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# Spread or stacked? Vertical versus horizontal food presentation, portion size perceptions, and consumption

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## ABSTRACT

This research investigates the unexplored consequences of food presentation on consumers' portion size perceptions and consumption. The findings show that consumers perceive portions as smaller and eat more when foods are presented vertically (i.e., stacked on the plate) versus horizontally (i.e., spread across the plate). The effect of presentation on portion size perceptions occurs because consumers use the surface area of the portion as a heuristic for overall portion size and, for equal volumes of food, portions presented vertically have a smaller surface area. Surface area is used as a heuristic for overall portion size presumably because (1) when looking down at a plate of food on a dining table, the surface area of the portion is more salient than the height and (2) through experience consumers learn that the surface area of the portion is often positively correlated with overall portion size. The results of this research underscore the importance of food presentation and identify viewing angle as a factor to consider when evaluating portion size.

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## 1. Introduction

Marketers invest a significant amount of time and money in perfecting the way food is presented (i.e., arranged) on plates (Deroy, Michel, Piqueras-Fiszman, & Spence, 2014; Spence, Piqueras-Fiszman, Michel, & Deroy, 2014). Some restaurants even use food presentation as a strategic tool. For instance, in an effort to increase sales, Red Lobster is moving away from horizontal food presentation (i.e., spreading food across the plate), which they have traditionally used and is instead emphasizing vertical food presentation (i.e., stacking food on the plate) (Choi, 2014; Quirk, 2014). Food presentation is important because the way that food is presented on a plate not only influences consumers' aesthetic evaluations of the dish, it can also influence their taste evaluations (Michel, Velasco, Gatti, & Spence, 2014), preferences (Zampollo, Kniffin, Wansink, & Shimizu, 2012) and even the price they are willing to pay for the dish (Michel et al., 2014). This research examines the previously unexplored consequences of food presentation on consumers' subjective portion size perceptions (i.e., the largeness/smallness and sufficiency/insufficiency of the portion) and overall consumption. This paper addresses the following research question: Holding the volume of food constant, would presenting food vertically (vs. horizontally)

influence how large/small or sufficient/insufficient a consumer perceives the portion to be or how much s/he eats?

This research focuses on vertical and horizontal presentation because these two types of food presentation are commonly used in restaurants. For instance, Red Robin and Quaker Steak and Lube serve onion rings stacked in a tower (i.e., vertically) and salads spread out on a plate (i.e., horizontally), whereas Season's 52 serves salads stacked in a clear cylinder (i.e., presented vertically), but other menu items spread across the plate (i.e., presented horizontally). Red Robin serves donuts stacked up (i.e., presented vertically), while Bonefish Grill serves them spread across a plate (i.e., presented horizontally). Finally, Denny's serves pancakes in a stack (i.e., presented vertically), while Perkin's Restaurant and Bakery serves them spread across the plate (i.e., presented horizontally). The menus at each of the top four casual dining restaurant chains in the United States (i.e., Olive Garden, Chili's, Red Lobster and Applebee's) (Restaurant News, 2016) contain both vertically and horizontally presented items.

For equal volumes of food, a critical difference between vertical and horizontal presentation is the relative size of the dimensions (i.e., length, width, height) of the portion. Specifically, if a portion of food was presented vertically the height (i.e., the dimension that is perpendicular to the plate) of the portion would be relatively greater than if the portion was presented horizontally, in which case the surface area (i.e., the dimensions that are parallel to the plate) would be greater. Thus, from a conceptual perspective, by investigating the effects of food presentation (horizontal vs. vertical), this research investigates

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how altering the dimensions of a portion of food (i.e., increasing the height when the food is presented vertically versus increasing the surface area when the food is presented horizontally) influences consumers' subjective portion size perceptions and overall consumption.

This research focuses on subjective portion size perceptions (i.e., whether a portion of food is large enough or sufficient enough for the consumer) rather than volume estimates (i.e., whether a consumer can guess the exact volume of the portion) because casual observation suggests that consumers think about portion sizes in subjective terms (i.e., small, medium, large) rather than in objective units (i.e., 12 oz). For instance, at restaurants consumers typically order based on what they perceive as sufficient to satisfy hunger (i.e., a medium order of onion rings) rather than the exact number of ounces (i.e., four oz of onion rings). Furthermore, consumption decisions are often driven by subjective portion size perceptions (i.e., "I've eaten a sufficient amount") rather than estimates of the number of units consumed (i.e., "I've eaten 16 oz") (Aydinglu & Krishna, 2011; Van Ittersum & Wansink, 2012). In fact, even when size information is available consumers pay little attention to it (Brown, 2013; Yang & Raghuram, 2005). It should be noted however, that subjective portion size perceptions are often consistent with volume estimates (Aydinglu & Krishna, 2011; Madzharov & Block, 2010). So, how would presenting food vertically (vs. horizontally) influence consumers' subjective portion size perceptions, henceforth just "portion size perceptions", and consumption decisions?

