How does the biophilic design of building projects impact consumers' responses? – Case of retail stores

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Abstract

The study that biophilic store design (BSD) has a much higher perceived visual quality, increases the desire to patronize, increases willingness to spend retail stores shopping times is on the increase in the literature. The study of greenery in building environments has been vastly studied, however, the inclusion of greenery study in retail stores and its potentials to provide a strategic business advantage have been scarcely explored. This research work draws from the Attention Restoration Theory to unearth the impact of biophilic design attributes on consumer responses. Hence, this study asked: "How do attributes of biophilic design in retail stores impact consumers' responses in retail stores". A quantitative research method with an online questionnaire was employed; 177 participants were recruited. Multiple regression analysis was computed via SPSS and demonstrated that the four attributes (predictors) of biophilic design positively impact consumer responses. Findings for three attributes (biomorphic forms and patterns, material connection with nature, and complexity and order) were significant, while a visual connection with nature was not significant. These findings suggest that a biophilic design positively impact consumer responses; however, simply presenting or using natural elements is not sufficient to produce positive consumer responses. Additionally, the t-test revealed that intent to purchase was significantly higher for a store low in biophilic attributes than the study hypotheses. Study limitations and implications are discussed herein. This work contributes to the biophilia design paradigm of building projects by empirically demonstrating the restorative potential of lifestyle centers.

Keywords: Biophilic design, consumers' responses, intention to purchase, intention to recommend, retail stores

1. Introduction

As part of efforts aimed at improving the quality of indoor environments and satisfying humans' innate and evolved desire to connect with nature (referred to as *biophilia),* space planners and designers have aimed to bring nature into the indoor environment (Abdelaal and Soebarto, 2018; Neilson et al., 2019). However, several ways of bringing nature into the indoor or built environment in line with biophilia are understood as *biophilic design* (Lipovac et al. 2020). Biophilic design seeks to connect the inherent human need to affiliate with nature in the modern built environment. Since today's "natural habitat" is mostly the built environment, where people now spend 90% of our time, the biophilic design seeks to satisfy their innate need to affiliate with nature in modern buildings and cities.

The implementation of biophilic design initially gained attention in hospitals, offices, and residential areas (Nieuwenhuis et al., 2014; Neilson et al., 2019; Egner eta al., 2020, Lipovac et al. 2020). The scholars highlighted that biophilic design is aesthetically pleasing, promoting cognitive functioning, and offers beneficial impacts in built environments (Joye et al., 2010; White and Gatersleben, 2011). The application of biophilic design in retail settings has recently gained popularity due to its perceived economic benefits, as it offers more pleasurable experiences for consumers (Wilson, 2015; Rosenbaum et al., 2018). However, these benefits may take a different form in a store's context (Joye et al., 2010).

Recent studies such as Ping and Hwa (2020) identified factors that influence shoppers' intention to visit shopping malls. The authors unearthed factors that included (1) convenience and accessibility, (2) internal environment, (3) entertainment, and (4) tenant variety. Few scholars found that Biophilic Store Design (BSD) has an impact on shopper satisfaction; intention to recommend (IR) the store to others; and planned expenditures, which include the intention to purchase (IP) and willingness to pay (Herzog and Gale, 1996; Rosenbaum et al., 2016). While several studies have responded to Joye et al.'s (2010) call for further research; however,

contemporary researchers have focused on the restorative impact of BSD on consumer behaviour, emotions, and attentional fatigue (Brengman et al., 2012; Rosenbaum et al., 2016; Rosenbaum et al., 2018; Ortegón-Cortázar and Royo-Vela, 2019). Thus, rather than studying the vastly investigated restorative impact of biophilic design on consumers in store's context, this work sought to remedy the missing research area that has not gained adequate attention in biophilic design literature impact of building projects. The scantly studied area is on how the biophilic design attributes impact consumers' intention to recommend (IR) and intention to purchase (IP).

Therefore, the identification of the literature gap has generated the research question: "How do the attributes of biophilic design impact consumers IR and IP?" The aim of this study is to investigate the impact of biophilic design attributes on consumers' IP and IR, which was addressed through the following objectives: (1) Examination of the extent to which consumers prefer different attributes of biophilic design (visual connection with nature, biomorphic forms and patterns, material connection with nature, and complexity and order of nature) in retail stores. (2) Exploration of the relationship between these attributes and consumers' IP. (3) Exploration of the relationship between these attributes and consumers' IR.

