undergraduate business students from a large Northeastern university participated in the study that was run as a two condition (number of product units displayed on package: five animal crackers vs. twenty-five animal crackers) between-subjects design. Participants were exposed to either a 3D mock-up of the physical package with 5 animal crackers or one with 25 animal crackers displayed in the image. Please see Appendix A for the product images.

As they were viewing the packages, participants answered open-ended questions "How many crackers do you think there are in one serving from this package?' and "How many servings do you think there are in this package?" in addition to questions on familiarity and attractiveness of the package on 7-point scales. Study participants were next given small zip bags with 30 crackers inside and were invited to consume the crackers while they completed a filler survey. Although we did not detect any correlation between number of units displayed and number of units inside the package from our observation of actual snack products available in stores, we wanted to check that the number of units displayed on the pack is not generally considered informative or relevant for such judgments. After the zip bags were collected we asked participants two final questions that measured (7-point scales) how relevant they thought the number of units displayed on the package was to estimates of how much the box held and to estimates of how much they should eat at one time.

*Results*

An ANOVA was conducted with number of crackers on the package as a between-subject factor. Note that there was no effect of familiarity or attractiveness of the package on any of the dependent measures ($Fs<1$). A measure of product quantity (total number of crackers inside the package) was computed by multiplying the number of servings by the number of crackers in a serving.

Study participants thought there were more crackers in a serving and more total number of crackers in the package that displayed 25 crackers than in the package that displayed 5 crackers (for serving size: $M_{25}=37.38$, $M_5=17.15$,$F(1, 75)=4.12$, $p<.05$; for product quantity: $M_{25}=235.75$, $M_5=121.26$, $F(1, 75)=3.96$, $p<.05$). Thus we found support for H1.

Consumption was measured in two different ways. First, for each participant, we subtracted the number of crackers left in the zip bags from the original number which gave us the number of

crackers consumed. Second, for each participant, we subtracted the weight (in ounces) of the crackers left in the zip bag from the original weight of the bag which gave us the weight of crackers consumed. Consistent with H2, participants consumed more of the product (measured both by number and ounces) when they saw the 25-cracker package than when they saw the 5-cracker package (for number consumed: $M_{25}=2.40$, $M_5=.65$, $F(1, 75)=6.16$, $p<.01$; for ounces consumed: $M_{25}=.16$, $M_5=.04$, $F(1, 75)=6.78$, $p<.01$).

*Discussion*

The results from Study 1c provide support for the hypothesized anchoring effect of unit number displayed on the package on perceptions of product quantity (H1) and on actual consumption (H2). Participants perceived the package to contain more product quantity and consumed more when they saw a package with more product units displayed. Note that these effects are independently generated by anchoring; the data do not support a mediation model of either serving size or product quantity as a mediator of product image on consumption. This is supported by the fact that study participants thought the number of units displayed was irrelevant to both judgments as indicated by the low means and standard deviation on the relevancy measures ($M_{\text{product quantity}}=2.7$; SD=1.8; $M_{\text{consumption}}=2.9$, SD=1.7; there were no differences across manipulation conditions, $p$'s>.10).

Additional support for anchoring would be obtained if such effects occurred only when study participants had sufficient attention to devote to the task, but not when study participants' attention was divided. The literature on anchoring states that one of the necessary conditions for anchoring to occur is study participants' devoted attention to the anchor as stimulus (Chapman & Johnson, 2002; Wilson, Houston, Etling, & Brekke, 1996). Wilson and colleagues (1996) demonstrate the occurrence of spontaneous anchoring toward an external target only when the anchor was made salient by extensive processing. This is consistent with the mechanisms of selective accessibility proposed by Mussweiler and Strack (1999) that describe how the anchor needs to be salient in order to become accessible in the judgment formation. Previously mentioned studies on anchoring in consumer research have also shown that salience of the anchor is a necessary condition for the anchoring effect to occur. For example, Krider, Raghubir, and Krishna (2001) show that consumers anchor area estimations on the most salient dimension. Another study by Chandon and Wansink (2006) demonstrates that consumers anchor their inventory estimates on external reference inventory levels only when they are made salient.

