

Putting product design in context: Consumer responses to design fluency as a function of presentation context

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Abstract: Existing research has well established that the fluency of mentally processing a design is an important determinant of consumers' aesthetic liking. Yet, to date, most studies have assessed consumers' reactions to design fluency in isolation, i.e., irrespective of the context in which the design is presented. In reality, however, consumers usually perceive a design in a context. Against this background, this research examines how a design's fluency and the visual context in which it is presented interact to affect aesthetic liking of bikes, chairs and lamps. To this end, we experimentally manipulate design typicality as an operationalization of design fluency and the usualness of an advertisement's background as an operationalization of presentation context. The pattern of results suggests that the effect of design fluency on aesthetic liking differs in unusual versus usual presentation contexts, which is in accordance with a dual process model of fluency-based aesthetic preferences.

Keywords: aesthetic liking, design fluency, product presentation, advertising

1. Introduction

In recent years, the study of when and why consumers are affected by aesthetic product design has become a fertile field of research (e.g., Hekkert, Snelders, & van Wieringen, 2003; Landwehr, Labroo, & Herrmann, 2011; Landwehr, Wentzel, & Herrmann, 2013; Veryzer & Hutchinson, 2013). One particularly important theoretical account to explain the principles determining aesthetic responses to product design is the fluency framework (Reber, Schwarz, & Winkielman, 2004). The framework's key tenet is that aesthetic liking is grounded in a perceiver's processing dynamics, i.e., in the fluency or ease with which a design can be processed. While existing research provides valuable insights on the determinants of fluency effects regarding the product design, e.g., design typicality and



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symmetry (Landwehr et al., 2013; Wurtz, Reber, & Zimmermann, 2008), it has largely ignored that the context in which a design is embedded may also have an impact on fluency-based aesthetic preferences. The present research therefore investigates how a design's presentation context interacts with design fluency in affecting aesthetic liking.

Considering the role of context is important in the light of a recent advancement of the fluency framework, called the *Pleasure-Interest Model of Aesthetic Liking*; i.e., the "PIA Model" (Graf & Landwehr, 2015). The PIA Model is a dual-process model of fluency-based aesthetics; it distinguishes between fluency-based aesthetic responses that are grounded in automatic, stimulus-driven processing and those that result from more controlled, perceiver-driven processing. Importantly, the model predicts different preference patterns for design fluency across the two types of processing. Because presentation contexts are likely to differ in the degree to which they address these two processing styles, fluency-based aesthetic preferences should be affected by the way a product is presented to consumers.

Overall, this research makes at least three contributions to the product design literature. First, to the best of our knowledge, this study is the first to analyse how the context in which a product is visually embedded interacts with design fluency in affecting aesthetic liking. The results of an empirical study in the domain of bikes, chairs, and lamps give indication for an interaction between design fluency and presentation context with respect to aesthetic appreciation. That is, design fluency has a positive effect on aesthetic liking both in an unusual and in a usual presentation context, but the shape of the slope differs between the presentation contexts: in an unusual context it is steeper at the lower end of the fluency spectrum, while in a usual context it is steeper at the higher end of the fluency spectrum. In addition, we show that in line with existing research (Landwehr et al., 2013), design typicality is a stimulus-inherent determinant of design fluency, and people prefer more typical designs because of the ease with which a typical design can be processed.

Second, this research contributes to a more realistic and thorough understanding of the determinants of aesthetic appreciation of product design, since consumers in real life hardly ever judge the aesthetics of a product in isolation, but always in a specific context (Blijlevens, Gemser, & Mugge, 2012; Bloch, 1995). That is, we show that the context in which consumers experience a product influences its aesthetic appreciation, over and above the fluency of the design itself. In this regard, we do not only provide support for the notion that fluency is a key construct in explaining aesthetic appreciation (Reber et al., 2004) but our results also endorse the recently introduced PIA Model (Graf & Landwehr, 2015), according to which a design's fluency interacts with a perceiver's processing style in affecting aesthetic liking.