The work contributes to the BSD literature by addressing the existing literature gap regarding the significance of different attributes of BSD. Besides, it contributes to practice, as the findings have important implications for store designers and planners, facility managers, and architects (Joye et al., 2010; Rosenbaum et al., 2016).

The study comprises six sections. Apart from the background in the above section, section two discusses the study's theoretical framework, followed by the derivation of hypotheses. The fourth section is the methodology and data collection section. The results were discussed in section five presents, followed by the conclusions. Meanwhile, the discussion includes the study's limitations and avenues for future research.

2. Theoretical Framework – Attention Restoration Theory (ART)

Theoretically, this study adopted the Attention Restoration Theory (ART) because it focuses on "voluntary attention", which refers to individuals' willingness and efforts to reduce their level of attentional fatigue and focus on certain activities or tasks (Kaplan, 1995, p. 169, Joye et al., 2010). This terminology—"voluntary attention"— was modified to "directed attention" to avoid confusion, as the attention can be susceptible to an environment, manageable, and directed (Kaplan 1995, p.170). ART has a primary focus on attentional processes and cognitive fatigue. More specifically, ART focuses on the process of depletion and restoration of directed attention, a form of attention on which people rely when they focus on tasks that are not spontaneously interesting (Egner et al., 2020). ART propose that three other environmental qualities can elicit attention restoration processes: being away (the extent to which an environment provides the opportunity to get away from daily hassles), compatibility (the extent to which an environment matches a person's inclinations at a given point), and extent or coherence (the extent to which the elements of an environment are connected in an orderly fashion) (Egner et al., 2020). Attentional fatigue occurs when an individual is required to engage in the "continuous application of mental effort", such as during a prolonged project or action (Stevenson et al., 2018). While the restoration of attentional fatigue and the attendant benefits are ART outcomes, this theory can also be extended to explain additional outcomes, such as changes in attitudes and behaviours, which are impacted by decreased attentional fatigue (Stevenson et al., 2018). Table 1 discussed relevant research which adopted ART.

Table 1: Relevant research which adopted ART.

Journal articles	**ART-adopted Research**
Egner et al., (2020)	The authors explored how ART offers a framework based on conditioning that can be applied to investigate the restorative effects of nature in contexts such as the museum.
Neilson et al., (2019)	A review of the limitations of Attention Restoration Theory and the importance of its future research for the improvement of well-being in urban living
Rosenbaum et al. (2016)	…. demonstrated that shoppers can be categorised into restorative and non-restorative groups depending on their responses to ART's four components: being away, fascination, extent, and compatibility. The authors further illustrated that restorative shoppers have higher shopping satisfaction levels, IR, IP, and loyalty to the store than non-restorative shoppers, and their impact on consumer responses (IR and IP) using three approaches: stress reduction; cognitive performance; and emotion, mood, and preference were rigorously engaged with since it was the focal point of their work.
Wolf (2004) Karmanov & Hamel (2008) Pasini et al., (2014) Rosenbaum et al., (2016)	…The authors utilised ART not in retail settings but typically collected data via self-reports and questionnaires, in which participants view photographs or films of landscapes or the interiors of buildings and rate these on factors such as preferences or likability.
Berto et al. (2008, p.186)	…. Investigated ART as added that an interaction with the object or environment of fascination could be beneficial for restoring "a depleted attentional system".
Wolf (2004)	…. claimed that a physical natural environment within a store not only provides more a satisfactory shopping experience—as the natural environment has a restorative impact on attentional fatigue—but also can represent a firm's image since the store design can influence customers' perceptions of product quality and willingness to purchase
Kaplan, (1995).	The original study of Kaplan's ART focused on "voluntary attention", which refers to individuals' willingness and efforts to reduce their level of attentional fatigue and focus on certain activities or tasks

This study does not measure attentional fatigue or its restorative impact, as several prior studies have done so; instead, the focus is on consumer-specified outcomes considered to be impacted by these restorative effects. Meanwhile, increased attentional fatigue often leads to a decreased concentration capacity (Cimprich, 1992). Thus, to support an individual who has weak intentions and abilities to direct his or her attention to specific tasks or activities, Kaplan (1995) proposed that all distractions, such as the level of noise or air pollution, must be inhibited.