Prior studies related to plating have investigated how the color (Piqueras-Fiszman, Alcaide, Roura, & Spence, 2012; Van Ittersum & Wansink, 2012), size (Van Ittersum & Wansink, 2012), and shape of plates (Piqueras-Fiszman et al., 2012) influence consumers' judgments and decisions; however, little is known about how the presentation of food on a plate might influence consumers. The few studies that have examined the effects of food presentation have focused on how balance and color (Zellner, Lankford, Abrose, & Locher, 2010), as well as neat (vs. messy) presentation (Zellner et al., 2011) influence consumers' evaluations of the food. The effects of presenting food vertically (vs. horizontally) have not been examined. This research fills this gap in the literature.

By investigating the effects of food presentation this research also contributes to the literature on heuristics used to evaluate food/beverage size. Research in this stream shows that consumers rely on heuristics related to the elongation of a container (Krishna, 2006; Raghuram & Krishna, 1999), the size label (Aydinglu & Krishna, 2011), and the number of units on a package (Madzharov & Block, 2010) when evaluating size. This research contributes by identifying the surface area of the portion of food on a plate as another heuristic consumers use when evaluating portion size.

This research also adds to the literature on visual biases in size perception which shows that increasing (vs. decreasing) the height of a cup (Krishna, 2006; Raghuram & Krishna, 1999; Wansink & Van Ittersum, 2003) or package (Raghuram & Krishna, 1999 – Study 1) influences consumers' food and beverage volume estimates leading to an elongation bias (i.e., taller cups are perceived as containing a greater volume of liquid than shorter/wider cups) (Krishna, 2006; Raghuram & Krishna, 1999; Wansink & Van Ittersum, 2003). This research identifies a boundary condition to the elongation bias by showing that when evaluating portions of plated food (vs. packages or beverages in cups/glasses) at a 42° angle portion size perceptions are inversely related to the height of the portion. This research argues that the elongation bias doesn't hold for portions of plated food because the height of the portion (vs. the height of a package or a food/beverage in a glass) is not the easiest to encode or the most diagnostic dimension when consumers view food at a downward angle.

Finally, this research adds to the literature by highlighting the importance of viewing angle in driving portion size evaluations.

Specifically, the findings show that effects of food presentation on perceived portion size hold when individuals view food at a downward (~42°) angle as they normally do when seated at a table, but that the effects are attenuated when they view food straight on (at a ~0° angle) as they might when the food is at eye level in a display case.

In addition to these conceptual implications, this research also has important practical implications. First, marketers use plate presentation strategically (e.g., Red Lobster). Thus, it is important that they understand the consequences of presenting food vertically (vs. horizontally). Additionally, due to rising food costs and increasing obesity rates, marketers and health professionals are often looking for creative ways to reduce portion sizes (Segal, 2008). Given that changing the way food is presented on a plate might simply involve the chef spreading food out on plates instead of stacking foods, the findings of this research suggest that horizontal presentation might be one option for marketers to consider.

Next, is a discussion of the theoretical framework for the research hypotheses. Then, the hypotheses are tested in a series of four experimental studies. The manuscript concludes with a discussion of the implications and directions for future research.

## 2. Theoretical background

### 2.1. Heuristics for size

Consumers have limited cognitive resources and tend not to expend these valuable resources on routine judgments and decisions (Dickson & Sawyer, 1990) like evaluating the size of a portion of food (Aydinglu & Krishna, 2011). Instead, for these types of judgments and decisions consumers rely on heuristics (Payne, Bettman, & Johnson, 1988) that are easy to use and diagnostic (Aydinglu & Krishna, 2011). Heuristics are easy to use since they are employed to save time and preserve cognitive resources, and are also diagnostic or accurate (Hsee, 1996). A consumer learns whether or not a heuristic is diagnostic through experience observing the relationship between the heuristic and the focal judgment (Hsee, 1996).

In the context of evaluating the size of containers or packages, heuristics tend to be related to the length of one salient (i.e., easy to use or encode) dimension of the object that experience has shown is correlated with product size (i.e., is diagnostic). For instance, when evaluating the volume of cups, glasses or other cylindrical containers by looking at, or looking at and touching the container, the height is not only easy to encode but also tends to be highly correlated with the volume of the container which leads consumers to use height as a heuristic for volume (i.e., the elongation bias) (Raghuram & Krishna, 1999). Similarly, when comparing the size of different shaped products/packages consumers tend to use the length of the most salient dimension (e.g., the base of longest side of square packages and the diameter of circular packages) as a heuristic (Krider, Raghuram, & Krishna, 2001). When consumers evaluate the size of a portion of plated food what dimension(s) would be easy to encode (i.e., most salient) and diagnostic? That is, what dimension(s) will consumers use as a heuristic for portion size?

This research argues that in a typical dining context (i.e., when looking down at a plate of food on a table) the surface area of the portion (i.e., the area of the portion covering the plate) would be easier to encode and also more diagnostic than the height, leading surface area to be used as a heuristic for portion size. The surface area would be easier to encode than the height because when seated at a dining table consumers typically view a plate of food at 42° (i.e., downward) angle (Nelson, Atkinson, & Darbyshire, 1994). The surface area should also be more diagnostic than the height. To elaborate, diagnosticity relates to how good of a predictor an attribute is and increases as the consumer becomes more experienced with observing the relationship between the attribute and the judgment of

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