We also rely on the suggestion by Mussweiler and Strack (2001b) that anchoring processes may be less heuristic than originally thought by Tversky and Kahneman (1974). The processes involved in the standard anchoring effects seem to be fairly elaborate and systematic in nature (Mussweiler & Strack, 2001b); therefore, we expect anchoring effects to occur only when study participants have sufficient cognitive resources and devote substantial attention to the anchor stimulus.

A similar literature on imagery processing corroborates this theorizing. Specifically, the product pictures on the package elicit imagery processing (Paivio, 1986) and help consumers imagine the product's attributes. However, in order for this process of imagery to happen consumers should have the cognitive capacity to do so (Petrova & Cialdini, 2008). Imagery is a resource-demanding process (MacInnis & Price, 1987; McGill & Anand, 1989; Unnava, Agarwal, & Haugtvedt, 1996), and allocating resources to another cognitive task could undermine its effects. Therefore, we expect that for cognitively busy study participants the product picture would not have the necessary accessibility and salience for imagery processing.

Based on the above theoretical and empirical findings we expect the anchoring effect of product image to occur only for study participants who have the cognitive resources needed in order for them to devote attention to the anchor and process the available pictorial information. We test for this moderating effect of cognitive load in Study 2 with the following hypothesis:

**H3.** Individuals who have cognitive resources available will consume more from packages displaying more product units than from packages displaying fewer product units. The number of units displayed should have less of an effect on consumption for individuals who have limited cognitive resources available.

*Study 2: the more you see, the more you eat*

*Method*

Ninety-four undergraduate business students from a large Northeastern university participated in the study that was run as a 2 (number of product units displayed on package: one cracker vs. nine crackers)×2 (cognitive load: yes vs. no) between-subjects design.

Participants were randomly assigned to one of the four conditions. In the cognitive load condition study participants were first given a list of nine words to remember and were told there would be a recall task at the end. Next, all participants were presented with a 3D color image of a package of whole-grain crackers. Study participants in one condition saw a package with only one cracker displayed; study participants in the other condition saw a package with nine crackers displayed (see Appendix B).

After seeing the packages participants indicated how many crackers, in total, they thought the package held. Participants were then invited to sample the actual product if they wished and were given a filler questionnaire to complete. When finished, study participants were handed the true questionnaire where they indicated their consumption. Product quantity consumed was measured by study participants self-reporting the number of crackers they consumed during the study. Familiarity with the brand was measured with two yes/no questions ("Have you tried this brand before"/"Have you seen this brand before?"), in addition to attractiveness of the package on a 7-point scale. Finally, we measured whether they self-reported to be dieting at the moment with three items on a 5-point scale (1=never, 5=always; e.g., "I am dieting to help control my weight"). At the end study participants were debriefed and thanked for their participation.

*Results*

An ANOVA was conducted with number of crackers on the package and cognitive load as between-subjects factors. No effect

of familiarity, diet, or attractiveness of the package was found ($F$s < 1). Results for product quantity were not significant ($F < 1$). However, analysis revealed a significant main effect of number of crackers on consumption ($F(1, 88) = 6.16$, $p < .05$) such that study participants who viewed a greater number of crackers on the package reported consuming more ($M_9 = 5.21$) than those who viewed a smaller number of crackers ($M_1 = 3.14$). Importantly, results confirm H3; the analysis revealed a significant interaction effect of number of crackers and cognitive load on consumption ($F(1, 88) = 8.64$, $p < .01$, see Fig. 1). As hypothesized in H3, study participants with full cognitive resources (no-load condition) reported consuming more crackers after viewing the 9 cracker image than the 1 cracker image ($M_{9\text{no-load}} = 6.65$, $M_{1\text{no-load}} = 2.43$; $F(1, 88) = 13.16$, $p < .001$). Consumption by study participants in the load condition did not differ significantly in the 9 cracker and 1 cracker conditions ($M_{9\text{load}} = 3.68$, $M_{1\text{load}} = 3.94$; $F < 1$).