Previous empirical studies, including those in settings other than retail that utilised ART, have typically collected data via self-reports and questionnaires, in which participants view photographs or films of landscapes or the interiors of buildings and rate these on factors such as preferences or likability (Wolf, 2004; Karmanov and Hamel, 2008; Pasini et al., 2014; Rosenbaum et al., 2016). The appropriateness of ART for data collection for BSD studies made it more compelling for its adoption in this study. Based on these relevant factors, this study focuses on ART because it is more relevant to shopping in retail settings, which is the study's methodological scope. Thus, one could surmise that shopping, as an entertainment context, could potentially have a restorative attentional impact by promoting fascination, in line with ART.

Rosenbaum et al. (2016) demonstrated that shoppers can be categorised into restorative and non-restorative groups depending on their responses to ART's four components: being away, fascination, extent, and compatibility. The authors further illustrated that restorative shoppers have higher shopping satisfaction levels, IR, IP, and loyalty to the store than non-restorative shoppers. Rosenbaum et al. (2016) and their impact on consumer responses (IR and IP) using three approaches: stress reduction; cognitive performance; and emotion, mood, and preference were rigorously engaged with since it is the focal point of this work.

3. Derivation of hypotheses

Empirical studies on visual connections with nature have examined individuals' attitudes and behavioural changes upon interaction with the natural environment (Barton and Pretty, 2010). The first attribute of BSD, a visual connection with nature, refers to visual or other physical evidence of natural elements' presence in a built environment (Soderlund and Newman, 2015). This connection with nature includes potted plants, trees, moving water, ambient light, and water fountain can promote "extreme biophilic attention (Mead, 2008; Browning et al., 2014) and aforementioned 'fascination', thereby leading to positive changes in one's mood (Karmanov and Hamel, 2008). Windhager et al. (2011) investigated the impact of a visual connection with nature and identified that such an environment positively impacts individuals' emotions, moods, and preferences (Windhager et al., 2011). Soderlun and Newman (2015) have stated that natural elements featuring movement can offer more than static ones.

Besides, the impact of a visual connection with nature on attitudes has been demonstrated in non-retail settings, such as outdoor sports and entertainment contexts (Barton and Pretty, 2010). Thus, the effect appears to be generalisable across contexts. In addition to visual elements, non-visual natural elements, such as nature sounds and thermal sensations, can be another important source of the biophilic design (Alvarsson et al., 2010; Zhang et al., 2010). However, this study's data was collected with an image-based questionnaire; thus, non-visual connections were not measurable. Based on the description of the first attribute of the BSD, the following alternative and null hypotheses are thus stated:

H1a: There is a positive relationship between preference ratings for visual connections with nature (plants and water) and intention to recommend the store to others (IR)

H_0: There is no positive relationship between preference ratings for visual connections with nature (plants and water) and intention to recommend the store to others (IR)

H2a: There is a positive relationship between preference ratings for visual connections with nature (plants and water) and intention to purchase (IP)

H_0: There is a positive relationship between preference ratings for visual connections with nature (plants and water) and intention to purchase (IP)

In progressing to the second attribute - biomorphic forms and patterns. These refer to designs of buildings and interiors mimicking natural elements' forms and patterns (Browning et al., 2014). As biomorphic object designs stem from nature, they naturally benefit from biophilia (Joye, 2007; Kellert, 2008). Thus, biomorphic objects have a restorative impact on fascination, despite not being made of natural material or featuring no apparent connections to natural settings (Benyus, 2008). Examples of biomorphic objects are the Eiffel Tower, the lower curve of which is inspired by the human thigh bone; a chair shaped like a tree's annual rings; and the Sydney's Opera House, which mimics bird wings (Benyus, 2008; Kellert, 2008).

