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Changing the influence of portion size on consumer behavior via imagined consumption

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ABSTRACT

A portion of food is usually considered as the norm for consumption. Due to the portion size effect, people tend to eat more when they are served a larger, as opposed to a smaller, portion. Here, spontaneous simulations of the experience of eating a portion of food by consumers (i.e., simulated eating) helped to reduce this portion size effect. Those participants who reported more eating simulations selected a smaller percentage of food from the very large portion. However, the quantity of food selected from this very large portion was nevertheless still larger than from the medium portion. Thus, simulated eating reduced but did not eliminate entirely the portion size effect. However, when the participants were encouraged to deliberatively imagine the sensory experiences associated with eating a portion of food (imagined eating), initial portion size no longer influenced the amount of food selected. Potential implications of these results for the consumer, for the food industry, and for public health are discussed.

1. Introduction

Marketplace (individual) food portion sizes sold for immediate consumption have increased side-by-side with obesity in recent years. For example, the portion sizes available in supermarkets in the United States have increased 10-fold from 1970 to 2000 while the sizes of the glasses and bowls found in the home have increased by 36% since 1960 (Wansink & Van Ittersum, 2007). Crucially, portion size exerts a significant influence over energy intake. According to a recent meta-analysis of 211 studies, a doubling of portion size leads to an average 35% increase in the amount consumed (Zlatevska, Dubelaar, & Holden, 2014). Importantly, the portion size effect does not appear to be affected by hunger (Rolls, Morris, & Roe, 2002).

One explanation for the portion size effect is that the total content of a portion of food is perceived as the appropriate serving size (i.e., the appropriate amount to consume). Perhaps reflecting that, as children, people are often told by their parents to finish their plate, and are often rewarded for so doing (Birch, Engell, & Rolls, 2000; Birch, McPhee, Shoba, Steinberg, & Krehbiel, 1987; Versluis & Papies, 2016). Furthermore, given that people have trouble estimating the calorie content of a portion of food and hence their consequent energy intake (Rolls et al., 2002; Wansink & Chandon, 2006), they tend to use the portion of food served as a benchmark against which to regulate their own consumption (Geier, Rozin, & Doros, 2006; Wansink, Painter, & North, 2005). Thus, people tend to adjust their consumption behavior automatically as a function of the size of a food portion, which then leads them to eat more when presented with a larger portion than with a smaller portion (Rolls et al., 2002; Wansink et al., 2005).

According to Marchiori and Papies (2014, p. 41), facilitating mindful attention or "helping consumers to be aware of and rely on internal signals of hunger and satiety" might reduce the influence of the size of a food portion on consumption. In their study, the mindful intervention reduced the effects of hunger on unhealthy food consumption, but did not influence the portion size effect: That is, people continued to eat more from the larger food portion than from the smaller one. One explanation for the continued presence of the portion size effect was that the participants were only focusing on their internal hunger and satiety states, not on the eating experience that led up to these states (Petit, Basso, et al., 2016). Such multisensory experiences – including the smell, taste, and mouthfeel of the food while eating – play an important role in the regulation of consumption (de Graaf, 2012; Ramaekers et al., 2014; Weijzen, Smeets, & de Graaf, 2009). For example, the contact time of food in the mouth informs the brain of the likely inflow of nutrients, thus giving rise to satiety signals (de Graaf, 2012).

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This article explores whether the action of mentally simulating the experience of eating an entire portion (i.e., reenacting "perceptual, motor, and introspective states acquired during experience", Barsalou, 2008, p. 618) might reduce the portion size effect. This, in turn, might benefit both consumers and also public health. For instance, if messages to encourage people to imagine the experience of eating the portion of food were added on a food's package, they might limit overconsumption from large food portions. Such messages might also increase people's desire to consume food in a smaller portion size. The present research begins with a review of the relevant literature on portion size and mental simulation, followed by the outlining of the hypotheses. Next, those studies that have been conducted in order to test these hypotheses are presented. Finally, the specific contributions of the studies are addressed, and limits and directions for future research presented.

2. Theory and hypotheses

The fact that imagining the experience of eating an appetizing portion of food can both enhance the expected pleasure, and increase purchase intent while, at the same time, reducing food intake may appear paradoxical. For this reason, the links between mental simulation and portion size and their effect on food consumption are examined.

2.1. Food portion and sensory pleasure

When deciding on a particular portion size, a consumer's strategy is partly guided by the expected pleasure associated with the food, as well as by the need to ensure that the size of the portion is large enough to stave-off hunger (Brunstrom & Shakeshaft, 2009). One prediction, then, is that consumers should choose a larger portion of food when they are feeling hungry, and a smaller portion when they are not so hungry. However, consumers are often offered price discounts with larger portion sizes when they go shopping at the supermarket, or when eating at a restaurant, and this generally increases consumption (Chandon & Wansink, 2012; Vermeer, Alting, Steenhuis, & Seidell, 2010).

