Brand Personality as a Mediator of Visual Complexity Effects on Consumer Responses to Packaging

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ABSTRACT

Brand Personality as Mediator of Visual Complexity Effects

on Consumer Responses to Packaging

Research suggests that the visual complexity of advertisements influences brand attitudes, product attitudes, and purchase intentions. This research seeks to extend findings on the effect of visual complexity to the product package design context. It empirically tests the effect of visual complexity on brand personality dimensions and brand personality appeal, and subsequent effects on brand attitude, product attitude, and purchase intentions. An experimental study manipulates visual complexity of fictitious brand packages in three product categories (ice cream, soda, and dishwashing liquid). A sample of North American consumers rated the brand packages in terms of perceived visual complexity, brand personality dimensions, brand personality appeal, and product attitude, brand attitude and purchase intentions. Overall, visual complexity positively affects consumer responses to brands, although it also negatively influences some brand personality dimensions. Support for a mediating effect of brand personality and brand personality appeal was weak. Many of the observed effects were product-category specific. This study nonetheless adds insights regarding the impact of visual complexity on consumer responses, and provides managerial implications for product design.

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TABLE OF CONTENTS

LIST OF TABLES vi
LIST OF FIGURES vii
INTRODUCTION 1
THEORETICAL BACKGROUND 3
  Visual Complexity 3
  The Effect of Visual Complexity on Brand Personality 5
  The Mediating Role of Brand Personality 9
METHODOLOGY 12
  Pretest 12
  Main Experiment 17
RESULTS 30
GENERAL DISCUSSION 44
  Summary of Findings 45
  Theoretical Implications 49
  Limitations and Future Research Directions 53
CONCLUSION 57
References 58
Appendix A 64
Appendix B 65

LIST OF TABLES

Table 1	17
Table 2	19
Table 3	24
Table 4	26
Table 5	35
Table 6	44

LIST OF FIGURES

Figure 1 12

INTRODUCTION

When walking through aisles of a grocery store, consumers are exposed to product packaging comprising combinations of visual attributes that are designed to capture attention and induce purchases. Keller (1993) defines packaging as a non-product-related attribute contributing to the image of the brand, and ultimately to consumer-based brand equity. Moreover, Underwood and Ozanne (1998) put emphasis on packaging's effectiveness in communicating a products truthfulness, comprehensibility, sincerity and legitimacy. This serves to promote brand identity and brand meaning, while also relating the brand to consumers' self-identity (Underwood, 2003). Furthermore, in exploring the role of brands in consumer's everyday lives, Lightfoot and Gertsman (1998) stress the importance of a brands packaging in its visual equity—the combined effort of visual attributes in designing a brand's visual persona—stating that packaging has developed throughout history to represent a more important role in contemporary times. The stronger presence of those packages in everyday life consequently allow consumers to create associations between themselves and the brand through the packaging. Given this body of research, the importance of visual cues represented in product packages becomes apparent as a means to both communicate brand identity, and influence consumer behaviours.

Research on visual design in marketing has examined advertisements, products, and product packages. It has found that package design is important in influencing consumer behaviors in terms of purchase intentions, choice, and consideration (Garber, Burker, & Jones, 2000; Kobayashi & Benassi, 2015; Reimann, Zaichkowsky, Neuhaus, Bender, & Weber, 2010). Product packaging and brand logos on product packages also play a role in influencing brand impressions, such as brand personality (Bajaj & Bond, 2017; Luffarelli, Stmatogiannakis, & Yang, 2019; Orth & Malkewitz, 2008). Research also posits that visual complexity, the extent to which a stimulus is composed of visual components that differ from each other (Berlyne, 1971), may have a role in influencing consumer impressions and perceptions of both advertisements (Pieters, Wedel, & Batra, 2010), product design (Cox & Cox, 2002), and product packaging (Lee, Hur, & Watkins, 2018). This initial body of research suggests that the visual design of a product package affects consumer perceptions and responses, such as purchase intentions and attitudes toward the product and brand, by means of the brand impressions they create. An important type of brand impressions that has implications for consumers' self-expression, perceptions of self-congruence with the brand, and ultimately brand equity, is brand personality (Aaker, 1997; Keller, 1993).

Based on the literature that suggests an association between visual cues, product packaging, brand personality, and consumer-responses toward the brand, the current research empirically examines the link between the visual complexity of product packaging, subsequent brand personality perceptions, and consumer-responses to the brand. This research seeks to contribute to the literature by situating dimensions of visual complexity—which was previously investigated in the context of advertisements—in a product packaging context, and by examining the impact of visual complexity on brand personality dimensions and brand personality appeal, as well as subsequent brand attitudes and purchase intentions. This provides a framework for using visual complexity in package design that marketing practitioners can apply to create packages consistent with a specific brand personality.

THEORETICAL BACKGROUND

Visual Complexity

The goal of this research is to explore how the visual complexity of product packages affect consumer perceptions of the brand they represent. Early work in the field of aesthetics and psychology defines visual complexity as being the extent to which a visual stimulus' simultaneously presented elements are different or similar (Berlyne, 1971). For a visual stimulus to be complex, it must have differences presented in its elements, and those differences must be identifiable. Expanding upon this notion of visual complexity, Pieters and colleagues (2010) explored how visual complexity arises in the context of advertisements. These researchers identified two types of visual complexity: feature complexity (i.e., the amount of detail and variation in basic visual features, colours, luminance, and edges) and design complexity (i.e., the elaborateness of design in terms of shapes, objects, and patterns depicted in the ad; Pieters et al., 2010).

In the work of Pieters and colleagues (2010), images were digital photos of advertisements. In this context, complex textures in backgrounds were deemed to increase feature complexity, as complex, dense textures tend to have great variance in luminance, colours, and edges. Thus, feature complexity varied as a function of individual pixels found within the image, and more complex images were those that had large variance between pixels in terms of luminance and colours. In their study, Pieters and colleagues (2010) used image file size (JPEG) to operationalize feature complexity. The JPEG algorithm compresses image files to reduce their file sizes by reducing the difference between each pixel in the image wherever possible. This definition of feature complexity can be illustrated with an example originally proposed by Attneave (1954), and later by Donderi (2006). Complexity is the level of probability that the emergence of one element in a visual stimulus can be predicted by the presence of another element. The higher that probability, the more a stimulus is deemed ‘redundant’, that is to say, that it is simple (Attneave, 1954; Donderi, 2006; Rosenholtz, Li, & Nakano, 2007). Consider an example: Given an array of pixels together creating an abstract image, it would be difficult to predict one element of the image, like the colour of one or more pixels, from the presence of others, especially if the pixels in the image vary greatly in their colours. Such an image is considered more complex than an image that consists of only one colour. Thus, an image consisting of many different pixels that would be difficult to predict is considered high in feature complexity, if one were to look at the patterns formed by those pixels and the variation between each, that differ in their luminance, edges, features, and colours.

The second component of visual complexity identified by Pieters and colleagues (2010) is design complexity. Pieters and colleague’s (2010) notion of design complexity builds upon past research looking at structural complexity of images, and consists of six core components: (1) the quantity of objects, (2) their irregularity, (3) dissimilarity, (4) detail, and (5) asymmetry in their arrangements, and the (6) irregularity in which they are arranged. Respectively, these are defined as (1) the total number of identifiable visual objects (product image, brand, shapes, etc.), (2) the irregularity of the shapes (e.g., a circular is regular, whereas the outline of a human body is not), (3) how different each of the objects are (e.g., if all objects are circles or if all are more subtract shapes), (4) the amount of detail found within each object (i.e., if there are many edges, colours, or luminances forming complex textures within the shapes), (5) if the image’s objects are symmetrically arranged, and lastly (6) if the image’s objects are regularly arranged (i.e., if they can be likened to a grid formation, or if they look like they are mostly randomly placed).

Increasing any of these attributes consequently increases design complexity, without necessarily increasing feature complexity. Pieters and colleagues (2010) found that increasing feature complexity generally decreases attention and attitude toward the ad, whereas increasing design complexity has a positive impact on both attitude and attention toward the ad. The current research seeks to extend these findings to a product packaging context. Specifically, while visual attention is not considered in the current research, we propose that increasing design complexity enhances purchase intention and brand attitude, much like what was demonstrated by Pieters and colleagues (2010) for advertisements. This prediction is summarized in the following hypothesis:

H1: Increasing design complexity enhances brand attitude, product attitude, and purchase intentions.

The Effect of Visual Complexity on Brand Personality

The marketing literature suggests that visual designs of product packages are an important means of conveying brand image (Keller, 1993; Underwood, 2003; Underwood & Ozanne, 1998). Within the framework of brand image and brand impressions lies the concept of brand personality (Keller, 1993). Brand personality is defined as the human characteristics associated with a brand (Aaker, 1997). Aaker's (1997) seminal work reveals that brand personality can be described in terms of five brand personality dimensions (i.e., sincerity, excitement, competence, sophistication and ruggedness). Research in marketing has found that there are various visual components that affect perceived brand personality. For instance, initial work on brand personality conducted by Aaker, Fournier, and Brasel (2004) used different type fonts, imagery (i.e., dogs, photographs) and colours to alter the perceived personality of a website (i.e., an online service brand). More specifically related to factors that affect product packaging, other research has explored the effects of both colours (Labrecque & Milne, 2011) and type font (Grohmann, Giese, & Parkman, 2012), successfully establishing these as effective tools in communicating brand personality.

Product packaging design comprises multiple visual components, including font, colours, shapes, photographs, and logos. Orth and Malkewitz (2008) studied the influence of holistic package design (i.e., the overall "gestalt" of packages rather than individual elements) on consumer brand impressions, to create a generalizable and practical set of guidelines for marketing practitioners in their quest to develop product packages in line with the brand's identity. These authors define holistic package design as the package design elements that jointly achieve a sensory effect on consumers (Orth & Malkewitz, 2008, p. 64). For example, by carefully selecting wine bottles that fit different established design criteria that describe most wine bottle designs (i.e., a total of 62 elements), Orth and Malkewitz (2008) were able to successfully map different holistic designs onto particular brand personalities. Their findings suggest that marketing practitioners can select from and combine a set of design principles to create the appropriate design for a wine bottle in order to convey a desired brand personality. The findings were replicated for fragrance bottles. While this research lends credibility to the notion that visual designs of product packages are important in influencing brand impressions of consumers, it fails to acknowledge that visual complexity may also play an important role, because the presence and arrangement of design elements may influence the overall effect of design on brand impressions.

Past research has sought to uncover the effects of visual complexity on brand impressions and has largely focused on symmetry, which is one of the six visual design complexity components proposed by Pieters and colleagues (2010). Bajaj and Bond (2017) explored the effect of symmetry on brand perceptions, and found that for brands positioned as exciting on the brand personality scale (Aaker, 1997), consumers are more likely to select brands that have asymmetrical designs on their labels—this was achieved by putting (a)symmetrical art pieces on fragrance bottles, and having accompanying text descriptions. Extending the literature in this domain, Lufarelli and colleagues (2019) explored the effect of logo symmetry on brand personality perceptions and found that asymmetrical logos increased the exciting personality dimension through the process of increased arousal. Lufarrelli and colleagues (2019) refer to this as the visual asymmetry effect, which operates through a congruency of excitement and asymmetry, and increases consumer evaluations of brands employing this visual design.