Unlike the other biophilic design attributes, biomorphic forms and patterns do not bring nature into the built environment but bring artificial objects inspired by nature (Joye, 2007). To digress a bit, the significant sources of attention restoration are the four ART components, which primarily rely on liking humans' inclination towards nature and natural elements, which means biomorphic forms and patterns lack distinctive natural elements. Thus, consumer responses to interactions with biomorphic objects may differ (Joye, 2007). The literature suggests that biomorphism has a similar restorative impact as the natural environment; however, few studies have tested this hypothesis (Joye, 2006; Kellert, 2008). Also, the literature has typically focused on this attribute regarding the functionality or aesthetics of the biomorphic building or object (Benyus, 2008; Cramer and Browning, 2008; Kellert, 2008). As such,

this study examines whether consumer responses to biomorphic forms and patterns

impact consumer responses (IR and IP). Therefore, based on the second attribute, the alternative and null hypotheses are stated:

> ***H3a: There is a positive relationship between preference ratings for biomorphic forms and patterns and IR***
>
> ***H_0: There is no positive relationship between preference ratings for biomorphic forms and patterns and IR***
>
> ***H4a: There is a positive relationship between preference ratings for biomorphic forms and patterns and IP***
>
> ***H_0: There is no positive relationship between preference ratings for biomorphic forms and patterns and IP***

Additionally, a material connection with nature indicates whether the materials used for manufacturing or constructing an object or building have a visible connection to nature (Soderlun and Newman, 2015). The material connection with nature should reflect distinctive natural environments or elements. Hence, mimicking the natural environment or elements, as in biomorphic forms and patterns, is insufficient to generate a material connection with nature (Browning et al., 2014). The most common example of a material connection with nature is timber, such as in wooden furniture and interiors, including moving water in the built environment. Besides, a material connection with nature can confuse the first attribute, a visual connection with nature. However, the first attribute focuses on bringing intrinsic, authentic natural elements into the built environment, while the third attribute means using natural material for construction or manufacturing (Browning et al., 2014). Furthermore, empirical studies on the third attribute of BSD - material connections with nature, especially the use of wood, have mainly been used in residential areas (Spetic et al., 2006; Tsunetsugu et al., 2007; Nyrud and Bringslimark, 2010). The studies agree that a wooden interior likely has a positive impact on mood and stress reduction. The studies examined interactions over a more extended period than those seen in store settings. Thus, this

study's potential contribution is examining consumer responses in retail settings featuring short-term visualisations of natural materials. Based on the third attribute, the fifth and sixth alternative and null hypotheses are thus stated:

> ***H5: There is a positive relationship between preference ratings for a material connection with nature (e.g., wooden furniture or interiors) and IR***
>
> ***H_0: There is no positive relationship between preference ratings for a material connection with nature (e.g., wooden furniture or interiors) and IR***
>
> ***H6: There is a positive relationship between preference ratings for a material connection with nature (e.g., wooden furniture or interior) and IP.***
>
> ***H_0: There is no positive relationship between preference ratings for a material connection with nature (e.g., wooden furniture or interiors) and IR***

Lastly, the term complexity and order of nature refer to the variety of natural elements and their harmony (Browning et al., 2014). The built environment may feature geometric figures or patterns, various plants, and diverse materials (Soderlun and Newman, 2015). In general, complexity and order of nature are not terms used in conjunction, as increased complexity often causes chaos, not order (Taylor, 2006). However, Taylor (2006) stated that the complexity caused by natural elements, such as fractals, often promotes creativity and reduces stress levels, subject to individual preferences. To the authors' knowledge, previous empirical research have not focused on complexity in the arrangement of natural elements in a built environment; rather, there has been an examination of the complexity caused by fractal geometry, such as wall art or paintings, and the impact on cognitive functioning, attentional fatigue, and stress reduction (Taylor, 2006; Hagerhall et al., 2008). This study addresses this gap in the literature by capturing consumers' responses to and perceptions of complexity due to the arrangement of various natural elements. Based on the description of the fourth attribute, the seventh and eighth alternative and null hypotheses are thus stated:

H7: There is a positive relationship between preference ratings for complexity and order (arrangement of natural elements) and IR

H_0: There is no positive relationship between preference ratings for complexity and order (arrangement of natural elements) and IR

H8: There is a positive relationship between preference ratings for complexity and order (arrangement of natural elements) and IP

H_0: There is no positive relationship between preference ratings for complexity and order (arrangement of natural elements) and IP