*Discussion*

In Study 2 we find support for H3; consumers who have the cognitive resources available reported greater consumption from the package displaying more crackers than from the package displaying fewer crackers. The fact that these results were obtained only in a no-load condition where consumers have the cognitive resources available, and thus are able to devote substantial attention to the stimulus as anchor, support anchoring as the underlying heuristic bias. These results are consistent with the proposition from the literature that anchoring might be a more elaborate and systematic type of processing (Mussweiler & Strack, 2001b).

Would the presence of product unit images still bias judgments when consumers are presented with both visual and verbal information, as they are during real shopping and consumption experiences? Previous research on information processing leads us to believe that graphics (visual information) on the package are more likely to influence consumers in their beliefs about the product than corresponding verbal information. Specifically, research on visual and verbal components of package design shows that accurate verbal labeling does not negate any misinterpretation presented graphically and that graphics affect beliefs even when accurate verbal information is provided (Bone & France, 2001).

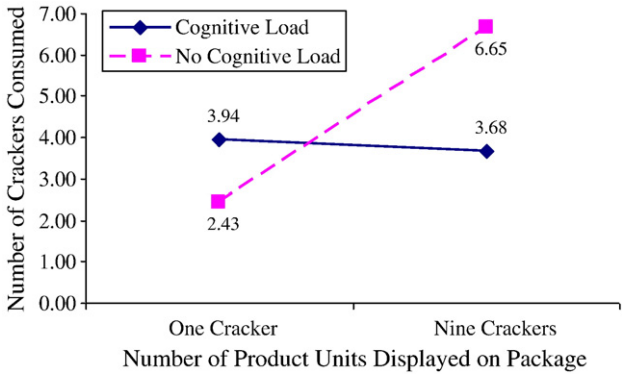


Fig. 1. Study 2: The effect of number of crackers and cognitive load on consumption.

However, also based on information processing research, people demonstrate individual differences in their consistencies and preferences in attending to and processing of visual information (Paivio, 1986). Individuals are classified as having high or low level of visual processing depending on how much they rely on visual information when attempting to perform cognitive tasks (Blazhenkova & Kozhevnikov, 2008). People at high level of visual processing (high visual processors) prefer to process information through graphics, diagrams and illustrations to a greater extent than people at low level of visual processing (low visual processors; Jonassen & Grabowski, 1993; Kirby, Moore, & Schofield, 1988). Additionally, high visual processors are people with high imagery ability in general (i.e., they invoke imagery easier and use it more often) while low visual processors are people with low imagery ability (Jonassen & Grabowski, 1993; Hollenberg, 1970). Therefore, we expect that because people with higher levels of visual processing rely more on visual images, they will be more prone to anchor their consumption on the product units they see on the package image.

In Study 3 we test for the moderating effect of visual processing on actual consumption of a snack food. We also seek to demonstrate that the anchoring bias persists despite the presence of verbal information on the package. Snack products convey verbal information via the nutrition fact panel. One such standard piece of verbal information is the number of servings in the total package, which is a proxy for product quantity; the more product inside, the more servings (note that it is customary for serving size to be presented in weight, e.g., grams, which remains invariant to total product quantity). Therefore in studies 3a and 3b, we test the following hypothesis:

**H4.** Consumption from packages displaying a greater number of product units will be greater than that from packages displaying fewer product units for individuals with relatively higher levels of visual processing.

## *Study 3A: a picture is worth a thousand words*

*Method*

Sixty-six undergraduate business students from a large Northeastern university participated in the study that was run as a 2 condition (number of product units displayed on package: five pretzels vs. thirty pretzels) between-subjects design. Level of visual processing was included in the design as a measured variable.

Participants were randomly assigned to one of the two package conditions. All participants were presented with a color image of the front and back packaging for Bachman's pretzel nuggets. Study participants in one condition saw a package with only five pretzels displayed; study participants in the second condition saw a package with thirty pretzels displayed (see Appendix B). Next to each of these images, the verbal information embedded in the nutrition facts panel was provided; this information was invariant across conditions. After seeing the packages, study participants completed an open-ended question on total number of pretzels ("How many pretzels total are in the bag?") followed by questions on brand familiarity and

attractiveness of the package (7 point scales). Study participants were then each given a bag containing exactly 35 pretzels, from which they could eat if they wished and were told to fill out the visual processing survey while they ate (Object Imagery scale; Blazhenkova & Kozhevnikov, 2008). This scale assesses people's preferences for representing and processing pictorial images on a 15-item, 5-point scale (1=totally disagree; 5=absolutely agree. Example items include: "My images are very vivid and photographic", "I can remember everything visually" and "I enjoy pictures with bright colors and unusual shapes like the ones in modern art." Reliability for the measure using Cronbach's alpha was .83.[2]

After completing the visual processing scale, study participants were asked to write down how many pretzels remained in their bags, which was used to calculate the number of pretzels consumed during the study. Finally, study participants were debriefed and thanked for their participation.