Finally, our research has direct managerial relevance, as it suggests that a design's success depends not only on the design itself, but also on how the design is marketed to consumers. Put differently, managers should be well aware of the fact that the way a design is marketed affects its aesthetic appreciation. In the interest of a design's success, product designers and product managers should therefore work conjointly.

The remainder of the paper is structured as follows. In the theoretical section we shortly introduce the key tenets of the processing fluency framework. After, we will summarize the key idea of the PIA Model (Graf & Landwehr, 2015) to predict an interactive effect of design fluency and presentation context on aesthetic liking. In the empirical section we report the results of a pre-study where we attest the notion that design typicality is a determinant of a design's fluency, and that typical designs are liked more. After, we report an experimental study that tests our main hypothesis on the interaction between presentation context and design fluency. Lastly, we discuss our results and provide theoretical as well as practical implications of our research.

2. Conceptual Development

In 2004, Reber and colleagues introduced a theoretical account on aesthetic pleasure that has gained considerable attention in the scientific community. Their framework explains aesthetic pleasure based on a single underlying mechanism, i.e., processing fluency, which describes the subjective experience of ease or difficulty with which a person can process an object. The model's key propositions can be summarized as follows. First, objects vary in the fluency with which they can be processed as a function of stimulus characteristics such as symmetry (Wurtz et al., 2008), contrast and clarity (Reber, Winkielman, & Schwarz, 1998), or typicality (Landwehr et al., 2011, 2013; Winkielman, Halberstadt, Fazendeiro, & Catty, 2006). Second, processing fluency is inherently positive and experienced as gut-level positive affect (Winkielman & Cacioppo 2001). Finally, provided that the positive feeling is not attributed to a different source, a person will interpret it as representing his or her disposition toward the stimulus, leading the person to aesthetically like the object (Reber et al., 2004; Winkielman, Schwarz, Fazendeiro, & Reber, 2003).

While the traditional fluency account explains a wide array of empirical phenomena and has been supported both in the domain of psychological aesthetics (e.g., Albrecht & Carbon, 2014; Belke, Leder, Strobach, & Carbon, 2010) and in the field of product design (e.g., Landwehr et al., 2011, 2013), it is restricted to gut-level aesthetic responses that accrue from automatic, rather passive stimulus processing (Graf & Landwehr, 2015). Other streams of research, by contrast, argue that people may also interact actively with objects and conceptualize aesthetic liking as resulting from a person's active elaboration of the object (Armstrong & Detweiler-Bedell, 2008; Carbon & Leder, 2005). To integrate these two approaches, the PIA Model proposes a dual-process perspective on fluency-based aesthetic liking (Graf & Landwehr, 2015). The main idea of the model is to augment the automatic, gut-level response with a deliberate, controlled response level. Automatic processing follows the prediction made by the traditional fluency account and implies that the more fluently the design, the higher aesthetic appreciation. In contrast, during controlled processing people wish to experience cognitive stimulation; accordingly, they prefer designs for which they experience cognitive stimulation. Thus, because a design's initial fluency is assumed to be related to stimulation affordance such that the more fluent the design, the lower the

potential for cognitive stimulation, automatic and controlled processing predict different preference patterns for design fluency.

To explain when people will adopt which of the two processing styles, the PIA Model suggests that a person's overall motivation to process a stimulus in a controlled manner is a combination of a perceiver-intrinsic and stimulus-intrinsic motivational trigger. On the perceiver-level, the need to better understand the stimulus is assumed to trigger processing motivation. Put differently, the desire to learn more about a stimulus implies a high motivation to process controlled. Regarding the stimulus, lower levels of stimulus fluency are proposed to promote high processing motivation (Alter, Oppenheimer, Epley, & Eyre, 2007).