Based on the eight hypotheses, the higher the IR and IP of a store, the higher the BSD features. This notion corresponds with the empirical literature of (Rosenbaum et al.) 2016 that identified positive relationships between consumers' appreciation for the components of biophilic design and satisfaction, IR, IP, and loyalty. As such, the final two alternative and null hypotheses are as follows:

H9: IR is higher for stores that score higher on the four BSD attributes than for stores that score lower on the four BSD attributes

H_0: IR is not higher for stores that score higher on the four BSD attributes than for stores that score lower on the four BSD attributes

H10: IP is higher for stores that score higher on the four BSD attributes than for stores that score lower on the four BSD attributes

H_0: IP is not higher for stores that score higher on the four BSD attributes than for stores that score lower on the four BSD attributes

4. Methodology and Data collection

The quantitative study was conducted via an online survey tool (SurveyMonkey) which comprised self-report/estimate measures based on two retail stores, which served as the independent variables (high versus low biophilic design attributes).

This work utilised nine images of a store high in all four biophilic design attributes and nine images of a store low in all four biophilic design attributes. Regarding the selection of images, we attempted to match the stores in terms of products (e.g., clothes, household products, and plants). In selecting the stores, we selected the ones

with more evidence of anthropologies features of the four attributes of biophilic design (See figures 2 and 3). For instance, Anthropologie has plants across the store (visual connection with nature); uses naturally shaped objects, such as whales, octopi, and deer (biomorphic forms and patterns); features wooden walls, floors, and stairs (material connection with nature); and complex arrangements of plants on the wall (complexity and order). In contrast, the four attributes of biophilic design have a limited presence at Urban Outfitters. In this case, we selected stores with evidence of attributes of biophilic design, such as plants (visual connection with nature), a spiral structure (biomorphic forms and patterns), wooden floors and shelving units (material connection with nature), and simple arrangements of plants (complexity and order). However, fewer attributes of biophilic design are present at Urban Outfitters than at Anthropologie. See Figure 1 for the research methodology framework.

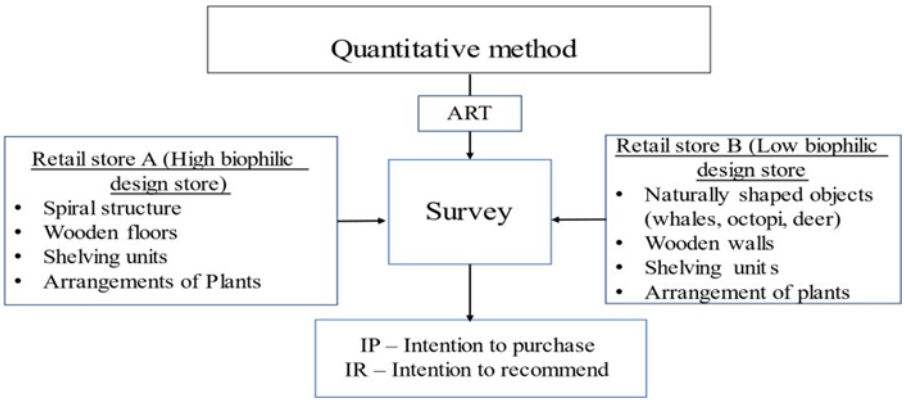

Figure 1.1: research methodology framework

Regarding the collection of images, multiple photographs of the store were adopted to show the four attributes of biophilic design for each store, and these were integrated within one image for ease of viewing within the questionnaire. Presenting coloured images was crucial, as appreciation of the attributes of biophilic design can differ depending on the richness of colours (Tsunetsugu et al., 2007).

As shown in Figures 2 and 3, Anthropologie features more evidence of the four attributes of biophilic design. For instance, Anthropologie has plants across the store (visual connection with nature); uses naturally shaped objects, such as whales, octopi, and deer (biomorphic forms and patterns); features wooden walls, floors, and stairs (material connection with nature); and complex arrangements of plants on the wall (complexity and order). In Figure 3, there is evidence of attributes of biophilic design, such as plants (visual connection with nature), a spiral structure (biomorphic forms and patterns), wooden floors and shelving units (material connection with nature), and simple arrangements of plants (complexity and order). However, fewer attributes of biophilic design are present at Urban Outfitters than at Anthropologie. Presenting coloured images was crucial as an appreciation of the biophilic design attributes can differ depending on the richness of colours (Tsunetsugu et al., 2007).

