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Investigating the influence of colour, weight, and fragrance intensity on the perception of liquid bath soap: An experimental study

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ABSTRACT

We report a preliminary experiment designed to investigate people's product expectations (for a liquid soap) as a function of its fragrance and packaging. To this end, a series of soap bottles was produced that were identical in shape but had different intensities of colouring (white, pink, or red). The weight of the bottles also varied (either light −350 g, or heavy −450 g). Two different concentrations of perfume were added to the liquid soap contained in the bottles (either low or high). The participants evaluated the perceived intensity of the fragrance contained in each bottle, the perceived weight of each bottle, and the expected efficacy of the soap itself (that is, the soap's expected "cleaning ability"). The results revealed a significant main effect of the colour of the packaging on the perceived intensity of the soap's fragrance. Significant effects of the perceived weight of the container on both the perceived intensity of the fragrance and on the expected efficacy of the soap were also documented. These results are discussed in terms of the design of multisensory packaging and containers for liquid body soap and, more generally, for body care and beauty products.

1. Introduction

Over the last decade or so, research interest in trying to understanding the factors determining how consumers perceive everyday products has grown in several fields, including in the areas of marketing and product design (Schifferstein & Hekkert, 2007). Researchers and marketers have extensively studied those factors that drive the consumers' perception of products, and how a product's sensorial and semantic attributes can alter a user's perception of the product itself. Typically, these studies have involved the use of psychophysical and/or psychological testing methods, investigating both the perception of the products as a function of the stimulation delivered to one or more of the user's senses (see Schifferstein & Spence, 2007, for a review), and the effect of the packaging on the perception of the product itself (Malnar, 2004; Pickton & Broderick, 2005, Chapter 29, pp. 599–612; Piqueras-Fiszman, Velasco, Salgado-Montejo, & Spence, 2013; see Spence & Piqueras-Fiszman, 2012, for a review). For example, Piqueras-Fiszman and Spence (2012a) recently investigated the influence that the weight of food containers, cutlery, and packaging has on feelings of satiety (before and after tasting the food, in their case, a yogurt), and/or on the perception of density of the food itself. These researchers reported that increasing the weight (of the packaging/plateware/cutlery) influenced the perceived density of the product contained within. These researchers also confirmed the weight-density illusion originally proposed by Piqueras-Fiszman, Harrar, Alcaide, and Spence (2011). The participants in this study also expected the contents of a heavier container to be more satiating than when exactly the same contents were presented in a visually-identical, but physically lighter, container.

A number of other studies have focused on investigating the visual features of products and their containers. The appearance of the product and the colour of its packaging also exert a significant influence on consumer perception, behaviour, and preferences (e.g., Marshall, Stuart, & Bell 2006; Spence & Piqueras-Fiszman, 2012). So, for example, Piqueras-Fiszman, Velasco, and Spence (2012) recently demonstrated that the taste of the food (crisps or potato chips) seems to depend, at least to a certain extent, on the colour of the packaging. Meanwhile, Ares and Deliza (2010) conducted a study to investigate the influence of the container on people's perception of food, using word association and conjoint analysis techniques. These researchers evaluated how the sensory characteristics of the packaging (in their study, they varied both the colour and size of the packaging) altered their participants' willingness to purchase the product (a milk dessert) and their liking for it. Meanwhile, Parise and Spence (2012) have measured people's performance in a modified version of the Implicit Association Test (see Greenwald, McGhee, & Schwartz, 1998) in order to assess the semantic attributes associated with the shape of

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different bottles of mouthwash. Their results revealed that the shape of the bottle in which the mouthwash was contained suggested certain specific characteristics and attributes to the consumer, expressed in terms of adjectives such as "gentle" or "powerful".

The majority of the studies on the product perception that have been cited so far can be considered in terms of the notion of crossmodal correspondences. Crossmodal correspondences' refer to a series of dimensions of experience that are shared across sensory modalities (see Spence, 2011, 2012, for reviews). Crossmodal correspondences have often been studied by means of relatively simple mappings (or correspondences) between stimuli presented in the visual and auditory modalities (e.g., Marks, 1975, 2004), vision and olfaction (Demattè, Sanabria, & Spence, 2006a; Gilbert, Martin, & Kemp, 1996; Maric & Jacquot, 2013; Schifferstein & Tanudjaja, 2004), touch and olfaction (Demattè et al., 2007; Demattè, Sanabria, Sugarman, & Spence, 2006b), etc.

However, the potential impact of crossmodal correspondences in the field of design is clear in terms of interpreting and satisfying the customer's preferences (and expectations) for a given product. The idea here is that people will, generally-speaking, prefer a product when different sensory attributes of the product suggest the same concept to the consumers' mind (see Spence, 2012; though see also Piqueras-Fiszman & Spence, 2012c; Schifferstein & Spence, 2007, for limited exceptions). Furthermore, designers could potentially use input from different sensory modalities in order to enhance and diversify the customer's experience while using a product (Schifferstein & Spence, 2007).