Symmetry is only one of the six components of design complexity identified by Pieters and colleagues (2010). In one of the few studies that link visual complexity to brand personality, Lee, Hur and Watkins (2018) explored the effects of design complexity as operationalized by Pieter and colleagues (2010) on perception of luxury brands to find that more complex designs benefit luxury brands with low familiarity. Another study proposed that design complexity influences personality perceptions (Favier, Celhay, & Pantin-Sohier, 2019). This research found that simpler designs are associated with reliability, authenticity, success, sobriety, and modernity. These personality attributes closely reflect the competence and sincerity dimensions of brand personality. Complex designs, on the other hand, are associated with seniority, joy, imagination, charm, femininity, and sophistication (Favier et al., 2019, p. 17). These personality attributes more closely represent the sophistication and excitement dimensions of brand personality.

While this initial research linking design complexity to brand personality attributes is informative, there are several concerns regarding the study conducted by Favier and colleagues (2019). First, this study raises concerns regarding the operationalization of visual complexity. The study employed champagne bottles that represented three levels of visual complexity (i.e., simple, medium, complex). Whereas the authors state that they followed Pieters and colleagues' (2010) visual complexity design principles, they do not explain how those principles were used to manipulate complexity. Instead, the authors used a self-report manipulation check measure for perceived complexity. This measure showed increased perceived complexity for the three manipulations, but does not make reference to the six visual complexity components. While the authors may have successfully manipulated design complexity, there is no objective evidence that they did so.

Second, Favier and colleagues (2019) used only the most representative traits for each facet as a measure for brand personality in order to reduce the amount of time it would take participants to answer the questionnaire. While this may have been an appropriate judgement, no attempt at a subsequent factor analysis was done in order to verify the validity of their adaptation of the brand personality scale. Thus, while an adapted measure of brand personality may have been warranted to reduce participant fatigue, the validity of the measures and the subsequent conclusions are uncertain. How Favier and colleagues' (2019) findings related to the five dimensions of brand personality (Aaker, 1997) is thus not clear.

A final concern of this study is the lack of acknowledgement of feature complexity as defined by Pieter and colleagues (2010). Feature complexity was not accounted for in Favier and colleagues' (2019) study. It is possible that feature complexity may have affected their results, particularly in case of the complex design that included complex, semi-uniform texture on the label of the bottle that served as stimulus (Favier et al., 2019, p. 16). The more prudent approach would have been to include a measure of feature complexity (e.g., JPEG image size) to ensure that, as design complexity increases, feature complexity does not substantially increase across conditions, or can be statistically controlled for.

In sum, there is initial evidence that design complexity (overall or in terms of complexity components) relates to brand personality dimensions, in terms of asymmetry being related to excitement (Bajaj & Bond, 2017; Lufarelli et al., 2019), and the relation between colours and brand personality dimensions (Labrecque & Milne, 2012). While the concerns regarding Favier and colleagues's (2019) study are substantial, it nonetheless points toward a link between design complexity and brand personality. This initial evidence leads to the following hypothesis:

H2: Design complexity relates negatively to the (a) sincerity and (b) competence dimensions of brand personality, and positively to the (c) sophistication and (d) excitement dimensions of brand personality.

While most personality dimensions are accounted for in previous research, one notable exclusion is that of ruggedness (evoking perceptions of toughness, strength, the outdoors, and ruggedness; Aaker 1997). Since previous models have not included ruggedness in their explorations, there is no evidence that allows for predictions regarding the relation between design complexity and the ruggedness dimension of brand personality. The ruggedness dimension is therefore examined in an exploratory fashion in this research.

The Mediating Role of Brand Personality

To shed light on the process of visual complexity, brand personality, brand attitudes and purchase intentions, it is important to establish the consequences of brand personality on consumers' brand-related responses. Indeed, the effects of brand personality are well documented. Studies have shown the effectiveness of brand personality traits in increasing brand trust and affect (Sung & Kim, 2010), and that, regardless of which dimension is explored, higher brand personality perceptions generally increase purchase intentions and brand evaluations (Freling & Forbes, 2005). Consolidating this body of research, Eisend and Stockburger-Sauer

(2013) undertook a meta-analysis dedicated to uncovering both the antecedents and consequences of brand personality. They find that all brand personality traits, with the exception of ruggedness, significantly predict purchase intentions, with sincerity and competence being the most effective drivers of this outcome. Their study shows that brand relationship strength, image, commitment, attitude, and use are mostly all affected by each of the five personality dimensions. Taken together, it is likely that brand personality itself is a strong predictor of consumer responses, such as purchase intentions and attitudes toward the brand.

Based on the literature reviewed on visual complexity and its potential effects on brand personality, and the literature on the effects of brand personality on consumer responses, the following hypotheses are suggested:

H3: The effect of design complexity on brand attitude, product attitude, and purchase intention is mediated by brand personality.

Based on earlier research (Eisend & Stockburger-Sauer, 2013), the following brand personality dimensions, in particular, are expected to mediate the effects of design complexity on consumer responses:

H3a: The effect of design complexity on brand attitude, product attitude, and purchase intention is mediated by sincerity, such that increasing design complexity decreases sincerity, which in turn decreases brand attitude, product attitude, and purchase intentions.

H3b: The effect of design complexity on brand attitude, product attitude, and purchase intention is mediated by competence, such that increasing design complexity decreases competence, which in turn decreases brand attitude, product attitude, and purchase intentions.

H3c: The effect of design complexity on brand attitude, product attitude, and purchase intention is mediated by sophistication, such that increasing design complexity increases sophistication, which in turn increases brand attitude, product attitude, and purchase intention.

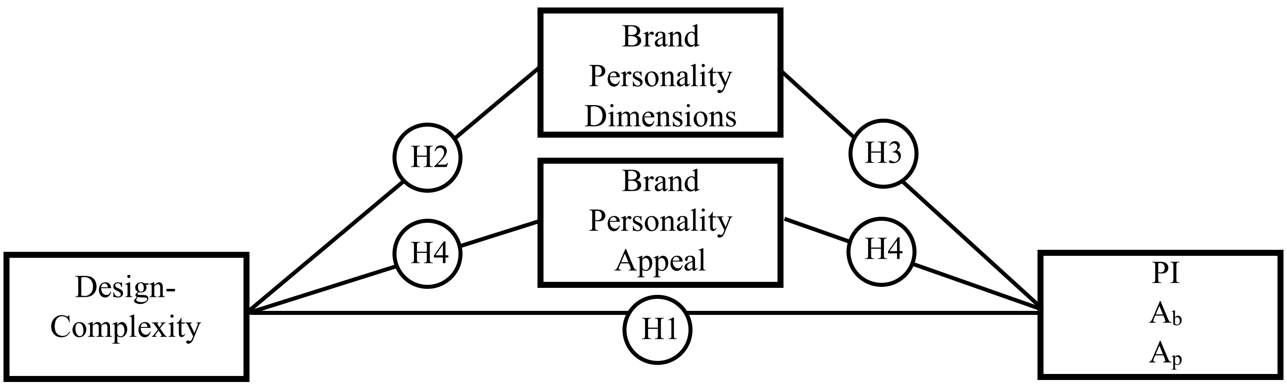
H3d: The effect of design complexity on brand attitude, product attitude, and purchase intention is mediated by excitement, such that increasing design complexity increases excitement, which in turn increases brand attitude, product attitude, and purchase intention.

A prediction regarding the effect of ruggedness could not be derived from prior research, and is thus not formally tested. Moreover, other research has sought to further the notion of brand personality by looking at what factors of brand personality specifically are responsible for making consumers prefer brands with strong personalities. Freling, Crosno, and Henard (2010) develop a scale that assessed brand personality appeal (BPA) defined as a brand's ability to appeal to consumers as a function of its communicated personality traits. They find that clarity (i.e., how clear a brand's personality is communicated), favorability (i.e., how favorable a brand's personality is) and originality (i.e., how unique or distinguishable a brand's personality is) are equally important in influencing how appealing a brand's personality is perceived to be among consumers. Since BPA has been established as a predictor of purchase intentions (Freling et al., 2010), and since it includes the notion of brand clarity, which is consistent with Underwood's (2003) argument that product packaging carries communicative power for brand personality, the following hypothesis is proposed:

H4: The effect of design complexity on brand attitude, product attitude, and purchase intention is mediated by brand personality appeal (BPA), such that higher design complexity increases BPA, which in turn increases brand attitude, product attitude, and purchase intention.

The following conceptual framework (figure 1) summarizes the proposed hypotheses.

Figure 1. Proposed framework.



METHODOLOGY

Pretest

Stimuli. This research employed fictitious stimuli for seven different consumer products, to preclude brand loyalty and brand familiarity effects. The stimuli were developed by the researcher and assessed for design complexity and feature complexity. Design complexity was assessed in terms of the presence or absence of the six design principles identified by Pieters and colleagues (2010). Feature complexity was operationalized in terms of the JPEG image file size (Pieters et al., 2010). The design features of the fictional brands were based on images of products available at four grocery stores (i.e., *Walmart*, *Metro*, *IGA*, and *Provigo*). The branded stimuli selected for the pretest were carried by at least three of the four grocery stores. For each product category, three different brands were selected, yielding a total of 21 images. For each of these brands, the highest resolution JPEG-format image was included in the pretest.

Sample, design, and measures. Seventy-five participants (*n* = 75) recruited on Amazon Mechanical Turk (MTurk) rated the 21 images in terms of the presence or absence of the six design complexity dimensions (Pieters et al., 2010). They received exchange for USD $2.25 for their time filling the questionnaire, which took a total of 10 to 15 minutes to complete. In order to ensure responses that were as accurate as possible, a set of instructions explained the design complexity dimensions, and how to identify them. Participants were asked if they understood these explanations. If they did, they were taken to the questionnaire, if they did not, they were taken to the end of the survey.

In the questionnaire, seven product categories (i.e., ice cream, laundry detergent, bathroom cleaner, dishwashing liquid, soda, snack bars, and cereal) were presented in random order. The three brands in each product category were presented in random order.

Participants saw each stimulus image six times—once for the rating of each of the six design complexity components in the following order: number of objects (few or many), regularity of objects (regular or irregular), similarity of objects (similar or dissimilar), detail of objects (little detail or great detail), symmetry of the object arrangement (symmetrical or asymmetrical), and lastly, regularity of object arrangement (regular or irregular).

Participants selected the option that best represented the stimulus (e.g., few or many objects, regular or irregular shapes). After completing the ratings, participants completed an attention check, and a set of demographic questions pertaining to their age, sex, country of residence, education and visual acuity. If the participant failed the attention check, they were taken to the end of the survey, and were not compensated for answering the questionnaire.

Results. Seventy-five (n = 75) participants were recruited through Amazon MTurk for this pretest, of which 45 participants passed the attention check, while 30 (40%) failed. Thus, an additional 30 participants were invited. Due to the possibly strict nature of the attention check, the questionnaire was edited to let participants continue the questionnaire regardless of if they had passed (n = 14) or failed (n = 16) the attention check. Data analysis was thus based on 75 completed questionnaires.

Participants in the final sample had an average age of 34.78 years (M = 34.78), the majority (62.7%; n = 47) were male, and n = 62 (82.67%) owned a university degree (bachelor's, master's, or doctoral). Eighty-five percent (n = 64) of participants were not students at the time of participation, and 98.6% (n = 74) had normal, or corrected to normal vision. Eighty-nine percent of participants (n = 67) rated themselves as not being colorblind. Lastly, the majority of respondents reside in the United States (n = 51), with the second most common country being India (n = 17). A select few were scattered in Europe (United Kingdom, Italy) and America (Brazil, Canada).