In this research, we argue that the context surrounding a design can serve as an implicit trigger of the perceiver-intrinsic motivation to engage in elaborated processing. More precisely, we propose that because an unusual presentation context will irritate the perceiver by attracting attention through its unusualness, a desire to better understand the stimulus will be provoked. Thus, an unusual, compared to a usual presentation context will trigger processing motivation, thus initiating controlled processing. Notably, our idea of stimulus decontextualization as a means to induce more elaborate processing is similar to the idea of a ready-made in art, where an everyday object is separated from its usual context and put into an unusual representation context to evoke a more elaborative processing style that goes beyond simple object recognition (Gerger, Leder, & Kremer, 2014).

Based on these arguments, we further hypothesize that because peoples' processing style and thus their preference for cognitive stimulation differs across presentation contexts, the positive effect of design fluency on liking will be differently pronounced for a usual compared to an unusual presentation context. To test this hypothesis, we consider three levels of design fluency that differ in their cognitive stimulation affordance—disfluent designs, fluent designs, and medium fluent designs. We suggest that the increase of aesthetic liking from a disfluent design to a medium fluent design will be more pronounced in an unusual context. This is because within this fluency range, a design cognitively stimulates the perceiver, and people cherish cognitive stimulation in a controlled processing mode but not on an automatic processing level. Second, we propose that the increase of liking for a fluent design relative to a medium fluent design will be less strong in an unusual presentation context. More precisely, because within this fluency range a design provides only little elaboration potential, the preference increase on a controlled processing level is less than on an automatic processing level.

3. Pre-study: Design Fluency

The purpose of the pre-study is to establish a set of target stimuli (i.e., product designs that are disfluent, medium fluent and highly fluent) that allow us to test our main hypothesis on the interaction between design fluency and presentation context. We operationalize fluency

by design typicality because a design's typicality is a particularly important determinant of consumers' aesthetic response (Landwehr et al., 2011, 2013), and typicality has been shown to affect fluency (Winkielman et al., 2006). Moreover, this study aims to demonstrate that because design typicality is a stimulus-intrinsic determinant of processing fluency, the positive relationship between design typicality and aesthetic liking is mediated by processing fluency.

3.1 Design and Stimuli

We use a 3x4x3 mixed factorial experimental design where the first factor is a within-subjects manipulation of design typicality (i.e., our operationalization of fluency; typicality low, typicality medium, typicality high), the second factor is a between-subjects manipulation of the measured aesthetic response (i.e., fluency, liking, typicality, novelty), and the last is a within-subjects replication factor of product type (bikes, chairs, lamps). For each typicality level, we employ six operationalizations; thus, our final stimulus set includes 54 stimuli, thereof 18 are bikes, 18 chairs, and 18 lamps; each of these groups of 18 stimuli partition into 6 untypical, 6 medium typical and 6 typical stimuli. The stimuli are coloured pictures of bikes, chairs, and lamps and are freely available on the Internet; they were selected and allocated to the three typicality levels by one of the researchers of this study according to short discussions with product design experts. Because typicality and novelty have been shown to be highly negatively correlated (Hekkert et al., 2003), we also assess the design's novelty.

3.2 Procedure

Stimuli belonging to one product category were consecutively presented to participants in one block, while the order in which stimuli were presented both within one category and across all categories was randomized. Participants were asked to evaluate each stimulus on a visual analogue scale with 101 points on one of the four dependent variables. More specifically, we measured aesthetic liking with one item "How much do you like the product's design?" on a scale ranging from not at all to very much (Landwehr et al., 2013). The item to capture fluency asked "How easy or difficult is it to study the product's design?," measured on a scale ranging from very difficult to very easy (Chang, 2013; Novemsky, Dhar, Schwarz, & Simonson, 2007). Typicality was assessed by the statement "I perceive this product's design to be," measured on a scale ranging from not at all typical to very typical (Blijlevens, Carbon, Mugge, & Schoormans, 2012), and novelty was assessed with the item "I perceive the bike's [lamp's; chair's] design to be" [not at all original versus very original] (Hekkert et al., 2003). Finally, we obtained participants' expertise and interest in the respective product category, as well as their Centrality of Visual Product Aesthetics (CVPA; Bloch, Brunel, & Arnold, 2013) as control variables.

