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Does the weight of the dish influence our perception of food?

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ABSTRACT

In many categories, weight has been found to influence how users perceive and appraise products. However, to date, the influence of the weight of the dish in which food is served on people's perception has not been studied empirically. This exploratory study was therefore designed to investigate whether the weight of the container would exert a significant influence on people's sensory and hedonic responses to the food consumed from it. Three bowls, identical except for the fact that they were different weights, were filled with exactly the same yoghurt. Consumers evaluated the yoghurt samples from the three bowls holding them with one hand, one at a time. Participants rated flavor intensity, density, price expectation, and liking using 9-point likert scales. Significant effects were found for all attributes except for flavor intensity. The effects on both density and price expectation ratings were highly significant.

These findings are potentially relevant for designers and those working in restaurants, the hospitality sector, and food production, since the design and choice of dishes (or packages) of various weights could potentially be used to help enhance and/or modify the way in which consumers perceive and experience the food consumed from them.

1. Introduction

Design can be defined as a multidisciplinary process that requires the ability to materialize predefined intentions and expectations into new design solutions. Ideally, good design should improve the user's experience (Buchanan, 1989). From its many dimensions, designers can manipulate different variables, such as a product's sensory properties, in order to, for example, alter user behavior and/or enhance product functionality.

From a multisensory perspective, many researchers have delved into how certain dimensions of experience are shared across the senses, or, in other words, the associations that most people make between diverse sensory attributes perceived via different modalities. These connections are commonly referred to as crossmodal correspondences (Schifferstein & Spence, 2008; Spence, 2011). The latest research findings demonstrate that crossmodal (or multisensory) interactions play a crucial role in our product perception and experience, and hence should be taken into account when designing products and their packages.

An extensive literature can now be found demonstrating the influence of one sensory design variable on how a product is perceived via another sense. To mention just a few recent examples: Becker, Van Rompay, Schifferstein, and Galetzka (2011) explored how the color intensity and shape of a package influenced participants' ratings of the flavor intensity of yoghurts (at least for those participants who reported being sensitive to design); Zampini and Spence (2004) found that providing louder feedback, and/or boosting just the high-frequency component of the sounds associated with consumers biting into crisps (or potato chips), resulted in their rating them as tasting significantly crispier. Spence, Shankar, and Blumenthal (2011) have also shown a smaller, but nevertheless still significant effect resulting from varying the noise made by the rattling of noisy crisp packets. Elsewhere Demattè, Sanabria, Sugarman, and Spence (2006) have demonstrated that people rate fabric swatches as feeling softer when presented with a lemony or lavender odor than with an animal-like odor instead (see also Churchill, Meyners, Griffiths, & Bailey, 2009). Taken together, results such as these therefore clearly highlight the need for designers to consider the message that they wish to transmit, and to seek to find a congruent combination of sensory variables that is well interpreted and accepted by consumers.

In the food industry, crossmodal correspondences between the container and its contents are gaining ever-more relevance. For example, it has been shown that the packaging or container attributes (e.g., the sounds it makes, its smell, feel, shape, and/or color) will affect subsequent taste experiences and product appraisals, but not only due to physical interactions, but also as a result of crossmodal associations and/or perceptual illusions (see Cheskin, 1957; Gal, Wheeler, & Shiv, 2007; Hine, 1995; Schifferstein,

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2009; Schifferstein & Spence, 2008; Spence & Gallace, 2011). Apart from packaging, containers such as cups and bottles have also been shown to modulate people's perception of the contents (e.g., Krishna & Morrin, 2007; Schifferstein, 2009). The size of the container has also been demonstrated to influence the amount of food that people consume (Wansink, van Ittersum, & Painter, 2006). However, the majority of studies published to date have focused primarily on the capacity or tactile properties of materials, such as their texture, rigidity, and temperature (e.g., Zampini, Mawhinney, & Spence, 2006). Meanwhile, other potentially equally important factors in product experience, such as product weight, have seemingly been ignored.

The weight of the object can transmit different meanings, and, according to Lindstrom (2005), in many product categories, there is a clear association between heaviness, quality, and expense, as, for example, in the case of perfume and wine bottles (Goldstein & Herschkowitsch, 2010, p. 80). In social behavioral research, Ackerman, Nocera, and Bargh (2010) have recently demonstrated that holding heavy or light clipboards non-consciously influenced participants' impression of job candidates they were evaluating. In their study, participants holding a heavy clipboard rated candidates' resumes as being better overall. In addition, there was also some suggestion that the weight of the clipboard affected participants' impressions of the candidates' traits related to a "heavy" metaphor. However, to date, there has been very little empirical research directly addressing the question of how a consumer's perception of the weight might affect their perception of food.