In order to select the stimuli that would be appropriate to use for the design of the fictitious brand, a Chi-square analysis estimated the likelihood that a specific design principle was present within a given stimulus. Since all participants rated each stimulus, the total number of ratings was 1,575 (75 respondents for each of 21 stimulus images). In order to develop stimuli that best represent real product packages, it was necessary to identify a baseline visual complexity along the six dimensions identified by Pieters and colleagues (2010) in order to design stimuli for the main experiment. The pretest therefore served to select stimuli that were rated to be low on visual complexity (i.e., packages that did not present elements of design complexity as described by Pieters et al., 2010 to a great extent).

Of the 21 stimulus images, participants were significantly more likely to rate each of the six design dimensions as not present (i.e., low level of visual complexity on the respective dimension) for four images in three product categories (i.e., ice cream, dishwashing liquid, and soda). Within these categories, four brands emerged as examples of package design low in visual complexity: Pepsi and Coca-Cola soda, Coaticook ice cream, and Palmolive dishwashing liquid.

For Pepsi, χ^2 analyses revealed a significantly greater choice likelihood for absence (vs. presence) of the six visual complexity components: number of objects, $\chi^2(1, N = 75) = 46.41$, $p < .001$, regularity of objects, $\chi^2(1, N = 75) = 52.92$, $p < .001$, similarity of objects, $\chi^2(1, N = 75) = 34.68$, $p < .001$, detail within objects, $\chi^2(1, N = 75) = 34.68$, $p < .001$, symmetry of object arrangement, $\chi^2(1, N = 75) = 37.45$, $p < .001$, and regularity of object arrangement, $\chi^2(1, N = 75) = 56.33$, $p < .001$.

For Coca-Cola, results were similar: number of objects, $\chi^2(1, N = 75) = 37.45$, $p < .001$, regularity of objects, $\chi^2(1, N = 75) = 9.72$, $p = .002$, similarity of objects, $\chi^2(1, N = 75) = 24.65$, $p < .001$, detail within objects, $\chi^2(1, N = 75) = 37.45$, $p < .001$, symmetry of object arrangement, $\chi^2(1, N = 75) = 18.25$, $p < .001$, and regularity of object arrangement, $\chi^2(1, N = 75) = 34.68$, $p < .001$.

For the ice cream brand Coaticook, ratings show significantly lower choice likelihood for the presence of all visual complexity dimensions: number of object, $\chi^2(1, N = 75) = 37.45$, $p < .001$, regularity of objects, $\chi^2(1, N = 75) = 40.33$, $p < .001$, similarity of objects, $\chi^2(1, N = 75) = 29.45$, $p < .001$, detail within objects, $\chi^2(1, N = 75) = 49.61$, $p < .001$, symmetry of object arrangement, $\chi^2(1, N = 75) = 37.45$, $p < .001$, and regularity of object arrangement, $\chi^2(1, N = 75) = 52.92$, $p < .001$.

In the dishwashing liquid category, Palmolive achieved similar results: number of objects, $\chi^2(1, N = 75) = 22.41$, $p < .001$, regularity of objects, $\chi^2(1, N = 75) = 16.33$, $p < .001$, similarity of objects, $\chi^2(1, N = 75) = 8.33$, $p = .004$, detail within objects, $\chi^2(1, N = 75) = 20.28$, $p < .001$, symmetry of object arrangement, $\chi^2(1, N = 75) = 22.41$, $p < .001$, and regularity of object arrangement, $\chi^2(1, N = 75) = 43.32$, $p < .001$.

None of the stimuli was associated with a significantly greater likelihood of presence (vs. absence) of the six dimensions of visual complexity. Table 1 summarizes pretest results. The stimuli rated as significantly and highly visually complex on one of the six components of visual complexity, allowed for identification of components to be used in the design of the fictitious stimuli for the main experiment.

Discussion. Pretest results indicate that most stimuli were generally rated as low in design complexity. The pretest identified four product packages that were rated as very simple, having only a brand element and a background color, or at most, one shape, in their design. The pretest did not identify stimuli that were perceived as complex on any of the design complexity dimensions. This suggests that for the main experiment, design complexity had to be manipulated by augmenting the stimuli identified as simple along the six design complexity dimensions. This also required that the design complexity of the fictitious stimuli in the main experiment had to be measured to ascertain the successful manipulation.

Table 1. *Pretest 1 for Design of Stimuli Results*

		Design Principles χ^2 Values					
Category	Brand	Number of Objects	Regularity of Objects	Similarity of Objects	Detail of Objects	Symmetry of Object Arrangement	Regularity of Object Arrangement
Dishwashing Liquid	Dawn	1.61	**9.72*** **	0.33	**3.853** **	1.613	**20.28*** **
	Palmolive	**22.41*** **	**16.33*** **	**8.33*** **	**20.28*** **	**22.41*** **	**43.32*** **
	Sunlight	0.33	1.08	1.08	1.08	0.01	**9.72*** **
Ice Cream	Breyers	14.52***	**7.05*** **	2.25	5.88**	2.25	0.65
	Coaticook	**37.45*** **	**40.33*** **	**29.45*** **	**49.61*** **	**37.45*** **	**52.92*** **
	Parlour	12.81***	3.85**	8.33***	14.52***	2.25	.01
Soda	C-Cola	**37.45*** **	**9.72*** **	**24.65*** **	**37.45*** **	**18.25*** **	**34.68*** **
	Pepsi	**46.413*** **	**52.92*** **	**34.68*** **	**34.68*** **	**37.45*** **	**56.33*** **
	Sprite	**8.33*** **	0.33	0.65	**12.81*** **	1.61	**14.52*** **
Bathroom Cleaner	Hertel	**7.05*** **	**7.05*** **	1.08	**4.81** **	0.33	**16.33*** **
	Lysol	12.81***	0.33	12.81***	11.21***	8.33***	0.33
	Vim	5.88**	1.08	4.81**	1.08	1.61	**3.00***
Cereal	Muslix	22.41***	1.08	0.33	2.25	0.65	1.08
	H-Crunch	20.28***	**3.00***	0.01	5.88**	2.25	**3.85** **
	All-Bran	12.81***	**14.52*** **	3.85*	.013	0.12	**7.05*** **
Snack Bars	Chewy	25.65***	0.01	2.25	1.61	3.00	**11.21*** **
	Kashi	0.12	**18.25*** **	**11.21*** **	1.08	**22.41*** **	**24.65*** **
	N-Valley	8.33***	**16.33*** **	1.08	0.01	**11.213*** **	**27.00*** **
Laundry Detergent	Gain	3.85**	1.61**	**4.813** **	1.61	8.33***	1.61
	Parisienne	7.05***	0.33	0.01	8.33***	1.08	0.12
	Tide	**5.88** **	**16.33*** **	0.01	**18.25*** **	1.08	**16.33*** **

**Significant at .1*
***Significant at .05*
****Significant at .01*
Note. The χ^2 values depicted in **bold** represent significance in simplicity, i.e., most participants chose the simple option, not the complex option.

Main Experiment

Manipulation of design complexity. The stimuli that were rated as low in complexity across all six design principles in the pretest were retained. The three remaining stimuli from three different product categories (i.e., ice cream, soda, dishwashing liquid) were manipulated to vary in their levels of design and feature complexity. Fictitious stimuli were developed to represent similar design cues as the real brands tested during the pretest (https://doi.org/10.17605/OSF.IO/F7D2H). The brand names were replaced in order to preclude effects of brand familiarity. In the soda category which was originally represented by the brand Pepsi, the logo also had to be changed, due to its iconic nature. The redesigned logo included the same colours as the original Pepsi logo, and represented similar levels of complexity. The stimuli were altered using *Inkscape* v 1.0, an open-source vector based graphic editor. For each product category, four different conditions were developed to reflect a combination of high or low design complexity and high or low feature complexity (Appendix A). The resulting stimuli are depicted in table 2 and table 3, representing varying levels of design complexity, and feature complexity, respectively.

Table 2. *Design complexity for fictitious brand stimuli*

Category	Design Complexity	Product image	Design Principle: Number of Objects	Regularity of Objects	Similarity of Objects	Detail of Objects	Symmetry of Object Arrangement	Regularity of Object Arrangement
Ice Cream	Low		1	Regular	Similar	Little detail	Symmetrical	Regular
	High		17	Irregular	Dissimilar	Much detail	Asymmetrical	Irregular
Dishwashing Liquid	Low		3	Regular	Similar	Little detail	Symmetrical	Regular
	High		10	Irregular	Dissimilar	Much detail	Asymmetrical	Irregular

			Design Principle					
Category	Design Complexity	Product image	Number of Objects	Regularity of Objects	Similarity of Objects	Detail of Objects	Symmetry of Object Arrangement	Regularity of Object Arrangement
Soda	Low		1	Regular	Similar	Little detail	Symmetrical	Regular
	High		30	Irregular	Dissimilar	Little detail	Asymmetrical	Irregular

Manipulation of feature complexity. Pieters and colleagues (2010) proposed JPEG size as a measure of feature complexity. JPEG is a compression technique whereby an algorithm compresses the image's constituent elements such as luminance, colours, and edges in groups of several pixels. A larger JPEG image size thus means that an image's luminance, colours, and edges were more complex as the compression algorithm cannot compress these efficiently without losing a lot of information. While JPEG does provide some insight into the level of feature complexity present in a stimulus by compressing the elements that comprise feature complexity, it lacks details that provide more insight into what drives the complexity in the visual scene, and potentially omits certain elements such as entropy (Gonzalez, Woods, & Eddins, 2011) and edge orientation (Rosenholtz, Li, & Nakano, 2007). At the same time, using more than one method to calculate feature complexity allows not only for more insight into other elements identified as being part of feature complexity, but also more robust methodology that validates the feature complexity manipulations of this study. As such, the current study compared three different methods for calculating feature complexity. These were image file sizes compressed with JPEG (Pieters et al. 2010), a custom algorithm developed in MATLAB (version 2020a, The MathWorks, 2020, Natick, Massachusetts) based on Matkovic, Neumann, Neumann, Psik and Purgathofer (2005), Willenbockel and colleagues (2010), and Dal Ben (2019), as well as a feature congestion measure developed by Rosenholtz et al. (2007). The primary function of using and comparing these three different methods was to show, across different methods, the successful manipulation of feature complexity. A secondary goal was to examine what factors that contribute to feature complexity, since these three methods focuses on slightly different elements to capture feature complexity.

The custom algorithm encompasses entropy, which is to say, that certain items in a visual scene can be harder (higher entropy) or easier (lower entropy) to predict based on what is present nearby that item (a similar concept to the example described in the theoretical background proposed by Attneave, 1954, and Donderi, 2006; Gonzalez et al., 2011, p. 645). In other words, entropy accounts for the randomness element in a scene. The custom algorithm further accounts for entropy of coloured edges (obtained from the red, green, and blue channels)—which is to say, the randomness of the distribution of red, green, and blue edges. More randomness of the pixels forming the RGB edges translates into greater entropy, and thus greater complexity. Luminance is also included in the algorithm and is defined as the intensity of the light being reflected by the pixels (Frisby & Stone, 2010)—increasing luminance increases the intensity of the light reflected, and if maximally increased would produce white. Lastly, contrast is measured to measure the amount of difference between each pixel—a white versus a black pixel would produce high contrast values, whereas a light gray versus a darker gray would produce lesser contrast values (Frisby & Stone, 2010). Together, these elements are run through the algorithm, which then produces one visual complexity score.