We recruited our participants using Amazon MTurk. Overall, a sample of 160 subjects participated in this study (49.4% = female, mean age = 26.66); 38 participants rated the fluency of the designs, 41 participants rated how much they like the designs, 40 participants

evaluated the typicality of the designs, and 41 participants assessed the novelty of the designs.

3.3 Results

In all subsequent analyses, we averaged the ratings on the dependent measures (fluency, liking, typicality, novelty) across the different operationalizations per typicality level within each product category.

In a first instance, we analysed whether our manipulation of design typicality was successful, i.e., whether our manipulation of typicality is reflected in participants' typicality perceptions, respectively inversely in participants' novelty perceptions. In addition, we assessed the effectiveness of our operationalization of fluency by typicality, and we assessed whether the typicality manipulation affects aesthetic liking. Because the design of our study features a repeated measures structure for the key independent variable (i.e., three different levels of typicality), the most suitable method to analyse the data is a repeated measures ANOVA (RM-ANOVA), which we conducted separately for the four dependent variables as well as for the three different product categories, which merely served as replications.

For all dependent variables and all stimulus categories, the mean scores for the dependent variables are statistically different across the three typicality conditions ($p < .001$).

Furthermore, LSD post hoc contrasts between the factor levels are all significant ($p < .01$). To control for individual differences in the CVPA (for the whole sample, $\alpha > .846$), we additionally conducted Mixed-ANOVAs, where we included CVPA as a between-subjects factor by dividing the sample into two groups at the median of the CVPA scale. The results show that also when including a between-subjects factor controlling for CVPA, the effect of design typicality on typicality perceptions, novelty perceptions, fluency, and liking remains robust in all three product categories. In the same vein, we also included product category interest and product category expertise as between-subjects factor in the ANOVA; the highly significant effect of typicality on all four dependent variables again remains stable. Overall, the results of the RM-ANOVAs imply that the manipulation of typicality was successful, and it approves the operationalization of design fluency by design typicality. Moreover, we find a significant effect of typicality on aesthetic liking, which attests the practical relevance of studying typicality-driven fluency effects.

4. Main study: Design Fluency and Presentation Context

4.1 Design and Stimuli

The aim of the main study is to investigate how design fluency interacts with a design's presentation context. The set-up of the study is a 3 (fluency: low, medium, high) \times 2 (presentation context: nonfit, fit) \times 3 (product type: bike, chair, lamp) \times mixed factorial design, where fluency is included as a within-subjects factor, context as a between-subjects factor and product type as a within-subjects replication factor.

For the target stimulus material, we draw on the pre-study. Based on the typicality ratings of the stimuli in the pre-study, we selected two stimuli per fluency manipulation and product category; in the low typical condition we selected two stimuli that were closest to a rating of 10 on the subjective typicality scale, in the medium typical condition we selected two stimuli that were closest to a rating of 50 on the subjective typicality scale, and in the high fluency condition those that were closest to a rating of 90. For the manipulation of context fit we created for each product category two different backgrounds depicting either a usage context that fits with the product or a usage context that does not fit. For instance, a chair was either depicted next to a wardrobe (context fit) or at the park (context nonfit) (Figure 1). We framed our stimuli as advertisements by including a brand name and the brand's web address (constant across all stimuli).

