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Seeing, smelling, feeling! Is there an influence of color on subjective affective responses to perfumed fabric softeners?

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ABSTRACT

Visual cues are likely to convey early sensory impressions and to generate strong expectations about product characteristics, which in turn could influence the final assessment of a product. The aim of this study was to investigate the influence of color on the verbal measurement of emotions in response to different perfumes in fabric softeners, the hypothesis being that color-perfume congruent pairs will induce enhanced positive emotional responses. In a first experiment, 102 participants were asked to report their feelings for nine perfumed fabric softeners, which were perfumed with one of three perfume variants and presented as one of three color variants. Verbal measurements of emotions were performed by using the ScentMove™ questionnaire. Results indicated that the subjective affective responses varied as a function of perfumes and were influenced by colors. A second experiment was conducted to verify whether the color-perfume congruency could be optimized. A group of 70 respondents participated in a color-matching exercise with the same three perfume variants and 10 possible colors, including the three original color variants. Results confirmed that other color-perfume associations could be more than or equally congruent to those presented in the first experiment. A third experiment was carried out to investigate whether increasing the color-perfume congruency would result in a significant increase of the subjective affective response. A group of 95 respondents were asked to report their feelings for nine perfumed fabric softeners, which were perfumed with the same three perfume variants and presented as one of three optimal color variants. The optimization of color-perfume pairing did not result in a significant increase of the subjective affective response. More generally, this study underlines the predominant role of perfume in the emotional response and a more limited influence of color.

1. Introduction

Visual cues convey early sensory impressions and may generate strong expectations, especially for olfactory perception, as we generally see products and foods before smelling and eating them (Cardello, 1994; Dalton, 2002; Demattè, Sanabria, & Spence, 2006). According to the assimilation-contrast theory (Anderson, 1973), visual information is either confirmed or disconfirmed through the smelling or eating experience of the actual stimulus (Deliza & MacFie, 1996). Expected and actual experiences are combined to produce the final evaluation of the stimulus. We decided to specifically investigate the influence of color information, one of numerous visual cues that can generate expectation, on olfactory perception.

Cross-modal color–odor interactions have been demonstrated by several authors (for a review, see Cardello, 2007; Spence, Levitan, Shankar, & Zampini, 2010). Engen (1972) showed that the presence of color increases false alarm rates for odor detection. Through a lexical analysis of tasting comments by wine experts, Morrot, Brochet, and Dubourdieu (2001) observed that white wines that were colored red were described as if they were red wines. Zellner and collaborators observed that flavor intensity is stronger in the presence of color than it is in equally concentrated colorless solutions (Zellner & Kautz, 1990; Zellner & Whitten, 1999). These authors and others also highlighted the existence of a color–odor appropriateness, or congruency, that could enhance the description and discrimination of odors (Davis, 1981; Shankar et al., 2010a; Shankar, Simons, Shiv, Levitan, & Spence, 2010b; Zampini, Sanabria, Phillips, & Spence, 2007; Zampini, Wantling, Phillips, & Spence, 2008; Zellner, Bartoli, & Eckard, 1991). The importance of color–odor appropriateness was also demonstrated in relation to identification tasks. For example, Stevenson and Oaten (2008) observed that participants made significantly more errors, were less accurate, and had a longer response latency when odors were presented with an inappropriate color (e.g., strawberry and cherry in green water) compared with an appropriate color

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(e.g., strawberry and cherry in red water). Blackwell (1995) reported that participants misidentified an orange-flavored solution as lime when it was colored green. In the same vein, Sakai, Imada, Saito, Kobayakawa, and Deguchi (2005) found that a cola-flavored solution was misidentified as orange or tea when it was colored orange.

Color–odor matching tasks demonstrated that some odors are associated with specific colors nonrandomly (Gilbert, Martin, & Kemp, 1996). This result was confirmed by Demattè et al. (2006) in both explicit and implicit tasks. This systematic correspondence probably results from repeated exposure to specific color-flavor parings through daily experience (Elliot & Maier, 2007). For example, a lemon odor is most commonly associated with the color yellow because lemons are yellow in most cultures; moreover, when we see a yellow-colored beverage, we expect a lemon flavor. Interestingly, Schifferstein and Tanudjaja (2004) found consistency in color–odor pairing for more complex fine fragrances, which could not be easily described nor easily associated with an object. Thus, color–odor pairings are probably not driven by identification per se, but are more likely linked to implicit semantic knowledge triggered by the odor or the color.