Three additional researchers helped the lead researcher select these stores and categorise them into the high versus low biophilic design categories as a pretest for adopted methodology. This process involved rating each store on the four biophilic design attributes. The aim was to ensure consensus across all raters regarding their perceptions of these stores before presenting the store images to the participants of the main study.

A quantitative approach was selected based on the relevance of theoretical adoption of ART for the study, which was also used to develop a series of testable hypotheses. Specifically, the study tested the predictor of the outcome variables and assessed potential differences in IR and IP for high versus low BSD settings (on a large sample of participants). Besides, snowball sampling was adopted. The high biophilic design store featured high levels of four attributes (visual connection with nature, biomorphic forms and patterns, material connection with nature, and complexity and order). In contrast, the low biophilic design store featured low levels of these four attributes. The presentation order of high and low BSD levels in the survey was randomised to minimise biases caused by the questions' order.

Moreover, this work adopted a cross-sectional survey design over a longitudinal design. A cross-sectional survey collects data on all variables at a single point in time. In contrast, a longitudinal survey collects some data at one point and other data at another point (Rindfleisch et al., 2008). While a longitudinal survey could produce less biased responses "by separating predictor and outcome variables over time", a cross-sectional survey better suits a context in which participants interact with the research setting for a limited time, such as shopping (Rindfleisch et al., 2008, p.274). The design of each stage of the survey had its benefits; however, the research scope's appropriateness was prioritised in selecting the survey's design.

There were two outcome variables (IP and IR), plus an additional four predictor variables (analysed in the multiple regression, as described below). The four predictor variables were the following attributes of biophilic design: (1) a visual connection with nature, (2) biomorphic forms and patterns, (3) a material connection with nature, and (4) complexity and order. To ensure the reliability of the questionnaire used, its degree of measurement between the claimed measurement and the real world. The content validity was adopted to answer the questions of whether the questionnaire covers all the relevant questions needed to answer the research questions. In doing this, the content validity was accomplished using expert panel to answer the question: Is the question or measurement in the questionnaire "indispensable" to the intended measurement? Lawshe, (1975) recommended that from a panel of subject matter experts (SME), ask whether intended questions or survey is relevant to the intended research issue? The Lawshe test below was used for the content validity:

CVR = [(ne - N)-N/2] / 2

... where

CVR = content validity ratio' ne = number of experts in the panel answered "yes, relevant"
N = total number of experts in the panel

A total of 225 respondents participated in the survey using snowball sampling. Snowball sampling refers to the researcher contacting an individual and distributing the questionnaire to his or her acquaintances (Goodman, 1961). There were 27 partial responses from participants who did not complete the questionnaire, and 21 participants did not agree with the informed consent statement and thus were disqualified. While 225 participants recruited were involved at the outset of the survey, 177 participants completed the survey (completion rate of 78%). The average completion time was 5 minutes. Below are Figures 2 and 3 of store images of

Anthropologie (High BSD) and store images of urban outfitters (Low BSD), respectively.