*Results*

Linear regression was used to test for H4 with number of pretzels consumed (Consumption) as the dependent variable. Number of product units displayed on the package (Number) was coded as a dummy variable equivalent to 0 if study participants viewed the 5-pretzel package and equivalent to 1 if study participants viewed the 30-pretzel package. Number, mean-centered Visual Processing, and the interaction between Number and Visual Processing were included as independent predictors. Familiarity was also included as a covariate however it was not significant ($\beta=-0.08$, $t=-0.67$, $p>.10$). There was no effect of attractiveness of the package on any of the dependent measures ($F$s$>0.10$).

The main effect of Number on Consumption was significant ($\beta=0.27$, $t=2.24$, $p<.05$) such that study participants who viewed the package with more pretzels reported consuming more than study participants who viewed the package with fewer pretzels. The main effect of Visual Processing on Consumption was not significant ($p>.10$). As expected, results show a significant two-way interaction between Number and Visual Processing on Consumption ($\beta=.33$, $t=1.97$, $p<.05$).

To explore the nature of the interaction, we compared whether there were significant differences across the two conditions at both low and high levels of Visual Processing. A spotlight analysis at plus and minus one standard deviation from the mean of Visual Processing was performed (Aiken & West, 1991; Fitzsimmons, 2008; see Fig. 2). The planned contrast for study participants at a high level of visual processing was significant ($\beta=0.50$, $t=2.98$, $p<.01$), however, the contrast for study participants at a low level of visual processing was not significant ($\beta=.03$, $t=0.18$, $p>.10$). These results confirmed H4, namely study participants at a high level of visual processing reported consuming more from the package that displayed more pretzels than from the package that displayed fewer pretzels ($M_{high30}=19.80$, $M_{high5}=8.73$); and for study participants at a low level of visual processing the number of pretzels displayed did not have an effect on consumption ($M_{low30}=11.61$, $M_{low5}=10.96$).

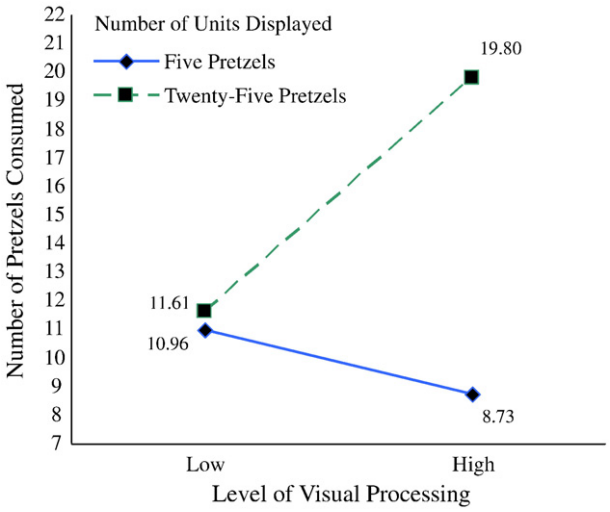


Fig. 2. Study 3a: The effect of number of pretzels and level of visual processing on consumption. Low visual processing is one standard deviation below the mean and high is one standard deviation above the mean.

The same procedure was followed to test for effects on Product Quantity. Number, mean-centered Visual Processing, and the interaction between Number and Visual Processing were included as independent predictors. Familiarity was also included and was not significant ($\beta=0.125$, $t=1.024$, $p>.10$).