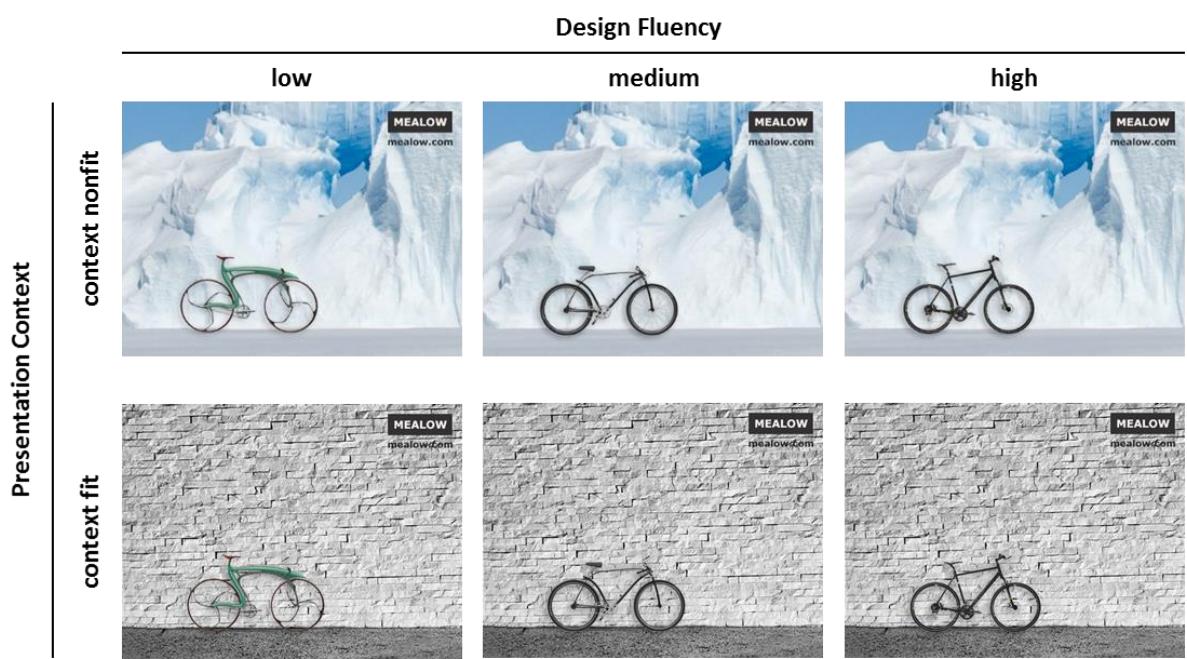


Figure 1 Exemplary Experimental Stimuli.

4.2 Procedure

On the first page of our online survey, participants were told a cover story that they will be shown various products within the same standard advertisement of a fictitious brand. Participants were then randomly assigned to one of the six between-subjects conditions, and they were asked to evaluate how much they like each product's design in a random order [not at all / very much]. Importantly, the instructions between the two presentation context conditions were exactly the same; the only difference between the two conditions was the background picture surrounding the product stimuli. Finally, we gathered participants' expertise and interest in the respective product category, as well as their CVPA as control variables.

We again obtained our participants via Amazon MTurk (54.6% = female, mean age = 25.89). Overall, a sample of 304 subjects participated in this study, thereof 51 subjects rated bikes surrounded by a usual context (i.e., context fit), 51 rated bikes surrounded by a unusual context (i.e., context nonfit), 48 rated chairs surrounded by a usual context, 52 rated chairs surrounded by a unusual context, 53 rated lamps surrounded by a usual context and 49 rated lamps surrounded by a unusual context.

4.3 Results

At the outset, we averaged the ratings of the liking ratings across the two operationalizations per fluency level within each product category. Based on these values, we removed two outlier participants from our analyses because their liking ratings for the highly typical stimuli were more than 1.5 times away from the interquartile range. Figure 2 shows the effects of the experimental manipulations of design typicality and context on aesthetic liking. As the descriptive analysis of the mean liking ratings across the experimental conditions indicate, the untypical and the highly typical stimuli are evaluated better when presented in a usual context. Aesthetic liking for the medium typical stimuli, by contrast, is higher when the presentation context is unusual compared to usual. Overall, this pattern of results indicates that the profile of liking ratings for different levels of design fluency differs as a function of presentation context.