1.1. On the crossmodal perception of fragrance and its application to bathing/cleaning products

Among those studies that have investigated crossmodal associations in the design and packaging of products, the ones that have involved the sense of smell (of olfaction) occupy a prominent role, given the aim of the present study. The nature of crossmodal correspondence between olfaction and the other senses has recently been reviewed by Stevenson, Rich, and Russell (2012). These researchers evaluated the crossmodal correspondence to both sensorial and semantic aspects of 20 different odours, concluding that both semantic and perceptual mechanisms underpin cross-modal matches involving odours. They also suggested an important role of the hedonic characteristics of the odour, as a further dimension of stimuli that is capable of underpinning the crossmodal correspondences documented behaviourally to date. One of the most frequently reported crossmodal correspondences involves the matching of olfactory to visual stimuli (specifically the colour, or hue, of visual stimuli). Additionally, it is well known that changing the colour can influence the perceived odour of a substance. Robust interactions between olfaction and colour have, for example, been reported by Zellner and Kautz (1990). They observed an interaction between odour intensity and the colour of a series of solutions that participants were evaluating. Specifically, coloured solutions were rated as smelling stronger than uncoloured solutions. However, Zellner and Kautz failed to observe any specific relation (or crossmodal congruency) between the hue of a colour and its effect on the perceived intensity of the odour. Interestingly, though, Arao, Suzuki, Katayama, and Yagi (2012) recently demonstrated that a congruent colour can help people to pick out a fragrance in an odour mixture, at least in liquid solutions. Finally, it is noteworthy that crossmodal correspondences between odour and colour appear to be fairly stable over prolonged periods of time: So, for instance, Gilbert et al. (1996) were able to demonstrate odour–colour mappings that were stable over the two years that separated successive testing sessions.

Crossmodal interactions between touch and olfaction have also been shown to constitute an important element in the product experiences of consumers (e.g., Churchill, Meyners, Griffiths, & Bailey, 2009; Demattè, Sanabria, Sugarman et al., 2006b; Laird, 1932). Significant crossmodal interactions between this pair of modalities have been reported by Demattè and her colleagues: They tested the perceived softness of a series of fabric swatches when scented with different fragrances. In their two experiments, they demonstrated the existence of an interaction between olfaction and touch. They also demonstrated that the perception of softness can be influenced by the pleasantness of the odour. Moreover, Krishna, Elder, and Caldara (2010) have shown that the semantic congruency between the olfactory and tactile properties of a product can enhance people's haptic perception of texture and temperature, not to mention their evaluation of the product itself (see also Churchill et al., 2009).

Despite the fact that all products provide some form of multisensory stimulation to the consumer, in the present study we focused specifically on soaps and body lotions where, as reported in the literature (e.g., Churchill et al., 2009), the role of olfaction in product evaluation is crucial. This kind of product offers users different kinds of sensory features (such as colour, weight, texture, and fragrance) through vision, touch/haptics, and olfaction. According to Schroiff (1991), a product's fragrance can affect people's product purchasing decision in a number of different ways: Confirming the product's likely performance, determining the customer's likely overall satisfaction when using the product, impacting on the brand, and ultimately affecting their purchase behaviour. Churchill et al. demonstrated that the fragrance exerted a significant effect on the perceived texture of the shampoo itself, and also on the perceived texture of a person's hair after washing. Finally, in older research, from Millward-Brown (2002) reported on a study of the evolution of soap packages and on the interaction between colour and smell. This report highlighted the importance of both fragrance and colour in driving the choice of consumers when it came to soap products. Interestingly, according to this report, colour assumes a greater importance when the fragrance is not available (e.g., when the consumer could not smell the fragrance through the product's packaging).

1.2. Aims of the present study

Given the results of previous research on the crossmodal correspondences that exist between olfaction and the other senses, and their applications to a variety of different real-world product categories, the present study was designed to provide some preliminary information concerning how people merge the inputs from different sensory modalities in order to perceive a multisensory product, in this case a liquid soap. In fact, our aim was to provide suggestions for the benefit of designers and marketers concerning some of the factors that should be taken into account when exploring novel multisensory solutions for packaging. We varied the concentration of the fragrance contained in the bottle, which itself varied in terms of its colour and weight. In fact, the "intensity" of the product's attributes was varied along three different sensory dimensions (i.e., olfaction, touch/haptics, and vision). Previous research has related the perceived intensity of a given fragrance to congruent, null, or incongruent colouring (e.g., Zellner & Kautz, 1990). Furthermore, other studies have related the perceived intensity of a fragrance to a variation in intensity suggested only by a variation in the colour brightness of the odorous solution (Zellner & Whitten, 1999). In the present study, we wanted to investigate the influence of the variation of the psychological construct of "*intensity*", suggested by different sensory modalities, such as different levels of a congruent colour applied to the packaging, different weights of the container, and by varying the intensity of the fragrance. In particular,