The last measure is the Feature Congestion measure (Rosenholtz et al., 2007), which considers line orientation, color variability as well as contrast and luminance values to provide a final score that represents the amount of visual complexity within a visual scene. All images were duplicated, and the duplicate was rotated 90 degrees since JPEG file size can change when rotating an image 90 degrees due to a shift of pixels within the boxes of pixels that are being compressed in the process. Both images' JPEG file sizes were recorded and processed through each algorithm to yield one respective average score. All scores were averaged across the original and rotated duplicate image. Table 3 provides the feature complexity values across products for low and high feature complexity, keeping design complexity constant. A more in-depth table showing all feature complexity scores for each stimulus is present in Appendix B.

Participants. A total of 180 (age: $M = 35.71$, $SD = 10.33$) participants were recruited through Amazon MTurk. The majority of participants were male (n = 120 66.7%), held a university degree (n = 143, 79.4%), and were not students (n = 159, 88.3%). Most had normal or corrected to normal vision (n = 179, 99.4%). Ten participants (5.6%) identified as being colour blind, while most other participants were not (n = 155, 86.1%). Most participants successfully passed the attention check (n = 130, 72.2%). Independent samples mean comparisons were performed to explore the effects of the failed attention check on the manipulation check, and revealed no significant difference between groups. A one-way ANOVA with attention check as the independent variable, and each design-principle rating as the dependent variable revealed no significant difference between the two groups, with the exception of significantly different ratings for regularity of object arrangement, $F(1, 538) = 4.92$, $p < .05$. Another one-way ANOVA with attention check as the independent variable and each personality dimension as the independent variable revealed only a significant difference in ratings for the BPA favorability dimension, $F(1, 538) = 5.21$, $p < .05$. Ratings for attitude towards the brand, attitude towards the product, and purchase intention did not differ as a result of failed or passed attention checks. Therefore, all data was retained for further analysis. Most participants originated from the United States (n = 159, 88.3%) or India (n = 11, 6.1%), with very few in other locations (n = 10, 5.6%).

Table 3. *Feature complexity for fictitious brand stimuli*

Category	Feature Complexity	Product image	Feature complexity score	JPEG File Size	Feature Congestion Score
Ice Cream	Low		30737	55.02 KB	3.56
	High		35999	63.13 KB	3.75
Dishwashing Liquid	Low		27990	49.92 KB	2.88
	High		36476	62.46 KB	3.35
Soda	Low		22462	64.15 KB	2.86
	High		32986	38.26KB	3.22

Note. The stimuli depicted in the table represent stimuli that have low design complexity, and vary in their feature complexity.

Design and measures. For each stimulus, participants completed the following measures in order: Attitude toward the brand and product (three items, 1 = *strongly disagree*, 7 = *strongly agree*; Sengupta & Johar, 2002) (These scales were identical, except for the target of the rating (i.e., brand versus product), purchase intention (four items, 1 = *strongly disagree* to 7 = *strongly agree*; Baker & Churchill, 1989), perceived visual complexity (*This product design is…* 1 = *very simple* to 7 = *very complex*; Pieters et al., 2010), perceptions regarding the six visual complexity dimensions (i.e., number of objects, regularity of object shape, similarity of object shape, detail within objects, symmetrical arrangement of objects, and regularity of object arrangement; slider scale anchored 0 to 100), brand personality (42-items, 1 = *not at all descriptive* to 7= *very descriptive*; Aaker, 1997), and brand personality appeal (semantic differential items, e.g., 1 = *bad* to 7 = *good*; Freling et al., 2011). Table 4 summarizes the scales and items.

The design for this study was mixed, meaning that each participant saw one condition of all product categories (conditions was the between groups factor, while product category was the within groups factor). Participants viewed only one of the four complexity conditions for each one product category, but saw all three product categories. This means that a participant would see the ice cream, dishwashing liquid, and soda in a random order, exactly once. When they saw the product package for the product category, it was one of the four different conditions (high or low feature complexity, high or low design complexity). This means that in total, participant saw three images, and answered a set of questions following each presentation.

Table 4. *Measures and scales used.*

Scale name	Source	Items	Anchors	Style	Alpha (α)
Attitude toward the brand	Sengupta & Johar, 2002	Good Useful Favorable	*I think this brand is* Very bad/Very good Not at all useful/Very useful Very unfavorable/Very unfavorable	7-point semantic differential	.85
Attitude toward the product	Sengupta & Johar, 2002	Good Useful Favorable	*I think this brand is* Very bad/Very good Not at all useful/Very useful Very unfavorable/Very unfavorable	7-point semantic differential	.86
Purchase intention	Baker & Churchill, 1989	I would like to buy this product I would buy this product I would actively seek out this product I would patronize this product	*Rate the extent to which you agree with each statement* Strongly disagree/Strongly Agree	7-point Likert	.88
Perceived visual complexity	Pieters et al., 2010	Simple	*This product design is…* Very simple/Very complex	7-point semantic differential	N/A

Scale name	Source	Items	Anchors	Style	Alpha (α)
BPA (Clarity)		Apparent Distinct Obvious Well-defined Clear	*This brand's personality is…* Apparent/Unapparent Distinct/Indistinct Obvious/Not obvious Well-defined/Vague Clear/Unclear		.73
BPA (Favorability)	Freling et al., 2011	Satisfactory Pleasant Attractive Positive Good Excellent Desirable	*This brand's personality is…* Satisfactory/Unsatisfactory Pleasant/Unpleasant Attractive/Unattractive Positive/Negative Good/Bad Excellent/Poor Desirable/Undesirable	7-point semantic differential	.88
BPA (Originality)		Distinctive Novel Surprising Fresh	*This brand's personality is…* Distinctive/Common Novel/Ordinary Surprising/Predictable Fresh/Routine		.88

Measure	Source	Items	Anchors	Style	Alpha (*α*)
BPS (Sincerity)		Down to earth Family-oriented Small-town Honest Sincere Real Wholesome Original Cheerful Sentimental Friendly			.92
BPS (Excitement)	Aaker, 1997	Daring Trendy Exciting Spirited Cool Young Imaginative Unique' Up-to-date Independent Contemporary	*Please rate the extent to which each word is descriptive of the brand shown above* Not at all descriptive/Very descriptive	7-point semantic differential	.95
BPS (Competence)		Reliable Hard working Secure Intelligent Technical Corporate Successful Leader Confident			.91
BPS (Sophistication)		Upper-class Glamorous			.90

Measure	Source	Items	Anchors	Style	Alpha (*α*)
BPS (Sophistication	Aaker, 1997	Smooth Feminine	*Please rate the extent to which each word is descriptive of the brand shown above* Not at all descriptive/Very descriptive	7-point semantic differential	.90
BPS (Ruggedness)		Outdoorsy Masculine Western Tough Rugged			.93

Procedure. After consenting to participate, participants were given a set of instructions about answering the design principle questions appropriately. These instructions were identical to the pretest instructions. If participants failed to understand the instructions (i.e., if they indicated that they did not understand), they were directed to the end of the survey, and did not receive a randomized code for compensation. If they understood the instructions, they answered questions about attitude toward the brand and the product (Sengupta & Johar, 2002), purchase intention (Baker & Churchill, 1977), and the manipulation check for visual complexity (Pieters et al., 2010). Participants then rated the product packages based on the six design principles identified by Pieters and colleagues (2010; (i.e., number of objects, regularity of object shape, similarity of object shape, detail within objects, symmetrical arrangement of objects, and regularity of object arrangement), brand personality (sincerity, excitement, competence, sophistication, and ruggedness; Aaker, 1997), and brand personality appeal (clarity, favorability, and originality; Freling et al., 2010). Questions in this section were presented by scale dimension and randomized to avoid order effects. Participants answered an attention check question, and a set of demographic questions at the end of the questionnaire.

RESULTS

Scale reliability and validity. The brand attitude scale reliability was acceptable (Cronbach's α = .85), as was the attitude toward the product scale (α =.86). Similarly, the purchase intention scale was found to be acceptable (α =.88). Reliability of the brand personality scale was strong (α = .97). In addition, each dimension was also found to be reliable (sincerity α = .92; excitement α = .95; competence α = .91; sophistication α = .90; ruggedness α = .93). A confirmatory factor analysis was performed for each dimension of the scale. Generally, the scales for each dimension had acceptable model fit indices (sincerity $\chi^2(44) = 316.91$, $p < .001$, CFI = .92, RMSEA = .11, SRMR = .05; excitement $\chi^2(44) = 117.81$, $p < .001$, CFI = .98, RMSEA = .06, SRMR = .02; competence $\chi^2(27) = 223.90$, $p < .001$, CFI = .93, RMSEA = .12, SRMR = .05; sophistication $\chi^2(9) = 92.43$, $p < .001$, CFI = .96, RMSEA = .13, SRMR = .03; ruggedness $\chi^2(5) = 19.57$, $p < .05$, CFI =.99, RMSEA = .07, SRMR = .02). A five-factor Principal Component Analysis with an oblique promax rotation indicated an overall acceptable fit of the model ($\chi^2(1, 661) = 1798.51$, $p < .001$). It should be noted that since three ratings were collected per participant, this inflates the degrees of freedom of the analysis three-fold—a value that is deemed only acceptable according to Bollen (1989). Eigenvalues exceeded 1.0 for all components (excitement $\lambda = 19.57$, sincerity $\lambda = 3.92$, ruggedness $\lambda = 2.40$, competence $\lambda = 1.28$, and sophistication $\lambda = 1.00$).

The reliability of the BPA scale (Freling et al., 2011) was acceptable ($\alpha = .87$). All dimensions reached acceptable levels of reliability as per George and Mallery's (2003) guidelines (clarity $\alpha = .73$, favorability $\alpha = .88$, originality $\alpha =.88$). To measure validity of the scale within the current study's context, a CFA was performed for each dimension, as well as a PCA for the scale model fit. The series of CFA's revealed an overall poor fit for the dimensions (clarity $\chi^2(5) = 173.04$, $p < .001$, CFI = .79, RMSEA = .25, SRMR = .12; favorability $\chi^2(14) = 581.22$, $p < .001$, CFI = .74, RMSEA = .27, SRMR = .12) with the exception of originality ($\chi^2(2) = 50.50$, $p < .001$, CFI = .96, RMSEA = .21, SRMR = .04). A three-factor PCA with an oblique promax rotation revealed a significant model ($\chi^2(75) = 907.11$, $p < .001$). Whereas the originality items clearly formed one factor ($\lambda = 2.97$), favorability and clarity did not clearly load onto respective components. This indicates a potential lack of validity for those two dimensions of BPA in the context of the current study. In line with previous research, average scores were calculated for each scale for inclusion in the analysis.

Manipulation checks. A series of manipulation checks were undertaken to ensure that the manipulations for level of visual complexity was successful. To this end, an analysis of variance (ANOVA) with perceived visual complexity as the dependent variable and both feature complexity and design complexity as the independent factors was performed. Considering that each participant saw one condition among three different categories, a separate ANOVA was performed for this manipulation check for each product category. For ice cream, the ANOVA revealed significant positive main effects of both design complexity ($F(1, 176) = 15.58$, $p < .001$, $\eta^2 = .075$) and feature complexity ($F(1, 176) = 13.93$, $p < .001$, $\eta^2 = .067$) on perceived visual complexity. There was no significant interaction of design complexity and feature complexity on perceived visual complexity. A Bonferroni corrected post-hoc analysis revealed significant differences between low design, low feature condition and the high design, high feature condition ($t(178) = -5.40$, $p_{bonf} < .001$), high design, low feature and high design, high feature complexity ($t(178) = -3.43$, $p_{bonf} < .05$), and low design, high feature and high design, high feature complexity ($t(178) = -3.56$, $p_{bonf} < .05$).