Another line of research has underlined the importance of color–odor appropriateness for more subjective evaluations. Zellner and collaborators (1991) showed that appropriate color–odor combinations are more pleasant, the appropriateness improving the successful identification and consequently increasing the positive hedonic value. Zellner and Durlach (2003) studied the influence of color on the expected and experienced refreshment, intensity, and liking of lemon, mint, and vanilla beverages. Lemon and mint solutions colored brown were less refreshing than when they were colored with another color. Liking ratings were affected in the same way and depended on the color, as observed for refreshment. Fenko, Schifferstein, Huang, and Hekkert (2009) studied the influence of color on the freshness for different types of products. Color was more important than odor for determining the freshness of soft drinks and dishwashing liquids and as important as odor for determining the freshness of scented candles.

More than its influence on liking and refreshment evaluation, color may influence reported feelings. Schifferstein and Tanudjaja (2004) investigated whether color–odor associations may be partly due to emotional associations using emotion scales adapted from the semantic differential measure of emotional state (Mehrabian & Russel, 1974), which is based on three emotional dimensions: pleasure, arousal and dominance. They found that only the pleasantness of the stimuli was linked with color–odor associations, but not the dominance or the arousal of the emotional dimensions. In our study, we wanted to further investigate whether color–odor associations influence the reported feelings by using another model for verbally measuring emotions. We used the ScentMove™ questionnaire (Porcherot et al., 2010), a simplified version of the Geneva Emotion and Odor Scale (GEOS; Chrea et al., 2009), originally developed to measure the subjective affective experience (i.e., feeling) elicited by everyday odors. Starting from a list of 480 terms (extracted from the literature on emotions and on olfaction, including the terms derived from the dimensional and the basic emotion models), Chrea et al. conducted three studies to select the most relevant terms for describing an emotional state that consumers experienced when smelling an odor in the past, or when smelling a presented odorant. The resulting model, GEOS, contains 36 representative emotional terms grouped into six categories with factorial analyses.

On the basis of the complete version of the GEOS questionnaire, we adapted the questionnaire to our commercial and development needs, and we reduced the number of terms to conduct quicker screening tests in sensory booths without losing the psychometric properties of the full set of scales. More precisely, we selected the three most representative terms for each of the six emotional categories by considering those terms with the highest loadings derived from the factorial analyses and those terms with the highest consensus as measured with Cronbach's alpha. The resulting ScentMove™ questionnaire consists of six scales, each illustrated by three terms related to "Sensuality/Desire" (Romantic, Desire, In love), "Relaxation" (Relaxed, Serene, Reassured), "Pleasant feeling/Well-being" (Happiness, Well-being, Pleasantly surprised), "Refreshment/Energy" (Energetic, Invigorated, Clean), "Sensory pleasure/Nostalgia" (Nostalgic, Mouthwatering, Amusement), and "Unpleasant feeling/Disgust" (Disgusted, Irritated, Unpleasantly surprised). We demonstrated that the ScentMove™ questionnaire yielded comparable results to the original GEOS questionnaire and provided reproducible, discriminating, and consensual data for different fragranced and flavored product categories. Results also indicated that this questionnaire was relevant to consumers for expressing their feelings, even if the three words do not have exactly the same meaning (Porcherot et al., 2010). One of the particularities of the ScentMove™ questionnaire is its capability of disentangling quantitative changes in affect (the same type of feelings but with different strengths) from qualitative changes (different feelings). Based on six emotional categories, it constitutes a powerful alternative to the more classical questionnaires (i.e., pleasure-arousal-dominance and basic emotions scales; Delplanque et al., 2012).

The aim of this study was to investigate the influence of color on the subjective affective experience, or feelings, for different perfumes of fabric softeners. The hypothesis was that color-perfume congruent pairs will induce higher liking and higher positive emotional responses. Three experiments were conducted. In the first experiment, nine fabric softeners were perfumed with three perfume variants and presented in combination with three color variants (blue, pink, and white). Respondents assessed their feelings by using the ScentMove™ questionnaire. The second experiment aimed at optimizing the color-perfume congruency by providing another color range; respondents participated in a color-matching exercise with the same three perfume variants and 10 possible colors, including the three original color variants. A third experiment was then conducted to further investigate the relation between color-perfume congruency and the subjective affective response. Nine perfumed fabric softeners, which were perfumed with one of the same three perfume variants and presented as one of three optimal color variants, were presented to respondents for the verbal assessment of emotions with the ScentMove™ questionnaire.

2. Experiment 1: Subjective affective response to colored and perfumed fabric softeners

This experiment investigated whether color influences liking and affective responses to perfumes of fabric softeners, as well as the role of the color-perfume congruency.

2.1. Method

2.1.1. Participants

One hundred two participants (25–50 years old, 81% female, French and Swiss nationalities) participated in one sensory booth session. They were recruited in different departments of the Firmenich, S.A., company at different locations around Geneva, Switzerland. All participants were able to smell the perfumes of the fabric softeners. They were not paid for their participation and completed a consent form.