Results indicated a significant two-way interaction between Number and Visual Processing on Product Quantity ($\beta=.38$, $t=2.23$, $p<.05$). There were no main effects of Number or Visual Processing. Again, a spotlight analysis at plus and minus one standard deviation from the mean of Visual Processing was performed. The contrast for study participants at a high level of visual processing was marginally significant ($\beta=0.31$, $t=1.76$, $p<.10$), however, the contrast for study participants at low level of visual processing was not significant ($\beta=-0.25$, $t=-1.41$, $p>.10$).

*Discussion*

In Study 3a we once again demonstrate the anchoring effect of product image on actual consumption. Study participants consumed more of the product when presented with a package that displayed more product units. However, we also show that individual differences in level of visual information processing moderate the anchoring effect. High visual processors consumed more pretzels when there were more units on the package than when there were fewer units on the package.

Importantly, we demonstrate that the image effect is powerful even in the presence of verbal information. In this study, all study participants were shown verbal information regarding the number of servings in the bag as well as the number of pretzels in one serving. Despite the presence of this verbal information, study participants appeared not to use this information in their estimates of total number of pretzels. In sum, Study 3a demonstrates that the presence of verbal

[2] One item number from the original Object Imagery Scale (item 11) was excluded due to low overall reliability with the rest of the items. Removing this item from the scale increased Cronbach's α from .51 to .83.

information is not sufficient enough to inhibit the anchoring effect of product image.

Finally, since the measure of consumption in Study 3a was a self-report (study participants were instructed to count how many were left in the bag and report that number) we conducted a follow-up study (Study 3b) in order to confirm H4 with more objective measures of consumption. Additionally, to eliminate the possibility of any demand effects due to mere measurement of serving size prior to consumption, we do not include such questions in Study 3b.

### *Study 3B*

#### *Method*

Fifty-nine undergraduate business students from a large Northeastern university participated in the study that was run as a 2-condition (number of product units displayed on package: three pretzels vs. fifteen pretzels) between-subjects design. Level of visual processing was included in the design as a measured variable.

Participants were randomly assigned to one of the two package conditions. All participants were presented with a color image of a packaging for Snyder's pretzels. Study participants in one condition saw a package with only three pretzels displayed; study participants in the second condition saw a package with fifteen pretzels displayed (see Appendix B). Study participants were each given a bag containing exactly 25 pretzels, from which they could eat if they wished and were told to fill out the visual processing, brand familiarity and attractiveness questions while they ate. Then, the surveys and the zip bags were collected and study participants were debriefed and thanked for their participation.

#### *Results*

Consumption was measured in two different ways. For each participant, we subtracted the number and the weight (in ounces) left in the zip bags from the original number and original weight of the bag.

Linear regression analyses were performed with Total Consumed and Ounces Consumed as dependent variables, following the same procedure as in Study 3a. Number of product units displayed on package (Number) was coded as a dummy variable equivalent to 0 if study participants viewed the 3-pretzel package and equivalent to 1 if study participants viewed the 15-pretzel package. Number, mean-centered Visual Processing, and the interaction between Number and Visual Processing were included as independent predictors. No effects of familiarity or attractiveness of the package were detected ($F$s$>.10$).

The main effects of Number on Total Consumed and Ounces Consumed were significant (for Total Consumed: $\beta=.32$, $t=2.68$, $p<.01$; for Ounces Consumed: $\beta=.28$, $t=2.32$, $p<.05$) such that study participants who viewed the package with more pretzels consumed more than study participants who viewed the package with fewer pretzels. The main effect of Visual Processing on consumption was not significant ($p>.10$).

As expected, results show significant two-way interactions between Number and Visual Processing on Total Consumed and Ounces Consumed (for Total Consumed: $\beta=.40$, $t=2.29$, $p<.05$; for Ounces Consumed: $\beta=.40$, $t=2.29$, $p<.05$). A spotlight analysis at plus and minus one standard deviation from the mean of Visual Processing illustrates the nature of the interaction (see Figs. 3 and 4). The contrast for study participants at a high level of visual processing was significant (for Total Consumed: $\beta=.60$, $t=3.52$, $p<.001$; for Ounces Consumed: $\beta=.57$, $t=3.26$, $p<.01$), however, the contrast for study participants at a low level of visual processing was not significant (for Total Consumed: $\beta=.05$, $t=.26$, $p>.10$; for Ounces Consumed: $\beta=.002$, $t=.01$, $p>.10$). As depicted graphically, study participants at high levels of visual processing consumed more from the package that displayed more pretzels than the package that displayed fewer pretzels (for Total Consumed: $M_{15high}=5.77$, $M_{3high}=.77$; for Ounces Consumed: $M_{15high}=.34$, $M_{3high}=.05$); and for study participants at low level of visual processing the number of pretzels displayed did not have an effect on consumption (for Total Consumed: $M_{15low}=2.32$, $M_{3low}=1.95$; for Ounces Consumed: $M_{15low}=.13$, $M_{3low}=.13$).