For the soda product category, the ANOVA revealed that there was only a significant positive main effect of design complexity on perceived complexity ($F(1, 176) = 16.17$, $p < .001$, $\eta^2 = .084$), and no effect of feature complexity on this measure. There was no significant interaction of design complexity and feature complexity conditions on perceived visual complexity. Post-hoc analyses reveal significant differences between the low design, low feature and high design, high feature conditions ($t(178) = -3.12$, $p_{bonf} < .05$), and the low design, low feature and high design, high feature complexity conditions ($t(178) = -3.46$, $p_{bonf} < .05$).

For the dishwashing liquid product category, there were no significant main effects of design complexity or feature complexity on perceived visual complexity, and no interaction of design complexity and feature complexity on perceived complexity. This may be indicative of a weak manipulation of visual complexity for that particular product category.

Overall, the ice cream product category showed significant effects of the feature and design complexity manipulations on visual complexity. In the soda category, only the design complexity manipulation influenced perceptions of visual complexity, whereas in the dishwash liquid product category, experimental manipulations did not affect visual complexity perceptions. To ensure that no differences in perceived visual complexity were occurring as a function of product category, a repeated measures ANOVA was performed with perceived visual complexity as the dependent variable, and product category as the within-groups factor. As expected, results indicate no differences in terms of perceived visual complexity as a consequence of the type of product they saw, $F(2, 356) = 0.28$, $p = .75$, $\eta^2 = .002$.

The next set of analyses was done in order to ensure that ratings of each individual design complexity component (i.e., number of objects, regularity of object shape, similarity of object shape, detail within objects, symmetrical arrangement of objects, and regularity of object arrangement) corresponded to its respective design complexity condition. We should expect to see higher ratings of each design complexity component for the high versus the low design complexity conditions. To this end, a series of three multivariate ANOVA (MANOVA) were performed for each product category, where the conditions (high/low design complexity) were the predictor variables, and each of the six (measured) design complexity dimensions served as the dependent variables. For ice cream, the overall model was significant (Approximate F(6, 173) = 9.10, $p < .001$, $\eta^2 = 0.16$). Higher design complexity was associated with higher ratings on the six complexity dimensions (all p's < .001). The same pattern of results emerged for dishwashing liquid, such that there was a significant overall effect of design complexity on each design complexity dimension ($F(6, 173) = 5.46$, $p < .001$, $\eta^2 = 0.16$). However, univariate ANOVAs revealed non-significant effects for regularity of objects ($F(1, 178) = 2.95$, $p = .08$) and detail of objects ($F(1, 178) = 1.59$, $p = .21$). Lastly, for soda, the overall model indicated a significant effect of design complexity condition on each design complexity dimension ($F(6, 173) = 7.16$, $p < .001$, $\eta^2 = 0.20$). Univariate ANOVAs reveal that condition did not significantly affect perceptions of detail of objects ($F(1, 178) = 3.14$, $p = .08$; Table 5).

Overall, the manipulation of design dimensions was successful for the ice cream product category. For the other product categories, design complexity manipulations did not influence perceptions of detail of objects. This may indicate either a failure in the manipulation of this particular component of design complexity, or a failure among participants to recognize and identify this component. In the dishwashing liquid category, results seem to be mixed, which was also seen in the previous manipulation check for perceived complexity. As a result of the manipulation check results, the hypothesis tests proceeded as follows: The measure of perceived overall visual complexity served as predictor, and the analyses were replicated on the product category level to illustrate differences between product categories.

Hypothesis tests. A PROCESS analysis (Model 4, 5000 resamples; Hayes, 2017) examined the effect of visual complexity, along with the indirect effect of visual complexity on attitude toward the product, brand, and purchase intention through brand personality dimensions and brand personality appeal. Perceived visual complexity served as the predictor (X), the brand personality and brand personality appeal dimensions as parallel mediators (M_x), and each of the outcome variables (attitude toward the product, brand, and purchase intention; Y_x) as the criterion in a separate model.

Table 5. *Univariate ANOVA's of Design Complexity on Design Principles*.

Category	Outcome	Numerator DF	Denominator DF	F-score	p-value	η^2
	Model Summary					
Ice Cream	Number of Objects	1	178	43.05	<.001	.195
	Regularity of Objects	1	178	35.60	<.001	.167
	Similarity of Objects	1	178	26.96	<.001	.144
	Detail of Objects	1	178	27.02	<.001	.132
	Symmetry of Object Arrangement	1	178	28.07	<.001	.136
	Regularity of Object Arrangement	1	178	25.52	<.001	.125
Dishwashing Liquid	Number of Objects	1	178	13.18	<.001	.07
	Regularity of Objects	1	178	2.95	.09	.016
	Similarity of Objects	1	178	4.48	.036	.024
	Detail of Objects	1	178	1.59	.21	.009
	Symmetry of Object Arrangement	1	178	23.52	<.001	.117
	Regularity of Object Arrangement	1	178	8.65	.004	.046
Soda	Number of Objects	1	178	23.94	<.001	.118
	Regularity of Objects	1	178	22.23	<.001	.111
	Similarity of Objects	1	178	37.06	<.001	.172
	Detail of Objects	1	178	3.14	.08	.017
	Symmetry of Object Arrangement	1	178	19.65	<.001	.099
	Regularity of Object Arrangement	1	178	14.62	<.001	.076

The first analysis comprised all product categories and measured the direct and indirect effects of perceived visual complexity on attitude toward the brand. For each participant, three ratings were included in the analysis, for each of three product categories. The overall model of perceived visual complexity on attitude toward the brand was significant, $F(9, 530) = 89.55$, $p < .001$, $R^2 = 0.60$. The direct effect of perceived visual complexity on attitude toward the brand was significant, $\beta = .055$, $t(530) = 2.77$, $p < .05$, 95% CI [.016, .094]. Significant positive path coefficients of perceived visual complexity on the mediators were observed for sincerity, $\beta = .13$, $R^2 = 0.05$, $t(530) = 5.55$, $p < .001$, 95% CI [.094, .182], excitement, $\beta = .36$, $R^2 = 0.24$, $t(530) = 12.94$, $p < .001$, 95% CI [.309, .420], competence, $\beta = .21$, $R^2 = 0.11$, $t(530) = 8.33$, $p < .001$, 95% CI [.160, .258], sophistication, $\beta = .30$, $R^2 = 0.16$, $t(530) = 10.29$, $p < .001$, 95% CI [.246, .362], and ruggedness, $\beta = .35$, $R^2 = 0.15$, $t(530) = 9.90$, $p < .001$, 95% CI [.278, .415], as well as for originality, $\beta = .33$, $R^2 = 0.16$, $t(530) = 10.12$, $p < .001$, 95% CI [.270, .400], but not the favorability or clarity dimensions of BPA. Significant positive path coefficients from the mediator to brand attitude were observed for sincerity, $\beta = .32$, $t(530) = 7.31$, $p < .001$, 95% CI [.234, .406], competence, $\beta = .12$, $t(530) = 2.21$, $p < .05$, 95% CI [.013, .223], sophistication, $\beta = .10$, $t(530) = 2.42$, $p < .05$, 95% CI [.020, .188], ruggedness, $\beta = .06$, $t(530) = 2.24$, $p < .05$, 95% CI [.008, .118], and favorability, $\beta = .34$, $t(530) = 9.21$, $p < .001$, 95% CI [.265, .409]. Taken together, these results indicate a positive indirect effect of perceived visual complexity on attitude toward the brand mediated by sincerity, competence, sophistication, and ruggedness. However, only the standardized indirect effects for sincerity, $\beta = .07$, $SE = 0.02$, 95% CI [.04, .11] and sophistication, $\beta = .02$, $SE = 0.02$, 95% CI [.002, .10] are evidence for a successful mediation. There were no indirect effects through BPA dimensions.

For attitude toward the product, the overall model was significant, $F(9, 530) = 77.12$, $p < .001$, $R^2 = 0.57$. The direct effect of perceived visual complexity on attitude toward the product was positive and significant, $\beta = .08$, $t(530) = 4.08$, $p < .001$, 95% CI [.043, .124]. Changing only the outcome variable means that all associations between the predictor and the mediators were identical to the previous analysis, with only the indirect effects changing for this model. Results reveal significant positive effects of sincerity, $\beta = .29$, $t(530) = 6.53$, $p < .001$, 95% CI [.206, .384], competence, $\beta = .16$, $t(530) = 2.94$, $p < .05$, 95% CI [.054, .271], sophistication, $\beta = .10$, $t(530) = 2.36$, $p < .05$, 95% CI [.018, .192], and a significant, negative effect of excitement on attitude toward the product, $\beta = -.14$, $t(530) = -2.90$, $p < .05$, 95% CI [-.236, -.045], as well as favorability, $\beta = .30$, $t(530) = 8.07$, $p < .001$, 95% CI [.231, .379], and originality, $\beta = .08$, $t(530) = 2.67$, $p < .05$, 95% CI [.021, .138] on the attitude toward the product. Thus, this model revealed significant indirect effects of perceived visual complexity on attitude toward the product. Sincerity (standardized indirect effect $\beta = .06$, $SE = .02$, 95% CI [.093, .231]) had the strongest positive effect (competence $\beta = .06$, $SE = .02$, 95% CI [.010, .107], sophistication $\beta = .05$, $SE = .02$, 95% CI [.003, .103]). Excitement had the strongest overall effect ($\beta = -.08$, $SE = .04$, 95% CI [-.153, -.014]), but this effect was unpredicted in that perceived visual complexity increased the perception of excitement in the brands, but excitement decreased the overall attitude toward the product. For BPA, this model revealed only a significant indirect effect of perceived visual complexity on attitude toward the product through the originality dimension ($\beta = .02$, $SE = .02$, 95% CI [.002, .087]).

A third model measured the indirect effects of perceived visual complexity on purchase intentions, through the BP and BPA dimensions. The overall model was significant, $F(9, 530) = 109.24$, $p < .001$, $R^2 = 0.65$. The direct effect of perceived visual complexity on purchase intention was significant, $\beta = .07$, $t(530) = 3.61$, $p < .05$, 95% CI [.035, .117]. The model revealed significant effects of all BP dimensions (sincerity, $\beta = .30$, $t(530) = 6.49$, $p < .001$, 95% CI [.21, .392], excitement, $\beta = -.19$, $t(530) = -3.84$, $p < .001$, 95% CI [-.29, -.094], competence, $\beta = .23$, $t(530) = 4.09$, $p < .001$, 95% CI [.12, .343], sophistication, $\beta = .23$, $t(530) = 5.15$, $p < .001$, 95% CI [.145, .324], ruggedness, $\beta = .07$, $t(530) = 2.50$, $p < .05$, 95% CI [.016, .133]). For BPA, significant effects were only observed for favorability $\beta = .28$, $t(530) = 7.35$, $p < .001$, 95% CI [.209, .361] and Originality, $\beta = .09$, $t(530) = 3.06$, $p < .05$, 95% CI [.035, .156]. This indicated a successful mediation of all brand personality dimensions on the effect of perceived visual complexity on purchase intention. Standardized positive indirect effects were strongest for sophistication ($\beta = .10$, $SE = .03$, 95% CI [.053, .156), excitement ($\beta = -.10$, $SE = .03$, 95% CI [-.166, -.038]) competence ($\beta = .07$, $SE = .02$, 95% CI [.030, .116]), sincerity ($\beta = .06$, $SE = .017$, 95% CI [.032, .097]), and ruggedness ($\beta = .04$, $SE = .02$, 95% CI [.0001, .077]) respectively. Originality was also found to have a standardized indirect effect with confidence intervals not crossing over zero, $\beta = .05$, $SE = .02$, 95% CI [.015, .081].