Thus, inspired by Ackerman et al. (2010) intriguing recent results, the aim of the present study was to investigate whether the weight of a food container, specifically a bowl being held in a participant's hand, would also influence their perception of the flavor and density, its expected price, and the acceptance of the food contained within.

2. Material and methods

The participants had to evaluate a sample of yoghurt, consumed while holding one of three bowls: a light bowl (L), a bowl with an intermediate weight (M), and a heavy bowl (H). The participants were not informed that the contents of the bowls were identical in all three cases. The procedure followed a within-subjects experimental design. Each of the three conditions was coded with a random number for identification and presentation purposes.

2.1. Stimuli

The bowls used for the experiments were made of white ceramic (15.5 cm in diameter, 375 g) for the L condition. To avoid other sources of bias, the same bowl was used for the other conditions, but with a hidden weight attached (covering the entire base of the bowl). The bowl was 300 g heavier in the M condition, and 600 g heavier in the H condition. Pilot testing revealed that these weight differences were clearly perceptible to participants.

A hundred and fifty grams of natural Greek style yoghurt (Tesco, UK) were served in each bowl such that the three bowls appeared visually identical.

2.2. Participants

Fifty volunteers participated in the experiment. Participants were randomly recruited at the Department of Experimental Psychology (University of Oxford) and other public places, based on their interest in taking part in the study. At the recruitment stage, no information about the specific aim of the study was provided. All of the participants confirmed that they had no clinical history of major disease and that their senses of smell and taste were not impaired. The age of participants ranged between 20 and 69 years (M = 32.9 years, SD = 10.8), and 27 were female. Their Body Mass Index was not collected. The procedures were explained to all participants in detail and informed consent was obtained prior to participation.

2.3. Procedure

The instructions were given to participants at the start of the experiment. The experimenter placed one bowl at a time on a table situated in front of the participant, together with a metallic spoon. The three bowls were presented in random order in monadical sequence. That is, the previous bowl was taken away before the next bowl was presented. In each condition, the participants were instructed to hold the bowl with one hand and the spoon with the other (the one they usually used for writing). In addition, the participants were also instructed to hold each bowl in the same way during the course of the experiment. They could taste as much as one spoonful of yoghurt during each evaluation. The same type of stainless steel spoon was used for all participants. Filtered natural water and water crackers were available for rinsing between tastings.

For each condition, the participants were instructed to fill in four scales using a paper-and-pencil questionnaire after tasting a spoonful of the yoghurt. The questionnaire included written instructions as well, phrased: "Please pick up the bowl with one hand and try a spoonful. Rate the yoghurt according to your own perception". Each scale had the attribute word to be rated situated on top. A 9-point likert scale anchored with "not at all expensive" and "very expensive" were used to rate the yoghurt samples on expected price; for the perceived flavor intensity scale, the anchors were "not at all intense" and "very intense". In order to rate perceived density, the scale was anchored with "very light" and "very heavy". To rate acceptability, the consumers had to score their overall liking using a 9-point hedonic scale, anchored with "extremely dislike" and "extremely like". Evaluations were performed under artificial daylight type illumination, temperature control (22–24° C) and air circulation. After the complete evaluation and data collection from all the participants, they were debriefed as to the purpose of the study.

2.4. Data analysis

In order to determine whether the weight of the bowls exerted any significant influence over the perceived flavor intensity, density, price expectation, or overall liking scores, a non-parametric Friedman's test was conducted on the data considering the weight of the bowl as source of variation. Differences were considered significant when $p < .05$. Effect sizes (Cramér's Phi, φ_c) were also calculated. These are expressed as the proportion of variance in the dependent variable (i.e., ratings of the attributes) explained by an independent variable (i.e., the three weight levels). When the effects were significant, post-hoc comparisons were carried out using Wilcoxon Signed-Rank Tests with a Bonferroni correction. Statistical analyses were performed using SPSS v.19.0 (IBM SPSS, Chicago, IL, USA).

3. Results

The results of the Friedman's test revealed significant main effects of the weight of the bowls on perceived density ($\chi^2(2) = 21.8$, $p < .001$), expected price ($\chi^2(2) = 24.8$, $p < .001$), and liking ($\chi^2(2) = 11.2$, $p = .004$) of the yoghurt samples, all of which increased as the weight of the bowl increased (see Fig. 1). The