In Study 3b we once again find support for H4 and confirm the anchoring effect of product image on consumption measured as total number of pretzels consumed and ounces of pretzels consumed.

## General discussion

The present research examines how the number of product units displayed on packaging affects consumer perceptions of product quantity and consumption. We demonstrate an anchoring bias such that more product units on the package lead consumers to believe that there is more of the product inside the package. Importantly, we demonstrate the anchoring effect of product image on actual consumption with four different snack types (animal crackers in Study 1c, whole-grain crackers in Study 2, pretzel nuggets in Study 3a and regular pretzels in Study 3b). In addition, in Study 3a we demonstrate that even when study participants were simultaneously presented with visual and verbal

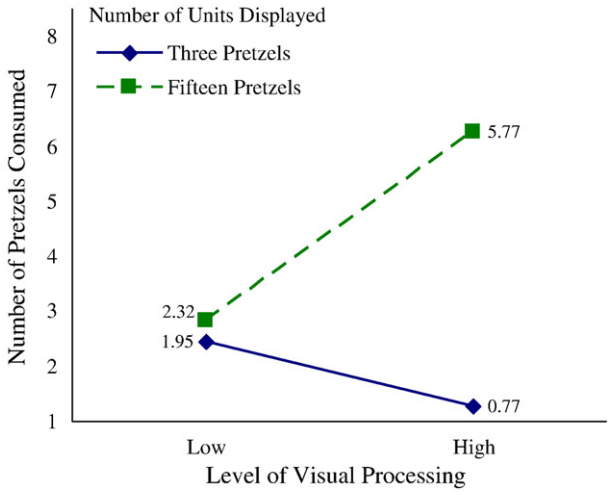


Fig. 3. Study 3b: the effect of number of pretzels and level of visual processing on Total Pretzel Consumption. Low visual processing is one standard deviation below the mean and high is one standard deviation above the mean.

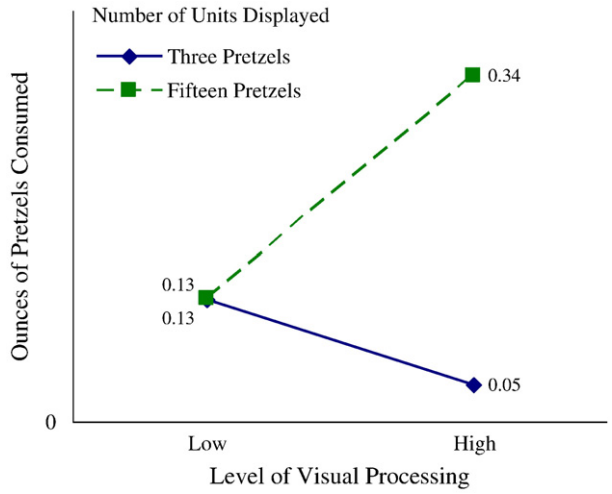


Fig. 4. Study 3b: the effect of number of pretzels and level of visual processing on ounces of consumption. Low visual processing is one standard deviation below the mean and high is one standard deviation above the mean.

information, they still consumed more from packages that displayed more pretzels than from packages displaying fewer pretzels despite the suggested serving size on the nutrition panel. Finally, we demonstrate that these effects are moderated by level of visual information processing (Studies 3a and 3b). Of note is that we specifically designed the stimuli so that all packages were equally appealing. Therefore we can also safely conclude that study participants were not merely eating more from packages they found more attractive.