While these initial results generally support an influence of visual complexity on attitude toward the brand and purchase intention through the perception of brand personality, it must be noted that the degrees of freedom for this analysis were artificially inflated by virtue of collecting three ratings (one for each product category) per participant. Thus, the analyses were replicated for each product category.

Ice cream. Following the same order as the previous analysis, a total of three PROCESS models (Model 4, 5,000 resamples; Hayes, 2017) were performed to test the effect of perceived visual complexity on attitude toward the product and brand, and purchase intention mediated by the five BP dimensions (Aaker, 1997) and the three BPA dimensions (Freling et al., 2011).

For attitude towards the brand, the overall model was significant, $F(9, 170) = 19.94$, $p < .001$, $R^2 = 0.51$. However, there was no significant direct effect of perceived visual complexity on attitude towards the brand, violating the first principle for a mediation of having an observable significant direct effect of predictor on the outcome (Baron & Kenny, 1986). Despite this, perceived visual complexity had significant positive effects on all BP dimensions (sincerity, $\beta = .16$, $t(178) = 4.20$, $p < .001$, 95% CI [.084, .235], excitement, $\beta = .37$, $t(178) = 7.87$, $p < .001$, 95% CI [.277, .463], competence, $\beta = .22$, $t(178) = 5.36$, $p < .001$, 95% CI [.141, .305], sophistication, $\beta = .29$, $t(178) = 6.31$, $p < .001$, 95% CI [.201, .384], and ruggedness, $\beta = .33$, $t(178) = 5.84$, $p < .001$, 95% CI [.223, .451]), and for clarity, $\beta = .11$, $t(178) = 2.78$, $p < .05$, 95% CI [.033, .193], and originality, $\beta = .30$, $t(178) = 5.72$, $p < .001$, 95% CI [.198, .406] on the BPA scale. On the outcome variable, significant effects of only sincerity, $\beta = .18$, $t(170) = 2.29$, $p < .05$, 95% CI [.025, .337], and favorability, $\beta = .27$, $t(178) = 4.15$, $p < .001$, 95% CI [.142, .400]. There were no significant standardized indirect effects observed for any variable.

Regarding attitude toward the product, results were similar, with the overall model being significant, $F(9, 170) = 29.02$, $p < .001$, $R^2 = 0.61$, but no significant direct effect of perceived visual complexity on attitude toward the product. Significant effects of sincerity, $\beta = .32$, $t(178) = 4.15$, $p < .001$, 95% CI [.165, .466], excitement, $\beta = .24$, $t(178) = 2.62$, $p < .05$, 95% CI [.059, .421], competence, $\beta = -.25$, $t(178) = -2.76$, $p < .05$, 95% CI [-.429, -.072], ruggedness, $\beta = .10$, $t(178) = 2.31$, $p < .05$, 95% CI [.016, .197], and favorability, $\beta = .37$, $t(178) = 5.80$, $p < .001$, 95% CI [.242, .491] were observed. Standardized indirect effects of sincerity, $\beta = .09$, $SE = .04$, 95% CI [.031, .177], excitement, $\beta = .16$, $SE = .07$, 95% CI [.024, .306], and competence, $\beta = -.10$, $SE = .05$, 95% CI [-.211, -.012] were significant, indicating mediation.

Lastly, for purchase intention, the overall model was significant, $F(9, 170) = 29.74$, $p < .001$, $R^2 = 0.61$. The direct effect of perceived visual complexity was not significant, $\beta = .07$, $t(170) = 1.84$, $p = .067$, 95% CI [-.005, .137]. The overall model revealed significant effects of sincerity, $\beta = .28$, $t(178) = 3.22$, $p < .05$, 95% CI [.107, .446], and favorability, $\beta = .28$, $t(178) = 4.01$, $p < .001$, 95% CI [.145, .425]. Standardized indirect effects were observed only for sincerity, $\beta = .07$, $SE = .03$, 95% CI [.015, .144], all other indirect effects included zero in their confidence intervals.

Dishwashing liquid. Focusing on dishwashing liquid, there was an indirect effect of perceived visual complexity on attitude toward the brand, through BP and BPA dimensions. The overall model was significant, $F(9, 170) = 28.57$, $p < .001$, $R^2 = 0.60$. The direct effect of perceived visual complexity on attitude toward the product was significant, $\beta = .07$, $t(178) = 2.01$, $p < .05$, 95% CI [.001, .137]. Significant effects of perceived visual complexity were observed on sincerity, $\beta = .09$, $R^2 = 0.02$, $t(178) = 2.04$, $p < .05$, 95% CI [.003, .181], excitement, $\beta = .35$, $R^2 = 0.19$, $t(178) = 6.43$, $p < .001$, 95% CI [.242, .456], competence, $\beta = .16$, $R^2 = 0.07$, $t(178) = 3.86$, $p < .05$, 95% CI [.080, .247], sophistication, $\beta = .29$, $R^2 = 0.15$, $t(178) = 5.52$, $p < .001$, 95% CI [.187, .394], and ruggedness, $\beta = .39$, $R^2 = 0.03$, $t(178) = 5.76$, $p < .001$, 95% CI [.257, .524]. Perceived visual complexity had a significant negative effect on clarity, $\beta = -.09$, $R^2 = 0.03$, $t(178) = -2.29$, $p < .05$, 95% CI [-.180, .-.014], and a positive effect on originality, $\beta = .033$, $R^2 = 0.13$, $t(178) = 5.20$, $p < .001$, 95% CI [.208, .462]. The path coefficients of sincerity, $\beta = .23$, $t(170) = 3.01$, $p < .05$, 95% CI [.079, .379], competence, $\beta = .29$, $t(170) = 3.42$, $p < .05$, 95% CI [.124, .465] and favorability, $\beta = .33$, $t(170) = 5.29$, $p < .001$, 95% CI [.207, .453] on attitude toward the brand were significant. Standardized indirect effects show that only competence ($\beta = .033$, $SE = .04$, 95% CI [.018, .164]) played a mediating role, such that perceived visual complexity relates positively to perceptions of competence in the brand, which in turn enhances attitude toward the brand for the dishwashing liquid product category.

When attitude toward the product served as criterion, the overall model was significant, $F(9, 170) = 30.24$, $p < .001$, $R^2 = 0.62$, and the direct effect of perceived visual complexity on attitude toward the product was also significant, $\beta = .07$, $t(170) = 2.24$, $p < .05$, 95% CI [.009, .140]. Whereas significant effects of sincerity, $\beta = .23$, $t(170) = 3.14$, $p < .05$, 95% CI [.086, .375] competence, $\beta = .21$, $t(170) = 2.52$, $p < .05$, 95% CI [.045, .374] clarity, $\beta = .15$, $t(170) = 2.43$, $p < .05$, 95% CI [.028, .267] and favorability, $\beta = .33$, $t(170) = 5.45$, $p < .001$, 95% CI [.210, .448] on attitude toward the product were observed, standardized indirect effects revealed that only competence mediated the relationship between perceived visual complexity and attitude toward the product, $\beta = .06$, $SE = .03$, 95% CI [.002, .132].

Lastly, when purchase intention served as criterion, the overall model was significant, $F(9, 170) = 32.41$, $p < .001$, $R^2 = 0.63$, whereas the direct effect of perceived visual complexity on purchase intention was not significant ($p =.20$). The path coefficients of sincerity, $\beta = .27$, $t(170) = 3.44$, $p < .001$, 95% CI [.114, .421], competence, $\beta = .21$, $t(170) = 2.43$, $p < .05$, 95% CI [.040, .388], sophistication, $\beta = .23$, $t(170) = 2.93$, $p < .05$, 95% CI [.076, .389], favorability, $\beta = .22$, $t(170) = 3.41$, $p < .001$, 95% CI [.092, .344], and originality, $\beta = .10$, $t(170) = 2.16$, $p < .05$, 95% CI [.009, .186] were significant. Standardized indirect effects revealed competence, $\beta = .05$, $SE = .03$, 95% CI [.003, .121], and sophistication, $\beta = .10$, $SE = .04$, 95% CI [.026, .198] as mediators of the effect of visual complexity.

Soda. For attitude towards the brand, the overall model was significant, $F(9, 170) = 40.73$, $p < .001$, $R^2 = 0.68$, with the direct effect of perceived visual complexity on attitude toward the brand also being significant, $\beta = .09$, $t(178) = 2.53$, $p < .05$, 95% CI [.020, .161]. Significant effects of perceived visual complexity were observed on sincerity, $\beta = .16$, $R^2 = 0.06$, $t(178) = 3.42$, $p < .05$, 95% CI [.068, .253], excitement, $\beta = .37$, $R^2 = 0.28$, $t(178) = 8.37$, $p < .05$, 95% CI [.286, .462], competence, $\beta = .23$, $R^2 = 0.12$, $t(178) = 5.03$, $p < .001$, 95% CI [.140, .321], sophistication, $\beta = .33$, $R^2 = 0.17$, $t(178) = 6.12$, $p < .001$, 95% CI [.223, .442], and ruggedness, $\beta = .32$, $R^2 = 0.15$, $t(178) = 5.67$, $p < .05$, 95% CI [.209, .433], as well as originality, $\beta = .38$, $R^2 = 0.22$, $t(178) = 7.09$, $p < .001$, 95% CI [.272, .483]. Significant path coefficients on attitude toward the brand emerged for sincerity, $\beta = .34$, $t(170) = 4.52$, $p < .001$, 95% CI [.191, .487], excitement, $\beta = -.16$, $t(170) = -2.02$, $p < .05$, 95% CI [-.326, -.003], and competence, $\beta = .30$, $t(170) = 2.68$, $p < .05$, 95% CI [.078, .514], as well as favorability, $\beta = .30$, $t(170) = 4.95$, $p < .001$, 95% CI [.180, .420]. Sincerity, standardized indirect $\beta = .08$, $SE = .03$, 95% CI [.027, .162], and competence, $\beta = .10$, $SE = .05$, 95% CI [.011, .226] mediated the path from perceived visual complexity to attitude toward the brand.

For attitude toward the product, the overall model was significant, $F(9, 170) = 33.25$, $p < .001$, $R^2 = 0.64$, as was the direct effect of perceived visual complexity on attitude toward the product, $\beta = .12$, $t(178) = 3.06$, $p < .05$, 95% CI [.043, .197]. Sincerity, $\beta = .36$, $t(170) = 4.37$, $p < .001$, 95% CI [.196, .520], excitement, $\beta = -.28$, $t(170) = -3.14$, $p < .05$, 95% CI [-.455, -.104], competence, $\beta = .25$, $t(170) = 2.05$, $p < .05$, 95% CI [.010, .484], favorability, $\beta = .32$, $t(170) = 4.89$, $p < .001$, 95% CI [.192, .453], and originality, $\beta = .14$, $t(170) = 2.55$, $p < .05$, 95% CI [.032, .250], all having significant effects on attitude toward the product. Nonetheless, only sincerity, standardized indirect $\beta = .09$, $SE = .04$, 95% CI [.021, .182], and excitement, $\beta = -.16$, $SE = .06$, 95% CI [-.271, -.029] mediated the impact of perceived visual complexity on attitude toward the product, such that perceived visual complexity positively related to perceptions of sincerity, which in turn increased attitude toward the product. Perceived visual complexity also related positively to excitement, which in turn related negatively to attitude toward the product for the Soda product category.

