



The pack size effect: Influence on consumer perceptions of portion sizes



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ABSTRACT

Larger portions as well as larger packs can lead to larger prospective consumption estimates, larger servings and increased consumption, described as 'portion-size effects' and 'pack size effects'. Although related, the effects of pack sizes on portion estimates have received less attention. While it is not possible to generalize consumer behaviour across cultures, external cues taken from pack size may affect us all. We thus examined whether pack sizes influence portion size estimates across cultures, leading to a general 'pack size effect'. We compared portion size estimates based on digital presentations of different product pack sizes of solid and liquid products. The study with 13,177 participants across six European countries consisted of three parts. Parts 1 and 2 asked participants to indicate the number of portions present in a combined photographic and text-based description of different pack sizes. The estimated portion size was calculated as the quotient of the content weight or volume of the food presented and the number of stated portions. In Part 3, participants stated the number of food items that make up a portion when presented with packs of food containing either a small or a large number of items. The estimated portion size was calculated as the item weight times the item number. For all three parts and across all countries, we found that participants' portion estimates were based on larger portions for larger packs compared to smaller packs (Part 1 and 2) as well as more items to make up a portion (Part 3); hence, portions were stated to be larger in all cases. Considering that the larger estimated portions are likely to be consumed, there are implications for energy intake and weight status.

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1. Introduction

Recent evidence suggests that when people are faced with large portions they tend to give larger prospective consumption estimates (Kral, Roe, & Rolls, 2004; Wansink, 1996), serve themselves more food and ultimately consume more (Chandon & Wansink, 2011; Diliberti, Bordi, Conklin, Roe, & Rolls, 2004; Kral et al., 2004; Raynor & Wing, 2007; Rolls, Roe, Meengs, & Wall, 2004; Rolls, Roe, & Meengs, 2006; Rolls, Roe, & Meengs, 2007; Van Kleef, Shimizu, & Wansink, 2013). This so-called 'portion size

effect' (e.g. Jeffery et al., 2007) was found to be independent of several factors, such as food's palatability (Wansink & Kim, 2005), serving method (self-served or pre-served) (Rolls, Morris, & Roe, 2002), eating location (Wansink, 2004), or food type (Ello-Martin, Ledikwe, & Rolls, 2005). Notably, it has been shown that people do not compensate for such excess energy intake in subsequent meals (Diliberti et al., 2004; Kral et al., 2004; Kral, 2006) which may in part explain the co-occurrence of increase in obesity and sizes of portions over the past 30 years (Ello-Martin et al., 2005).

Although the 'portion size effect' seems unaffected by so many factors, not all is lost: some stimuli have been found to act as modifying cues (Brogden & Almiron-Roig, 2010; Geier, Wansink, & Rozin, 2012). Notably, external cues on the pack (Versluuis, Papies, & Marchiori, 2015) or the serving plate (Van Ittersum & Wansink, 2013) were also found to influence perceptions of portion sizes,

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with the potential to adjust consumption (but see also Libotte, Siegrist, & Bucher, 2014; Robinson et al., 2014). In order to better understand the 'portion size effect', we thus propose to look more closely at how consumers' perception of portion sizes were influenced by pack sizes.

Portions sizes are defined as the quantity of food/drink that one can consume in one eating (Schwartz & Byrd-Bredbenner, 2006) whereas pack sizes refer to the size of the container the food. Similar to portion sizes, pack sizes are known to influence food consumption (e.g., Versluis et al., 2015; Wansink, 2004) as well as content volume estimates (Wansink & Chandon, 2014) with increasing pack sizes leading to increasing portion size estimates and intakes. Indeed, some individuals show a tendency to finish a whole pack (e.g., Versluis et al., 2015) and do not seem to be able to differentiate between packs and portions in their consumption. It is important to note, however, that for experimental purposes, pack sizes and portion sizes can be manipulated independently (e.g., Wansink, 1996). Some studies have used verbal descriptors of pack sizes also called 'size descriptors', e.g. terms like small, medium or large (e.g. Aydinoglu & Krishna, 2011; Just & Wansink, 2014) and in some cases the pack size has been provided as a weight or volume (e.g. Aydinoglu & Krishna, 2011). Relatively little work has been done exploring the links between the so-called 'portion size effect' and the 'pack size effect'. Indeed, portion and pack sizes in research are often used interchangeably and can be confounded (see Zlatevska, Dubelaar, & Holden, 2014). We thus argue that it is of relevance to distinguish between portion and pack size effects with the 'pack size effect' referring to the effect of increased consumption or increased portion size estimates with increasing container size in which the food or drink is presented (e.g. Zlatevska et al., 2014); which can also be a plate or cup serving (Wansink, 1996; Rolls, Roe, Kral, Meengs, & Wall, 2004).

