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What makes products fresh: The smell or the colour?

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ABSTRACT

Freshness is important for food products, beverages personal care products and cleaning products. In the present study we used an experimental approach to investigate sensory dominance in the product experience of freshness. We created products (soft drinks, dishwashing liquids, and scented candles) using fresh and non-fresh stimuli (colours and smells) in four different combinations and asked respondents to evaluate the freshness and pleasantness of each product. The results demonstrated that smell dominated the judgments of freshness for soft drinks and dishwashing liquids. However, for scented candles smell and colour were equally important in determining freshness. This suggests that the dominant sensory modality for the product experience of freshness depends on the characteristics of the particular product.

1. Introduction

When people interact with products, more than one sensory system is usually involved in this interaction. People can see the product, touch it, hear the sound it makes and often smell it. All the senses are involved simultaneously, but their contribution to the overall product experience is not necessarily equivalent. Since product experience is multisensory, it is interesting to know which sensory modality plays a leading role in a particular experience, so that designers can concentrate their efforts on the creation of the most relevant product properties.

1.1. Sensory dominance

Most designers believe that vision is the most important modality in product experience. For instance, Crilly and colleagues (2004) argue that "judgements of products are based largely on visual information" (p. 547). In addition, Bloch (1995) claims that "the visual appearance of products is a critical determinant of consumer response and product success" (p. 16). The importance of vision has been emphasized for such product properties as elegance (Coates, 2003), functionality (Monö, 1997), and social significance (Dittmar, 1992). Although visual information frequently dominates our culture and environment (Postrel, 2003; Schroeder, 2002), the full range of human senses influence responses to design (Macdonald, 2000). It is important that a product's appearance is congruent with other sensory aspects of design (Smets & Overbeeke, 1995), because the visible product form creates an expectation of what will be perceived by the other senses (Monö, 1997).

In cognitive psychology the topic of sensory dominance has been addressed experimentally. For example, in their classic study Rock and Victor (1964) presented participants with an object of which the visual shape, because of optical distortion, differed considerably from its actual shape perceived by touch. The conflict between visual and tactual size was resolved completely in favour of vision, and most participants were unaware of any conflict. Strong visual dominance over touch has been demonstrated in a variety of perceptual tasks, involving the determination of size (Miller, 1972), length (Teghtsoonian & Teghtsoonian, 1970), curvature (Easton & Moran, 1978), depth (Singer & Day, 1969), and spatial location (Hay, Pick, & Ikeda, 1965). Studies also demonstrated visual dominance over auditory signals, such as in the well known "ventriloquism effect" (Bertelson, 1999).

Empirical studies on product experience have shown that consumers also tend to consider vision as more important than other sensory modalities. For example, Schifferstein and Cleiren (2005) demonstrated that consumers acquired most of the information on products by vision and touch: this information was most detailed and the subjects were surest of their judgments. The experiment also showed that products were harder to identify by sound or smell than by vision or touch. Blocking vision increases task difficulty and task duration, up to the point where simple tasks can no longer be completed without help from others (Schifferstein & Desmet, 2007). A questionnaire study in which participants reported the importance of the sensory modalities for the usage of 45 different products (Schifferstein, 2006) demonstrated that on average the relative importance sequence of sensory modalities was vision, followed by touch, smell, audition and taste. In addition, when

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people were asked to rate how important they found the different modalities for their lives in general, most of them selected vision as the most important modality.

However, the importance ratings for the sensory modalities differed greatly between products. For about half of the 45 products, the importance of vision was lower than for one of the other modalities. For example, audition is the most important modality for a vacuum cleaner and a coffee maker, and for many other products with electric motors. Touch is most important for a computer mouse and a pen, and probably for many other hand tools as well. Smell plays a dominant role for a deodorant and (together with taste) for food products (Schifferstein, 2006). Evaluations are likely to reflect the importance of sensory modalities among the existing products in the described category. New product introductions can increase or decrease the relative importances. For instance, the introduction of cell phones that are carried all day long has probably made haptic properties more important for telephones.

Furthermore, it has been demonstrated that the dominant modality depends on the period of product usage. At the moment of buying vision is the most important modality, but at later stages the other modalities become more important (Fenko, Schifferstein, & Hekkert, 2008). Modality importance in product usage also depends on the product characteristic a person is judging. When respondents rated the importance of the various sensory modalities for the evaluation of three product aspects (safety, ease of use, and enjoyment), the impact of sensory information was highest for enjoyment, lower for ease of use, and lowest for safety (Schifferstein, 2006).

We suspect that the importance of various sensory modalities for the judgement of different product experiences (such as freshness, warmth, and pleasantness) can also vary. Therefore, in the present study we will focus on the roles of the senses for a specific experience (freshness) in a number of products.