Logically, when presented with a large portion when not hungry, the consumer should just eat less of the larger portion. However, consumers automatically tend to eat more from larger portions than from smaller ones. Paradoxically, the lack of enjoyment during the consumption of the food, could perhaps help to explain the importance of the portion size effect. From a homeostatic point of view, people eat more when feeling hungry to compensate for the decline of energy resources (Redden & Haws, 2013). Oftentimes, people will stop eating once they have replenished these resources. Satiation is an indicator of this replenishment, which results in the decline in enjoyment of the food with greater consumption (de Graaf, 2012; Herman & Polivy, 1983; Redden & Haws, 2013).

For this reason, hunger should lead people to cease eating once they feel less enjoyment (Herman & Polivy, 1983). However, the size of the food portion suggests how much it is acceptable to eat (Wansink, 2004). The portion size effect seems to occur implicitly, since consumers eat more from a large portion even if they do not feel hungry (Kral, Roe, & Rolls, 2004; Rolls et al., 2002), or the food itself is stale (Wansink & Kim, 2005). Therefore, hunger and pleasure do not seem to play a primary role in the regulation of consumption when people eat their food in a portion format.

2.2. Mental simulation and sensory pleasure

According to the theory of grounded cognition, the initial perception of an object is stored in memory and when the consumer later experiences the object again, they mentally simulate the prior perceptual experiences associated with that object (Barsalou, 2008; Barsalou, Simmons, Barbey, & Wilson, 2003). Mental simulation can be conceptualized as a more automatic form of mental imagery initiated by the exposure to representations of objects (Elder & Krishna, 2012). When people see a picture of a food product on an advertisement, they will simulate behavioral scenarios of using or eating the food product. This simulation may, in turn, influence, for example, their purchase intentions (Elder & Krishna, 2012; Krishna & Schwarz, 2014).

In the context of eating behavior, seeing attractive food appears to trigger spontaneous reenactments of previous encounters. These reenactments include thinking about the sensory (e.g., taste, texture, and temperature), situational (e.g., time, place, event), and hedonic (i.e., pleasure, displeasure) features of the food, something that is called "eating simulations" (Papies, 2013). People can also deliberatively attempt to construct representations of eating experiences in working memory that are labeled as "eating imagery" (Barsalou, 2008; Elder & Krishna, 2012; Morewedge, Huh, & Vosgerau, 2010).

In general, mental simulation has a motivational function in that it can facilitate interactions with object, help prepare action, and, in the case of food consumption, may also increase food craving (Anderson, 1983; Gregory, Cialdini, & Carpenter, 1982; Jeannerod, 2001; Schlosser, 2003; Spence, Okajima, Cheok, Petit, & Michel, 2016). For instance, eating simulations can be evoked by hunger and the energy content of food. These variables produce increased activity in those brain areas that are involved in the processing of taste and reward (i.e., the bilateral posterior fusiform gyrus, the left lateral orbitofrontal cortex, and the left middle insula) when people see pictures of food (Van der Laan, De Ridder, Viergever, & Smeets, 2011). Thus, the extent of eating simulations might well be increased when consumers feel that food is appetizing, hence increasing food craving (Papies, 2013; Spence et al., 2016). Such a notion would be consistent with Elder and Krishna's (2012) finding that for those consumers who report more mental simulations of interactions with an appetizing food product, purchase intent increased. However, people do not necessarily increase their food intake as a consequence of the desire to acquire the food. Next, the positive effect of mental simulations on both the motivation to acquire the food and the regulation of consumption is discussed.

2.3. Portion size and mental simulation

Mental simulation can fuel sensory pleasure and may also give rise to satiation (Larson, Redden, & Elder, 2014). Satiation is not solely driven by an internal signal indicating that physiological limits have been reached. Rather, satiation also has a top-down cognitive component that is likely linked to sensory adaptation and habituation (Galak, Redden, & Kruger, 2009; Redden & Haws, 2013). Mental simulation is at least partially represented in the same brain systems as overt perceptual states. Thus, eating simulations can reactivate some of the same brain areas that are recruited during actual consumption, which in turn, can produce similar sensations (Barsalou, 2008; Chen, Papies, & Barsalou, 2016; Simmons, Martin, & Barsalou, 2005). Similar to consumption, then, the mental simulation of eating a large quantity of food may affect satiety and give rise to feelings of fullness (Larson et al., 2014; Toepel et al., 2015).

Larson et al. (2014) demonstrates that simply viewing 60 (vs. 20) pictures of food having a specific taste (e.g., a salty food) decreased people's enjoyment of similar tasting food during subsequent consumption. Larson and his colleagues provided evidence in support of the idea that the level of mental simulation of the taste of a pictured food mediates the effect of the picture on people's enjoyment of food. At the neural level, viewing a portion that is "too big" is associated with less activity in those brain areas (e.g., the inferior parietal lobule, superior temporal gyrus, and mid-posterior cingulate gyrus), that are associated with attention and reward valuation compared to the sight of the "ideal" portion (Toepel et al., 2015). Mental imagery can also be used to encourage the consumer to make a healthy food choice and reduce their consumption (Morewedge et al., 2010; Petit, Merunka, et al., 2016). For instance, asking a participant to imagine eating 30 M&Ms. (vs. just three) significantly reduced subsequent consumption of these candies in the lab setting (Morewedge et al., 2010).