In order to better understand modifying factors of the 'portion size effect', we propose to measure portion size estimates indirectly, by looking more closely at how portions sizes are visually affected by pack sizes. When participants are asked to state the number of portions to be contained in a pack, they provide indirect information on their representation of portion sizes. In other words, the fewer portions stated for a presented pack size, the larger the portions. Portion sizes are not defined a priori but rather by what the individuals perceive portions to be. We argue that there is no fixed portion size, as individuals have been found to be affected differently by pack sizes dependent on their personal portion size preferences (e.g., Versluis et al., 2015). This is important, as we argue that, in particular when comparing across different individuals and cultures, there is no such thing as an absolute portion size other than the individual estimates to the actual presented packs. In fact, demographic as well as individual differences do not allow generalized consumer predictions (Ozen, Pons, & Tur, 2012).

Notably, individuals across several cultures are exposed to increases in pack sizes (for increase in plates sizes in American culture since 1900, see Van Ittersum & Wansink, 2013). Rozin, Kabnick, Pete, Fischler, and Shields (2003) also found evidence for larger pack and portion sizes in the US compared to France. When comparing sweet drinks marketed in Australia, Canada, the Netherlands and New Zealand, Poelman et al. (2015) found substantial within and between country variation with respect to package and recommended serving sizes. Dietary patterns vary across Europe, with significant variations found in categories like beverages (Naska et al., 2006; Nissensohn, Castro-Quezada, & Serra-Majem, 2013) and processed foods (Fernández-Alvira et al., 2014). With the potential of changing pack sizes in parts of Europe, it is important to verify how portion estimates are influenced by different pack sizes across a diverse group of consumers

and to identify the factors that potentially moderate pack size effects. Indeed, the role of cultural differences based on pack sizes is yet an element that remains to be determined as very few studies have looked at the role of cultural differences in estimating portions.

A modifying factor frequently reported is gender. Previous evidence suggests that women base their estimates on more appropriate portion sizes than men (Almiron-Roig, Solis-Trapala, Dodd, & Jebb, 2013; Yuhas, Bolland, & Bolland, 1989) and that the portion size effect is attenuated for women (Rolls et al., 2006; Rolls et al., 2004, Rolls et al. 2004). In line with this, Burger, Kern, and Coleman (2007), who evaluate the extent of deviations from pre-defined standard portions, found that male participants over-estimated portions more than females, specifically for solid foods with high energy density.

Other factors that have received similar attention in research on portion size estimates are age (Diliberti et al., 2004; Fisher, Liu, Birch, & Rolls, 2007; Fisher, Rolls, & Birch, 2003; Flood, Roe & Rolls, 2006; Jeffery et al., 2007; Kral et al., 2004; Levitsky & Youn, 2004) and Body Mass Index (BMI) (Albar, Alwan, Evans, & Cade, 2014; Burger et al., 2007; Fisher et al., 2007; Wansink, Payne, & Chandon, 2007). However, as demonstrated in the meta-analytic review undertaken by Zlatevska et al. (2014), results for gender, age and BMI on portion size estimates are inconsistent and call for further research.

Factors that have received less attention in research but nevertheless appear to play a role in portion size estimation are relevance of portion information (Ayala, 2006), and an interest in health and knowledge of nutrition (Soederberg Miller & Cassady, 2015; Spronk, Kullen, Burdon, & O'Connor, 2014). All of these factors are potentially interrelated. For example, research has shown that European consumers can differ in their healthfulness ratings of foods (Raats, Hieke, Jola, Kennedy, & Wills, 2014) and consequently in the healthfulness of their food choices (Aschemann-Witzel et al., 2013).

Portion information search behaviour is a further factor that potentially affects portion estimates significantly across cultures. It is thus assumed that different cultural backgrounds, due to their impact on the role of food, may influence how consumers estimate portion sizes but no clear body of evidence exists to date to answer this question.

To summarize, despite the consistency of the portion size effect, some factors were found to influence consumers' estimations of portion sizes, in particular external cues (i.e., context and situational cues) such as pack size and cultural background as well as individual characteristics such as gender or age. In the present study, applying a pan-European sample, we set out to examine how pack size and number of units of different food and drink products influence portion size estimates across different cultures. Portion size estimates were measured in response to a combined photographic and text-based description of different pack sizes. The main hypothesis was thus that the size of a presented pack has a general effect on people's internal representation of portion sizes, affecting their estimate on number of portions contained in a pack. We assumed that the direction of the effect will be that for foods and drinks presented in larger packs would lead to relatively smaller number of stated portions based on representations of larger portion sizes contained in the pack.

Throughout the study, a large pack is defined as a pack that contains more food and has greater dimensions, compared to the small and medium packs of the same food. In addition to the main 'pack size effect', we further expected that gender would have a significant modifying effect on portion estimates (Almiron-Roig et al., 2013; Burger et al., 2007; Rolls et al., 2006; Rolls et al., 2004; Versluis et al., 2015; Yuhas et al., 1989). More specifically, we expected the effect of pack size to affect men more than women,

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