This paper contributes to the perceptual literature as it introduces a new factor that affects quantity judgments in the consumer domain. Quantity judgments such as "how big" and "how many" are integral parts of day-to-day consumer decisions. Consumers normally do not use mathematical formulae to make these estimates, thus systematic biases in these judgments are important to study and document (Krishna, 2008). The present research contributes to previous findings on quantity perceptions in the consumer domain by showing that perceptions for packages are influenced by product images as displayed on the package front.

The present work also contributes to the literature on anchoring as a heuristic that people often use to make judgments. Particularly important is that we find people anchor on the product image only under conditions of full cognitive resources. This finding provides support to the suggestion in the anchoring literature that this bias requires more cognitive ability than originally thought. When grocery shopping in the natural environment, people sometimes shop under conditions of full cognitive resources, such as might be the case when shopping for pleasure, shopping alone without time constraints, or when shopping online. Other times, however, consumers shop under conditions of limited cognitive resources, such as when we are time constrained or shopping with impatient young children. Extensions of this work could refine the level of cognitive resources necessary for our effects to maintain.

Our exploration of the anchoring effect was limited to the number of product units holding background graphics constant. However, other interesting extensions of this work might explore potential interactive effects with other packaging designs, such as background graphics. For example, it is common for consumer packaged goods to showcase "consumption partners" on the image (e.g., cookies with milk, crackers with cheese). Arguably, these pairings depict normative eating scenarios and might act as a relevant heuristic that interacts with the number of cookies or crackers to influence consumption. Additionally, given recent trends in the emergence of brand extensions that "trade up" and "trade down" (Hagtvedt & Patrick, 2009), another interesting extension of this work might be to investigate whether the effect of product unit image is enhanced for luxury brands vs. value brands.

As mentioned previously, packaging aesthetic appeal was held constant in our studies in order to rule out alternative explanations. Aesthetic appeal in package design has been shown to influence product choice such that more aesthetic packages are preferred over more standardized packages (Reimann, Zaichkowsky, Neuhaus, & Weber, 2010). A potentially interesting research question is whether package appeal will increase or decrease the anchoring effect of product unit image on consumption. We would expect that this would depend on the source of the aesthetic appeal (i.e. the product image or other package elements like color and shape) and whether the aesthetic and objective features are in congruency or not (Hoegg, Alba, & Dahl, 2010).

With the present studies, we extend our understanding of the effects of contextual factors on consumption volume. Contextual factors such as package shape, plate shape and product variety have been shown to indirectly influence consumption by suggesting consumption norms and inhibiting consumption monitoring (Wansink, 2007). For example, consumers wishing to reduce their caloric intake are advised to use smaller plates to avoid mindless eating. These studies demonstrate biases that are perceptual in nature. Despite our theorizing that the product unit bias necessitates some cognitive resources therefore making it less perceptually hard-wired (Raghubir, 2008) our findings might still offer similar strategic guidance to dieters. With sufficient consumer education, dieters might be warned away from the dangers of overeating due to product images. Perhaps public policy efforts should not only focus on requiring disclosure of serving size information on nutrition labels but also on strategies that facilitate communication of that same information through visual information.

Though the studies were conducted within the snack food domain, our findings extend to product categories other than food. For instance, the number of pills pictured on the box of an over-the-counter medicine might influence consumers' estimations of the correct dosage. Future research should examine this, in particular focusing on how images might affect elderly people's perceptions of dosage size. Previous studies have found that older consumers have a difficulty using label information even when given instructions how to do so (Cole & Balasubramanian, 1993) which would make them more likely to rely on the visual information presented on packages.

## Appendix A

### STUDY 1A: STIMULI WITH FOUR COOKIES VS. SEVEN COOKIES


### STUDY 1B: STIMULI WITH FOUR COOKIES VS. SEVEN COOKIES


### STUDY 1C: STIMULI WITH FIVE VS. TWENTY-FIVE ANIMAL CRACKERS

## Appendix B

### STUDY 2: STIMULI WITH ONE CRACKER VS. NINE CRACKERS


### STUDY 3A: STIMULI WITH FIVE PRETZELS VS. THIRTY PRETZELS


### STUDY 3B: STIMULI WITH THREE PRETZELS VS. FIFTEEN PRETZELS


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