1.2. Experiencing freshness

For many personal care products, cleaning products, beverages and food products it is important to evoke freshness. Freshness plays an important role in many everyday experiences, such as shaving, brushing teeth, taking a shower, and drinking soda. It is also possible to talk about "the fresh look" of a new fashion collection or "the fresh colour" of a product.

Freshness is a multisensory product experience that includes visual, olfactory, tactile, and, in some cases, also gustatory and auditory components. The Oxford English Dictionary (1989) gives 16 different meanings of "fresh", several of which can be applied to products. These meanings can be roughly divided into two groups: (1) new, recent, newly made, recently arrived, retaining its original qualities, not deteriorated or changed by lapse of time; (2) pure, invigorating, refreshing (said especially of air and water), not stale, musty, or vapid.

In this paper we will focus on the second definition of freshness. As the study was conducted in the Netherlands, these two meanings can be separated empirically, because in the case of food products different words are used to indicate these two meanings ("vers" for the first meaning and "fris" for the second meaning). For the other two product categories we used (dishwashing liquid and scented candles) only the second meaning is applicable. Therefore, our results on perceived "freshness" are equivalent to and can be directly compared to results obtained in other studies on the perception of "refreshing". Previously, Labbe, Gilbert, Antille, and Martin (2009, p. 100) have used similar arguments to relate the perception of "refreshing" in food products to Westerink and Kozlov's (2004) study on "freshness" in oral care. In studies on beverages, one of the characteristics of "refreshing" is the ability to quench thirst (see Labbe et al., submitted for publication). Following the line of reasoning set out by Zellner and Durlach (2003, p. 635), we consider "thirst-quenching" as an aspect of "refreshing" relevant to food and beverages.

According to several studies, the most important characteristics of refreshing foods or beverages are temperature-related tactile attributes (cool, cold). Zellner and Durlach (2002) found that "cold", "cool" and "icy" were the sensory characteristics that were most commonly expected by participants for refreshing food and beverages. In the area of oral care, coldness was also mentioned as a tactile characteristic related to oral freshness (Westerink & Kozlov, 2004).

The second important attribute of refreshing in food and beverage products is flavour. According to Zellner and Durlach (2002), orange and strawberry flavours were judged as the most refreshing for food and beverages. Labbe et al. (2009) demonstrated that mint odorants were scored as the most refreshing. The flavour most commonly listed as not refreshing is chocolate (Zellner & Durlach, 2002). The gustatory sensation most often associated with a refreshing experience is high acidity (Labbe et al., 2009). According to McEwan and Colwill (1996), a carbonated lemon drink was more thirst-quenching for consumers than orange juice and some other drinks (orange squash, cola, isotonic, sparkling water, diet cola and strawberry milk), mainly due to its high acidity.

Colour also affects the perceived freshness of beverages. Experimental data suggest that judgements on colour freshness depend on the associations with particular products. For example, Clydesdale, Gover, Philipsen, and Fugardi (1992) found that consumers expect clear and brown non-alcoholic beverages to satisfy their thirst more than other colours, because of their association with water and colas, respectively. Of the other colours, red and orange beverages were perceived as more thirst-quenching than green or purple ones. Zellner and Durlach (2002) found that the colour most frequently associated with refreshing foods/beverages was clear, followed by red. In contrast to Clydesdale et al. (1992), these authors found that the least likely colour for a refreshing food/beverage was black, followed by brown.

Studies also suggest that auditory cues can modulate the perception and evaluation of food freshness, despite the fact that consumers are often unaware of the influence of such auditory cues. For example, potato chips were perceived as being both crisper and fresher when the sound of biting was amplified, or when the high frequency sounds were selectively amplified (Zampini & Spence, 2004). However, the freshness of potato chips is probably quite different from the freshness of a soft drink. The former is probably closer to the first meaning given by the Oxford Dictionary (newly made, retaining its original qualities, not deteriorated). A similar meaning of freshness has been investigated in several food studies. For example, in a study on the freshness of apples (Peneau, Hoehn, Roth, Escher, & Nuessli, 2006) the perception of freshness was best described by taste, crispness and juiciness. In a study of fresh bread positive drivers of freshness were appearance ("porous"), odour ("floury", "malty", and "toasted") and flavour ("sweet", "buttery" and "oily") (Heenan, Dufour, Hamid, Harvey, & Delahunty, 2008).

1.3. Present study

In the present study we investigate what is more important for the experience of product freshness: the smell or the colour. According to the results of a questionnaire study in which respondents assessed the relative importance of different sensory modalities for various product experiences (Fenko, 2008), the dominant modality for the experience of freshness was olfaction (mean rating 3.4 out of 4), followed by taste (3.1) and vision (2.9). The difference between the ratings of olfaction and vision was significant (paired samples two-tailed T-test, $p < 0.05$). Because we included non-food products in our study, we will not discuss taste further.