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'To preserve unity while almost allowing for chaos': Testing the aesthetic principle of unity-in-variety in product design

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ABSTRACT

Unity-in-variety is considered to be one of the oldest-known universal principles of beauty. However, little empirical research exists on how unity and variety together influence aesthetic appreciation. In three studies we investigated how unity and variety predict the aesthetic appreciation of a range of product designs, and further assessed whether perceived visual complexity and individual differences in regulatory focus influence this relationship. Our findings reveal that both unity and variety, while suppressing each other's effect, positively affect aesthetic appreciation. Hence, product designs that exhibit an optimum balance between unity and variety are aesthetically preferred. Furthermore, the research reveals that unity is the dominant factor in this relationship and facilitates the appreciation of variety. We discuss several theoretical and practical implications resulting from these studies.

1. Introduction

In many domains of human creativity, varying from art (Cupchik & Gebotys, 1988) and music (Fechner, 1876) to poetry (Lipps, 1903) and architecture (Nasar, 1987), unity-in-variety is considered an important factor in explaining aesthetic appreciation. In its broadest sense, the principle states that in order for humans to find pleasure in their interaction with objects, they need to sense a form of unity and coherence in the various parts and approaches towards it (Fechner, 1876).

We set out to study the principle of unity-in-variety in the domain of product designs. While other aesthetic principles (cf. e.g., Most Advanced Yet Acceptable; Hekkert, Snelders, & van Wieringen, 2003) that focus on the effects of typicality and novelty on aesthetic appreciation have been researched thoroughly in the past (Blijlevens, Carbon, Mugge, & Schoormans, 2012; Goode, Dahl, & Moreau, 2013; Hung & Chen, 2012), little empirical research exists on the joint effect of unity and variety on aesthetic pleasure for human artefacts.

In this paper we argue that unity and variety, while being partial opposites, simultaneously contribute to aesthetic appreciation of product designs. We conducted three studies to empirically assess whether there exists such a preferred balance between unity and variety, and further explore how perceived visual complexity and individual differences in motivational drives may influence this combined effect of unity and variety on aesthetic appreciation.

1.1. Unity-in-variety

The discussion of the relevance of unity and variety in explaining aesthetic appreciation can be traced back almost two millennia (Plotinus, 1969). The principle has since been examined within the context of different fields, most notably general psychology (Eysenck, 1942; Langfeld, 1920), philosophy (Berlyne, 1971; Fechner, 1876; Hutcheson, 1729), the arts (Cupchik, Spiegel, & Shereck, 1996), music (Tan, 2005) and information theory (Attneave, 1959). The divergence in terminology resulting from such diverse investigations requires us to clearly state the principle as we understand it. We define the principle of unity-in-variety as: the maximization of both unity and variety, in order to achieve a balance that offers the greatest aesthetic appreciation. The term *aesthetic appreciation* refers to pleasure attained from the sensory processing of a stimulus "for its own sake" (Dutton, 2009; Hekkert, 2014). Because the individual concepts of unity and variety can be differently applied across several domains, we briefly discuss both concepts in relation to visual perception and product design aesthetics.

Variety refers to the number and intensity of perceived differences between perceptual properties and elements (Berlyne, 1972). Properties such as colour, line, orientation, size and texture can be regarded as easily identifiable, basic aspects in the perception of products (Graves, 1951). In the case of the car (see Fig. 1), such basic properties together create our impression of an element like a car door handle.

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Fig. 1. BMW M5 (2012), Copyright by BMW AG.

The other elements of the car, like body panels, windows or wheels, also consist of a variety of these properties. Any differences between property combinations and combinations of elements serve to generate a perceived impression of variety within the car. Increasing the number of elements, or the number of combined property differences among elements, will lead to more variety (Fechner, 1876; Lauer & Pentak, 2012). A car whose door handle is different in colour from the door that it is connected to will be perceived as more varied than one whose handle is similar in colour to the door. Without enough variety in objects, they are perceived as monotonous, leading to boredom and loss of interest (Berlyne, 1971; Bexton, Heron, & Scott, 1954; Roehm & Roehm, 2010).