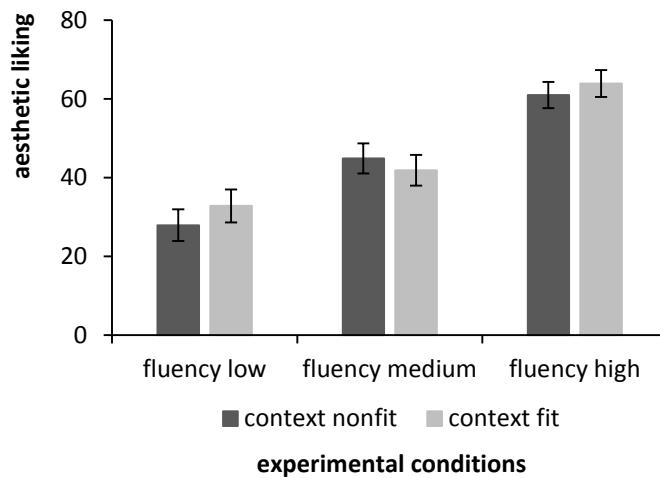


Figure 2 Effects of the experimental manipulations of design typicality and context on aesthetic liking. Error bars represent 95% confidence interval of the means.

5. General Discussion

The intent of this research was to examine how product design fluency interacts with a design's visual presentation context, in particular, the usualness of the presentation context. To test this notion, we conducted an empirical study focusing on bikes, chairs and lamps as stimuli and using design typicality as an operationalization of fluency. The pattern of results tend to support our hypothesis that design fluency and presentation context interact. More specifically, while aesthetic liking appears to increase with design fluency both in a usual and in an unusual presentation context, this increase is in an unusual context more pronounced at lower levels of fluency and less pronounced at higher levels of fluency as compared to a usual context.

Although we cannot provide empirical evidence for the underlying processes, the preference patterns we find are in accordance with the main predictions of the PIA Model, a dual-process model of fluency-based aesthetics (Graf & Landwehr, 2015). That is, at low levels of design fluency, a fluency increase elicits a stronger positive effect on aesthetic liking under controlled processing (as opposed to under automatic processing) because people under controlled processing are cognitively stimulated by the designs, thus experiencing aesthetic interest. In contrast, when the fluency level from which the fluency increase takes place is already medium fluent, the positive effect is less pronounced on a controlled processing level because people are only marginally cognitively stimulated.

Admittedly, the interaction between design fluency and presentation context that we find is rather small. However, as the pre-study shows, the product stimuli do not only represent very strong manipulations of fluency, they are also highly predictive of aesthetic liking. Compared to that, our manipulation of context was only very subtle. The combination of these two factors implies that it is perfectly reasonable that the effect is not overly pronounced. In fact, it would be interesting to see whether the same context manipulation interacts to a greater extent with fluency when using a less strong fluency manipulation. In this regard, another interesting question would be to examine whether the interaction effect holds robust in other product categories.

The results of this research offer several managerial implications. Most importantly, it sensitizes managers and designers to conjointly consider the design and the context in which the design will be presented and marketed to consumers. While we operationalize the context as the usage scenario in which a design is visually presented within an advertisement, there may be many other levels on which the context surrounding the product can play a role. That is, the positioning, the whole advertising campaign or communication strategy on the level of the product, the designer or firm may all be contextual factors that affect how consumers process the design and thus a design's success. Importantly, not only the visual configuration of the context may play a role, but also content related factors. In addition, the findings of this research are particularly important when design constraints (e.g., technical, function, ergonomic, or regulatory constraints) (Bloch, 1995) or positioning issues prevent a purely stimulus based optimization of design

fluency and hence aesthetic appreciation. Put differently, when aesthetic appreciation is rather low because of low levels of design fluency, aligning the presentation context with the fluency of the design may be an effective means to increase aesthetic appreciation. In a related vein, our research is of high importance when launching new products. That is, to the extent that novelty often implies atypicality and thus low levels of design fluency (Landwehr et al., 2013), a fluency compatible presentation context respectively marketing campaign can become a crucial determinant of product launch success.

In sum, this research contributes to the product design literature by examining fluency-based aesthetic preferences in a realistic consumer behaviour context. In doing so, it shows the relevance of the fluency construct in research on aesthetic preferences of product design. At the same time it suggests that future research on fluency-based aesthetic preferences should make an effort to take into account contextual factors that affect consumers' processing of product design to fully understand consumers' aesthetic responses to products.

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