When purchase intention served as the criterion, the overall model was significant, $F(9, 170) = 42.45$, $p < .001$, $R^2 = 0.69$, as was the direct effect of perceived visual complexity on the purchase intentions, $\beta = .11$, $t(178) = 2.59$, $p < .05$, 95% CI [.026, .188]. There were significant effects of sincerity $\beta = .31$, $t(170) = 3.56$, $p < .001$, 95% CI [.137, .479], excitement, $\beta = -.23$, $t(170) = -2.49$, $p < .05$, 95% CI [-.421, -.049], competence, $\beta = .29$, $t(170) = 2.31$, $p < .05$, 95% CI [.043, .544], sophistication, $\beta = .20$, $t(170) = 2.38$, $p < .05$, 95% CI [.034, .373], favorability, $\beta = .35$, $t(170) = 5.01$, $p < .001$, 95% CI [.212, .487], and originality, $\beta = .13$, $t(170) = 2.20$, $p < .05$, 95% CI [.013, .244]. Only sincerity, standardized indirect $\beta = .06$, $SE = .03$, 95% CI [.011, .146], excitement, $\beta = -.11$, $SE = .05$, 95% CI [-.218, -.014], and competence, $\beta = .09$, $SE = .05$, 95% CI [.002, .197] mediated the effect of perceived visual complexity, however. This analysis revealed a successful mediation, such that perceived visual complexity related positively to sincerity, competence, and excitement. Sincerity and competence related positively to purchase intention, while increasing excitement seemed to negatively impact purchase intention. The results of all of the analyses as they relate to the hypotheses are summarized in table 6.

Table 6. *Results of hypothesis tests.*

Model	Hypotheses									
	H1	H2a	H2b	H2c	H2d	H3a	H3b	H3c	H3d	H4
Overall										
A_b	✓	✕	✕	✓	✓	✕	✕	✓	✕	✕
A_p	✓	✕	✕	✓	✓	✕	✕	✓	✕	✕
PI	✓	✕	✕	✓	✓	✕	✕	✓	✕	✕
Ice Cream										
A_b	✕	✕	✕	✓	✓	✕	✕	✕	✕	✕
A_p	✕	✕	✕	✓	✓	✕	✕	✕	✓	✕
PI	✕	✕	✕	✓	✓	✕	✕	✕	✕	✕
Dish - washing Liquid										
A_b	✓	✕	✕	✓	✓	✕	✕	✕	✕	✕
A_p	✓	✕	✕	✓	✓	✕	✕	✕	✕	✕
PI	✕	✕	✕	✓	✓	✕	✕	✓	✕	✕
Soda										
A_b	✓	✕	✕	✓	✓	✕	✕	✕	✕	✕
A_p	✓	✕	✕	✓	✓	✕	✕	✕	✕	✕
PI	✓	✕	✕	✓	✓	✕	✕	✕	✕	✕

Note. ✓ denotes a confirmed hypothesis; ✕ denotes a rejected hypothesis.
A_b refers to attitude toward the brand; A_p refers to attitude toward the product.

GENERAL DISCUSSION

The purpose of this research was to explore the effects of product design on consumer perceptions of those products, including outcome variables such as attitude towards the product and brand, as well as purchase intention. In addition, this study explored the effect of product design on perceived brand personality of brands displayed on those products. Product design was manipulated to vary in terms of its design complexity (low or high), which itself depends on six components of design complexity, originally proposed by Pieters and colleagues (2010). The role of brand personality was explored at two levels; the five brand personality dimensions proposed by Aaker (1997), and the three brand personality appeal dimensions, proposed by Freling and colleagues (2011). This study addressed the following research questions: What role does visual complexity of product design play in consumer perceptions of those products, and brands associated with them? Moreover, are consumer brand personality perceptions also affected by visual complexity of product design, and can they affect outcomes? The final model predicted that brand personality and brand personality appeal would positively or negatively (depending on the dimension) mediate the relationship between design complexity and the outcome variable. Data were collected from an online MTurk sample, and the predicted mediation was tested using PROCESS (Hayes, 2017).

Summary of Findings

Results indicate mediation of perceived visual complexity effects, through several (but not all) brand personality and brand personality appeal dimensions, on attitude toward the brand and product, and purchase intention. For attitude toward the brand across all product categories, increasing visual complexity had a direct positive effect on sophistication and sincerity, which in turn led to greater attitudes toward the brand. Interestingly, a distinction emerged between attitude toward the product and attitude toward the brand. For instance, a mediation of perceived visual complexity on attitude toward the product through sincerity, competence, and sophistication was observed. Additionally, increasing perceived visual complexity had a positive effect on perceived excitement, and an increase in perceived excitement of the brand was associated with decreased attitude toward the product. Originality, a dimension of BPA, was also found to be positively associated with attitude toward the product, such that increasing perceived visual complexity increased perceptions of brand personality originality, which in turn led to more positive attitudes toward the brand. Consistent with prior research (Sung & Kim, 2010), the final model using purchase intention across all product categories revealed significant positive effects of all brand personality dimensions on purchase intentions, except for excitement, which decreased purchase intentions. As visual complexity was increased, perceptions of sincerity, competence, sophistication and ruggedness were increased, leading to greater purchase intention. While the original hypotheses (H_3, H_4) state that increased design complexity should have a negative association with sincerity and competence, and a positive association with excitement and sophistication, these results hint towards a possible positive relationship between design complexity, sincerity and competence. While the clear separation of design and feature complexity was not obvious for this study, this novel finding certainly warrants further exploration on whether design and feature complexity can be independently manipulated and measured in a product (not advertisement) context. Once again, originality was found to have a positive indirect effect as a mediator of the relationship between perceived visual complexity on purchase intention. It is also important to note that the overall model including all product categories resulted in a threefold inflation in degrees of freedom. The analysis was thus replicated at the product category level. Thus, significant results at the overall level are hardly surprising, and must be interpreted lightly. To remedy this, and to observe potential differences at the product category level, the analyses were again performed for each of the three product categories.

Results for the ice cream product category differed from those for dishwashing liquid and soda. Specifically, the increase in brand, and product attitude, as well as purchase intention as a result of increased perceived visual complexity, which was based on Pieters and colleagues (2010) findings regarding ads, was not supported. One possible explanation might be greater product involvement and thus less reliance on peripheral cues, such as package design, in this product category (Petty & Cacioppo, 1984). Pretest results also revealed significant differences in perception of visual complexity, as well as design complexity elements for the ice cream—suggesting that this failure in a relationship between outcome variable and independent variable is not due to poor manipulation of the independent variable. However, one very important factor pervasive to this entire study was the failure to properly manipulate feature complexity. The failure to do so in this particular study means that no test of the second hypothesis was possible at all—specifically, the testing of the moderation of feature complexity on the relationship between design complexity and the outcome variables, such that increasing feature complexity negatively impacts this relationship. As mentioned by Pieters et al. (2010), increasing feature complexity was found to decrease attitude towards brands within ads—by not clearly isolating feature complexity there is a possibility of this effect having muddled the clarity of the effect of design complexity. It is also possible that design and feature complexity cannot be clearly isolated when in the context of product design—possibly due to the (1) the lack of variety in design for certain product categories, (2) the inability to design realistic products with high feature complexity, (3) some product categories being better fit for manipulating feature complexity than others (a congruity effect between product category and variations in feature complexity), or less likely (4) the lack of existence of a clear distinction between feature and design complexity in a product context altogether. The effect of perceived visual complexity, however, was clearly found on the outcome variables for the other two product categories, except for purchase intention of the dishwashing liquid.

When looking at the effect of perceived visual complexity on each of the personality dimensions for each product category individually, perceived visual complexity had a positive effect on all personality dimensions. This finding contradicts what Favier et al. (2019) have demonstrated, leading us to originally predict that design complexity would relate negatively to sincerity and competence (i.e., H_3a and H_3b) which itself was based on facets (rather than the second-order factor) of the brand personality scale. This may mean that their conception of the relationship between visual complexity and brand personality is different since it targets more specific facets, and thus potentially doesn't extend to the higher-order factors those facets represent. However, visual complexity was indeed found to be positively related to sophistication and excitement, as predicted.

Interestingly, hardly any of the predicted mediations were successfully shown in the results. Out of the three product categories, there were only two successful mediations, from perceived visual complexity to brand attitude through excitement for ice cream, and from perceived visual complexity to purchase intention through sophistication for dishwashing liquid. These findings are both consistent with Favier and colleagues (2019) as well as Sung and Kim (2010) as they successfully illustrate a clear path from visual complexity positively affecting two brand personality dimensions, and these in turn positively affecting outcome variables such as product attitude and purchase intentions. However, the overwhelming results seem to suggest that no such relationship exists, or at least, for this study, the data do not seem to suggest such a relationship. Some possible alternative explanations are likely to be the questionable quality of the data gathered through online mediums such as MTurk. However, past research in this domain has in fact shown that across five different samples, each originating from a different platform (in person students, Lightspeed, MTurk, Qualtrics, and online students), none or very little differences exist in terms of data quality between these methods, in the context of advertising research (Kees, Berry, Burton, & Sheehan, 2017). In some cases, MTurkers were found to have higher ratings of data quality indicators such as attention checks, and number of characters used for open-ended answers (Kees et al., 2017). While this study was performed to assess data quality differences between sampling platforms specifically in the context of advertisement research, there is no reason to assume these findings wouldn't generalize to other topics such as products and brand personality. The complexity of the framework proposed for this research (complex instructions regarding identifying design complexity elements, having to answer long questionnaires, and the mediation model) coupled with the use of online respondents may have affected the results to some extent. More research is needed to identify if online respondents through a platform like MTurk are appropriate for more complex theoretical research and frameworks.

Theoretical Implications

The current research extends the body of literature concerning consumer product perceptions in multiple ways. First, the current study explores how visual elements of design originally developed for advertisements can be extended to product design. Second, the current research attempts to generalize known effects of visual design complexity found in advertisements on outcomes (such as attitude towards the brand, product, and purchase intentions) in a product context. Lastly, the current study combines the brand personality literature, both in terms of brand personality dimensions, and brand personality appeal, to visual design complexity by exploring the potential effect that increasing visual design complexity has on consumer perceptions of brand personality. In addition, it can be argued that the current literature attempts to build upon previous research shortcomings, such as Favier et. al. (2019) who had some ambiguous methods. In short, the current study attempts to generalize findings originally observed by Pieters et al. (2010) for advertisements, to products, while also including the concepts of brand personality (Aakers, 1997) and brand personality appeal (Freling et. al., 2011).

While the current research fails to successfully establish a predicted mediation path from visual design complexity, to brand personality dimensions, and finally to purchase intention and consumer attitudes across three different product categories, it does provide some insight into the application of visual design complexity in the context of product categories, and not print advertisements. One important theoretical contribution is the fact that the results suggest a potential significant pathway from design complexity, through brand personality, and lastly, outcome variables. This suggests that visual design can indeed affect brand personality dimensions, when visual design varies as a function of visual complexity, or at least, perceived visual complexity. To be clear, while most of the results were ambiguous, and did not provide clear evidence for this relationship, the existence of some significant pathways warrants further research, which can build upon the weaknesses of this current research to establish the existence or absence of the proposed relationships with more confidence.