Humans actively avoid boredom by searching for variety. This search for variety is ingrained behaviour, as we have a natural tendency to explore and acquire new information (Berlyne, 1966). It is likely that the perception of variety has become pleasurable because it bears the prospect of learning (Berlyne, 1971; Biederman & Vessel, 2006; Hekkert, 2014). We therefore appreciate variety in simple figures (Berlyne, Ogilvie, & Parham, 1968; Berlyne, 1970; Eisenman, 1966), art (Cupchik & Gebotys, 1988, 1990), music (Tan, Spackman, & Peaslee, 2006), gardens (Lindemann-Matthies & Marty, 2013) and packaging (Kahn, 1995). However, too much variety will permit chaos to trouble our senses, resulting in confusion and lack of understanding. Therefore, variety will only be appreciated if our senses can somehow organize these elements into a comprehensive or unified whole.

Because the number of functional properties and features in products are generally high by default, there is hardly ever a need to increase the variety in designs. Instead, efforts are directed towards organizing components in a structured manner, thereby increasing the design's unity.

Unity is the perception of a whole, and of an order and coherence between properties and elements (Berlyne, 1971; Veryzer & Hutchinson, 1998). Because the world around us is inherently chaotic, our brain continuously seeks to organize and structure incoming sensory information. By grouping visual properties (e.g. lines and colours) into coherent elements, we build an organized mental image of our surroundings. Gestalt psychologists' attempts to discover how perception arises out of such grouping and self-organization of properties and elements led to the laws of perceptual grouping (Kellett, 1939; Köhler, 1929; Wagemans et al., 2012; Wertheimer, 1938). Examples of Gestalt laws such as proximity, similarity, and continuity experientially reveal how certain properties of elements can influence their perceptual grouping. The design field was eager to integrate these Gestalt laws as tools to enhance unity (Arnheim, 1954; Lauer & Pentak, 2012; Lidwell, Holden, & Butler, 2010). For example, the repetition of similar elements, e.g., using the same handle on the driver's door and the rear passenger door, groups those elements together, thereby supporting our perceptual organization of the whole car (Fig. 1). The car door handles in the figure also follow 'a line' that runs from headlight to taillight; this form of continuity can guide and facilitate our perception. By applying these grouping principles to the elements that make up a product like a car, its overall feeling of unity can be enhanced.

The ability to see unity in an inherently chaotic world helps humans comprehend their surroundings, and has been regarded as supporting apperception, fluent processing, and perceptual organization (Armstrong & Detweiler-Bedell, 2008; Brighouse, 1939; Otis, 1918; Palmer & Rock, 1994). Being able to group elements together and detect unifying properties generates a sense of pleasure. Ramachandran and Hirstein (1999) use the well-known 'Dalmatian dog' example (Fig. 2) to explain this: An image of a dog is initially seen as a random pattern of black and white spots. As soon as the viewer discovers that certain spots can be perceptually grouped together to form a Dalmatian, the result is a pleasurable 'aha' sensation. Naturally, the pleasure attained from the perception of unity also extends to other types of stimuli, such as product designs. Evidence for such a universal relationship comes from the domains of websites (Moshagen & Thielsch, 2010), product line drawings (Veryzer & Hutchinson, 1998), art (Cupchik & Gebotys, 1988), music (Tan et al., 2006), and a variety of visual patterns (Berlyne & Boudewijns, 1971; Leeuwenberg & Van der Helm, 1991; Nadal, Munar, Marty, & Cela-conde, 2010).

To summarize, both perceived unity and variety positively influence aesthetic appreciation. However, we can intuitively recognize that unity and variety are at least partial opposites. Returning to the car example (Fig. 1), the choice of blue for most body panels adds some variety to the design, as the colour is dissimilar to the colour of the rims. It is possible to increase unity by changing the body colour to silver, thereby mimicking the properties of the rims. Yet, this similarity in colour inevitably decreases the overall variety. Hence, unity and variety are interdependent and likely suppress each other's effect on aesthetic appreciation.

The interdependence of unity and variety is conceptualized in the principle of unity-in-variety. Empirical studies into the workings of the principle are, to our knowledge, scarce. Those studies explicitly investigating unity-in-variety were performed with the use of relatively simple polygonal figures or patterns (Berlyne, 1972; Berlyne & Boudewijns, 1971; Birkhoff, 1933; Boselie & Leeuwenberg, 1985; Eysenck, 1941). These stimuli are often lacking colour or depth and do not represent the visual complexity of real-life objects, preventing generalization of those findings to objects that humans encounter in their daily lives, such as product designs. More complex stimuli were used by Cupchik and Gebotys (1988). Artists rated forty paintings of different artistic quality on the items: simple–complex, warm–cold, idealized–

Fig. 2. Pleasure can be felt when the seemingly random spots are perceptually unified and a Dalmatian dog is discovered. [Original photograph attributed to Ronald C James (1965)].