The Central Role of Product Beauty in Consumers' Neuropsychological Response to the Design of Hedonic and Utilitarian Products

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Aesthetic experience and preference is not a unitary phenomenon, and is the result of affective and cognitive elements (Di Dio & Gallese, 2009). Affective response refers to the feelings and emotions experienced when interacting with or observing an object (Yeung & Wyer, 2004). Cognitive response includes the mental categorization of the product as well as product-related beliefs such as quality, durability, and ease of use (Bloch, 1995). While studies have examined how different properties of the object contribute to perceptions of product beauty, the influence of these perception in subsequent affective and cognitive responses of consumer has been left unexamined. This study embarks on a 'deep' understanding of consumers' aesthetic experiences through the use of neuroscientific tools, which allow for the triangulation of 'objective' findings from neuroimaging data captured through functional magnetic resonance imaging (fMRI) with 'self-reported' findings from psychometric data. In neuroscience, affect and cognition are represented by well-known sub-cortical and fronto-parietal cortical networks, respectively, and the emotional and cognitive states experienced by an individual can be characterized by the activity in the corresponding networks (Kandel et al., 2000). The purpose of the study is to examine consumers' affective and cognitive response to differing levels of design complexity in hedonic and utilitarian consumer products, while examining whether these effects are explained by perceptions of product beauty. The following hypotheses were explored:
H1: Design complexity and product category will have an interaction effect on consumers' affective and cognitive response: Affect and cognitions will be higher when hedonic products are complex and utilitarian products are simple in design, than when hedonic products are simple and utilitarian products are complex in design.
H2: The interaction effect of design complexity and product category on affective and cognitive responses will be mediated by perceptions of product beauty.

Three pretests were conducted to select stimuli for the two experiments. Pretest 1 identified highly hedonic (e.g., perfume, wall art, apparel) or utilitarian (e.g., toothbrush, can opener) product categories. These were manipulated into simple and complex product designs through the addition/subtraction of aesthetic units such as line and shape to a common base object and tested in Pretests 2 and 3. Experiment 1 (psychometric) employed a 2 (complexity: high, low) x 2 (category: hedonic, utilitarian) between-subjects design administered using Qualtrics (on the Internet). A total of 226 undergraduate students (87% female) participated in the study and evaluated two stimuli presented in random order accompanied by measures for perception of beauty, affect, cognition, and manipulation checks. Data was analyzed using analysis of variance and covariance, and regressions. Experiment 2 (neural) consisted of a 2 (complexity: high, low) x 2 (category: hedonic, utilitarian) within-subjects, event-related design with a behavioral task of indicating beautiful/not using an MR-compatible button box. Twenty

four subjects were scanned in a 3 Tesla Siemens Verio scanner while they performed the task viewing 64 product images, presented in pseudo-random order through E-Prime software.

MANOVA results (Experiment 1) revealed support for H1. Design complexity and product category had a significant interaction effect on consumers' affective ($F_{1,221}$ = 6.69, p = .01) and cognitive response ($F_{1,221}$ = 6.17, p = .01) such that: a) affect is higher when hedonic products are complex (M = 5.01) and utilitarian products are simple in design (M = 4.09), than when hedonic products are simple (M = 4.24) and utilitarian products are complex in design (M = 3.77); and b) cognition is higher when utilitarian products are simple (M = 5.28) and hedonic products are complex in design (M = 3.84), than when utilitarian products are complex (M = 4.31) and hedonic products are simple in design (M = 3.82). MANCOVA and regression analyses also revealed support for H2 by meeting the three conditions for mediation. 1) Design complexity and product category had a significant interaction effect on perceptions of product beauty ($F_{1,222}$ = 19.68, p < .001) such that perception of product beauty are higher when hedonic products are complex (M = 4.86) and utilitarian products are simple in design (M = 5.04), than when hedonic products are simple (M = 4.19) and utilitarian products are complex in design (M = 3.76). 2) Perceptions of product beauty had a significant positive influence on consumers' affective (β = .74, p < .001) and cognitive response (β = .53, p < .001). 3) When perception of product beauty was included as a covariate, the interaction effect of design complexity and product category on consumers' affective and cognitive response became non-significant (p >.05). Thus, perception of product beauty completely mediates the above interaction effects of product design complexity and category on consumers' affective and cognitive response.

Analysis of neural data from Experiment 2 further supports the proposed mechanism in H2. Stimuli with positive perceptual judgments (beautiful/not) were contrasted with stimuli with negative perceptual judgments. Amygdala, which is the involved in affect, were activated only during positive perceptual judgment supporting the link between judgments of beauty and the experience of affect. Frontal areas, which are the substrates of cognition, are active during both positive (Middle Frontal Gyrus) and negative (Inferior Frontal Gyrus) perceptual judgments. This invalidates the prediction that greater cognition will result from positive perceptual judgment. In retrospect, this seems logical because it requires some cognitive deliberation to decide that something is not beautiful. A more nuanced conclusion is that positive and negative perceptual judgments require different aspects of cognition as evidenced by different frontal areas they activate. The findings from this study create strategic insights for product design and marketing by finding that maximizing product beauty through design has the potential to maximize affective and cognitive responses of consumers to create holistic aesthetic experiences.

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