Another theoretical contribution suggested by the current research is the idea that visual complexity can be manipulated by visual design components, but that the ability to do so on product packages may be limited in nature, when compared to print advertisements. While print ads can be more creative in their designs, product packages may require less creative, and more functional designs to illustrate some of the product features, ingredients, flavours or types. In addition, print advertisements, or perhaps even advertisements online, are not limited to representing physical products that have packages—a great example of this is in Pieters and colleagues' (2010) use of a Lee jeans ad, which doesn't represent a product that has a package at all. One can also think of software application advertisements, which do not have physical products, or simply any type of service being advertised. The distinction to be made here is simply that advertisements can draw from a larger pool of products and services, and can thus expand designs more creatively than product packages, where product packages don't only have specific requirements for what is displayed on the label (e.g., the Canadian *Consumer Packaging and Labelling Act*, 1999), but are also smaller in size as well. This limits the creativity product package designers work with, meaning that, for instance, the 6 design complexity principles outlined by Pieters and colleagues (2010) may be more difficult to implement and manipulate in the product package context versus an advertisement context. Building upon this, future research could look at how advertisement design complexity and product package design complexity differ, if at all. One contribution that this study provides is the difference in how the design complexity principles were measured. Whereas Pieters and colleagues (2010) asked for the presence or absence of these variables, the main study of this research instead used sliding scales, from zero to one-hundred, to measure each design complexity principle, adding to the variance that can be captured for that construct. Indeed, our analyses revealed that products designed to be more complex in terms of design complexity, were rated higher on the slider scale for each principle. Asking participants whether a principle is present or not can be difficult given the sometimes-complicated nature of understanding objects in a scene, and their arrangement. Barring an objective measure of design complexity, adding a scale with more variance alleviates some of the risk of using a binary scale.

Due to mixed results on the manipulation checks—which suggested that the independent manipulation of design complexity and feature complexity was not successful—the hypotheses tests were based on consumer's perceived overall visual complexity. What we do know from the pretest results is that, for all product categories, perceived visual complexity seems to be, for the most part, driven by design complexity elements. While the original goal of this study cannot be fully tested, it is still interesting to explore the effects of perceived visual complexity, as driven by design complexity, on product perceptions, brand attitudes, and purchase intention, mediated by brand personality components. Of note, the perceived visual complexity scale, though rating high on reliability, must also be taken lightly during interpretation, as this scale consisted of only one item, and originally was meant to serve as a manipulation check. Nonetheless, the current study contributes to the literature by looking at the effects of perceived visual complexity, driven by design complexity, on brand personality and personality appeal, as well as consumer attitudes and intentions.

Managerial Implications

The aim of the current study was to, from a practical standpoint, provide organizations involved with product package design with insight regarding how more complex, and simpler designs may affect consumer perceptions of their product. This implication was expected to range consumer perceptions from an attitudinal standpoint (product and brand attitude), a behavioural standpoint (purchase intentions), and a relational standpoint (brand personality and brand personality appeal perception). However, the results of the study are not clear enough to make this assertion with confidence. Despite this, the current study still has some managerial implications that may be useful to firms or organizations designing new product packages, or redesigning existing product packages. The first is the knowledge that the design complexity of the product can be measured successfully through application of Pieters and colleagues (2010) framework for design complexity, consisting of six core design principles. The second is that this design complexity, when measured, does relate to perceived brand personality. For instance, more visually complex designs not only increase perceived visual complexity of the product, but also brand personality dimensions like sophistication and excitement. For an organization with a product, or range of products, that are known to rate highly on the excitement or sophistication dimensions of brand personality, it is useful to know that increasing visual complexity can help maintain these perceptions of brand personality, and possibly enhance these perceptions. While the evidence is slim, there was a positive mediation identified for ice cream and dishwashing liquid for these brand personality dimensions, such that increasing (perceived) visual complexity led to increases in excitement and sophistication, respectively, which led to increases in product attitudes, and purchase intentions, respectively. Organizations can thus potentially decide to run studies using a similar framework in order to test different product designs. In addition, this study also showed that these results may indeed depend on the type of product being assessed. For instance, the successful mediation described above does not hold true for the soda category. While this may be due to methodological shortcomings, it is an indicator that organizations should consider how product categories not only fit in with certain brand personalities, but also how the product packages design may or may not affect that relationship.

Limitations and Future Research Directions

Limitations of this study include the lack of a proper manipulation check for the successful design of the fictitious stimuli developed. The study included an initial pretest to determine product categories and indicate which design principles to include or exclude to manipulate complexity, but did not test products designed from that initial pretest. While the main study included a measure of the design principles, testing it beforehand may have reduced to overall complexity of the questionnaire, data, and analyses. It would have also allowed for final touch ups on the products before proceeding with the hypothesis tests which may have prevented ambiguous results, such as the ones observed for the dishwashing liquid product category. At the same time, including such a pretest may have allowed for a clearer understanding of the distinction between feature and design complexity, originally proposed by Pieters and colleagues (2010). In this study, it is likely that the products were simply designed in a way that muddled both types of complexities which in turn led to the complete absence of hypothesis testing for the predicted moderation of the relationship between design complexity and outcome variables by feature complexity. While it is certainly unlikely that the lack of a measurable effect on the outcome variable is due to some level of impact from feature complexity, future studies may seek to more carefully manipulate feature complexity.

Another prominent limitation of the current study is the fact that, in this case, feature complexity was not treated as a continuous variable, but instead products were designed to have low or high feature complexities, as determined by their visual complexity scores. A more powerful way to manipulate feature complexity would have been to include more products and product categories, and to have them continuously vary in their visual complexity scores to obtain a more precise measure of the predicted moderation. While manipulating feature complexity into two distinct groups (high and low) is a good starting point to identify its potential effect on a relationship, a continuous measure may have produced more thorough and objective results. Using a pool of existing products of low familiarity to a sample and measuring their feature complexity by running them through the different methods included in this study, for example, could be one way to approach a more objective and continuous feature complexity variable.

A final limitation to this study is the fact that the questionnaire used for the main experiment was perhaps long and complex. This includes lengthy instructions about how to understand the design complexity elements and rate them, as well as the full brand personality and brand personality appeal scales. It is possible that because of this, participants may not have fully understood the study, or perhaps felt fatigued and did not pay full attention to the visual stimuli while answering the questionnaire. A cleaner methodology for future replications would help determine if this was the case or not, and it would also shed light on the possibility that complex research designs may or may not be appropriate for the MTurk platform.

*Future Directions***.** The effect of perceived visual complexity was clearly found on the outcome variables for ice cream and soda, but not the purchase intention of the dishwashing liquid. Future research could explore the possibility that dishwashing liquid may be perceived as a utilitarian product, making it distinct from products like ice cream or soda. Indeed, Voss, Spangenberg and Grohmann (2002) have previously looked at the possibility that when forming brand attitudes, those attitudes are based on two, rather than one dimension of attitude. Attitudes formed for brands by respondents were shown to be predictably classified as being hedonic, that is, affectively based and experiential, or utilitarian, which is to say functional, and instrumental (Batra & Ahtola, 1990). While dish soap was not specifically used as a product category in the scale developed and tested by Voss and colleagues (2002), other studies have hinted at or successfully established dish detergent as a utilitarian and low involvement product (e.g., Crowley, Spanenberg, & Hughes, 1992; Suh & Youjae, 2006). The notion of utility can also be extended from brand attitudes to product benefits. While the literature in this field of study has not specifically looked at the effects of fictitious versus existing utilitarian brands on purchase intentions, perceived product benefits (utilitarian or symbolic) have been suggested to have effects on purchase intentions, while considering the effect of existing or fictitious brands versus general product categories. For example, LeBoeuf and Simmons (2010) have explored the symbolic and utilitarian product benefits on consumer attitudes and purchase intentions, showing that at the product category level (i.e., without mention of the brand) utilitarian products were perceived as providing more utilitarian benefit than symbolic products. However, when branding the products (and not merely mentioning the product category), the effect was reversed, where utilitarian (symbolic) products now revealed more symbolic (utilitarian) benefits than before. Thus, they determine that the effect of branding a product may indeed reverse the perceived utility (or symbolic benefit) of a product category. In the same set of studies, LeBoeuf and Simmons (2010) also explore the same effect in the context of fictitious brands versus mere product categories. They reveal a similar effect for the product category, but cannot reliably determine the reversed effect for the fictitiously branded products—results of the interaction were non-significant. This suggest that there is perhaps something more at play when we consider the effects of product benefits on purchase intention, in the context of fictitious brands. In the context of this study, it may be possible that the attribution of a fictitious brand to an otherwise utilitarian-benefit product may have affected participant's willingness to purchase the product in a similar way as in LeBoeuf and Simmons (2010). The reason for why this occurs is yet unclear, but LeBoeuf and Simmons (2010) speculate that different appeals arise when brands are attributed to product categories. To consider these findings is important, particularly because dishwashing liquid may produce utilitarian brand attitudes, and utilitarian benefits in consumer's minds, whereas soda or ice cream may be distinct from that. One other possible avenue for future research would be to include an objective measure of visual attention. With it, not only could how much attention people put towards product packages that are simple versus complex be analyzed, but also, where people look on the product package as a result of simple or complex designs, which has been looked at previously in advertisement contexts (attention put towards the brand, pictorial, or other aspects of the product design; Pieters, Wedel, and Zhang, 2007; Pieters et al., 2010).

CONCLUSION

While previous research has sought to uncover the effects of visual design and visual complexity on consumer perceptions of brands and products, research in the context of product packages is rare. Previous research has shown that product packages can affect consumer perceptions of the product, as well as the brand, elevating the role of product packages to one that affect consumer-brand relationships. The current study builds on these findings and explores the effects of visual design complexity on consumer responses, such as brand attitude and purchase intentions, to product packages. Brand personality and brand personality appeal were included as a potential mechanism through which visual design complexity affects those consumer responses. Results indicate that the effects of visual complexity are only partially mediated by brand personality, and that its effect on outcome variables remains equivocal. Future research is needed to address some of the methodological shortcomings of the current study, and to further explore the notion that visual design complexity affects consumers' visual attention as a pathway to responses to product packaging.

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Appendix A

Visual representation of the between-groups stimuli conditions

High Feature, High Design Complexities

High Feature, Low Design Complexities

Low Feature, High Design Complexities

Low Feature, Low Design Complexities

Appendix B

Feature complexity measures for each stimulus, by condition

Product Category	Conditions		Feature Complexity Measures		
	Feature Complexity	Design Complexity	File Size (KB)	Feature Complexity Score	Feature Congestion Score
Ice Cream	High	High	87.40	40,526	4.34
	High	Low	63.13	30,738	3.75
	Low	High	76.27	32,200	4.15
	Low	Low	55.02	20,760	3.57
Dishwashing Liquid	High	High	64.15	29,288	3.37
	High	Low	62.46	28,754	3.35
	Low	High	54.52	24,418	2.97
	Low	Low	49.92	22,560	2.88
Soda	High	High	64.07	29,323	3.23
	High	Low	64.15	28,921	3.22
	Low	High	51.53	23,324	3.00
	Low	Low	38.26	13,051	2.86

Note: Feature congestion score (Rosenholtz et al., 2007); Feature complexity score (Franzen et. al., 2020; https://osf.io/f7d2h/, which also includes links to the stimuli used)