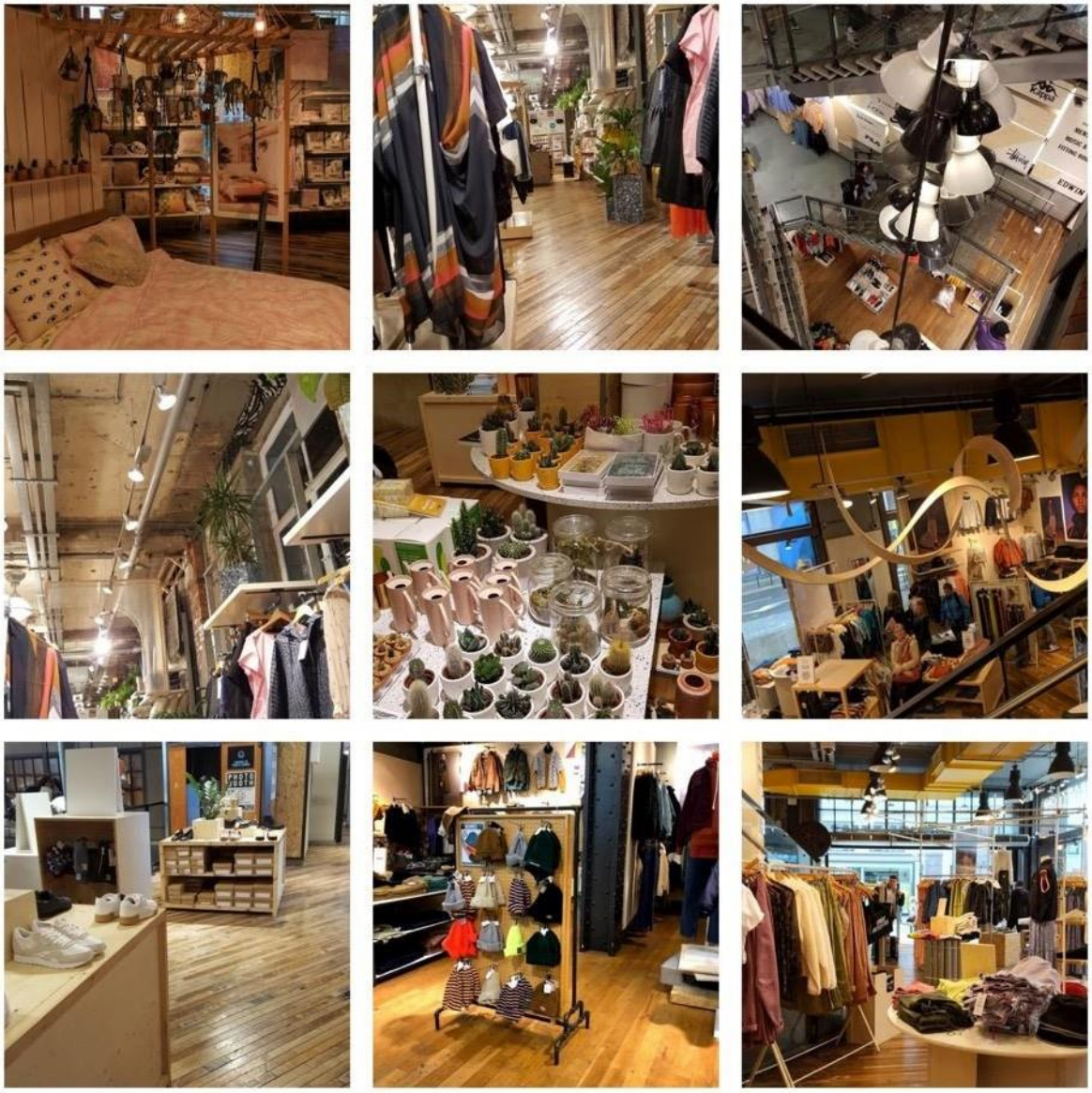

Figure 2: Store images of Anthropologie (High BSD)

Figure 3: Store images of Urban Outfitters (Low BSD)

5. Data analysis and Results

The authors used SPSS for data analysis. There were 27 partial responses from participants who did not complete the questionnaire, and 21 participants did not agree with the informed consent statement and thus were disqualified. While 225 participants were recruited and started the questionnaire, 177 participants completed the questionnaire (completion rate of 78%). The average completion time was 5 minutes. A summary of the participants' demographic information is in table 2. Some participants opted not to provide demographic information, which explains the different sample sizes.

Table 2. Summary of participants' demographic and background information.

Summary of participants demographic and background information	
Age (N=174)	18 to 24 (N=43, 24.71%)
	25 to 34 (N=45, 25.71%)
	35 to 44 (N=18, 10.34%)
	45 to 54 (N=22, 12.64%)
	55 to 64 (N=26, 14.94%)
	65 to 84 (N=18, 10.34%)
	75 or older (N=2, 1.14%)
Gender (N=174)	Female (N=100, 57.47%)
	Male (N=74, 42.52%)
Ethnicity (N=176)	American Indian or Alaskan Native (N=2, 01.12%)
	Asian or Pacific Islander (N=49, 27.84%)
	Black or African American (N=5, 2.84%)
	Hispanic or Latino (N=10, 5.68%)
	White / Caucasian (N=105, 59.65%)
	Prefer not to answer (N=5, 2.87%)
	Other (N=1, 0.56%)
Average household income (N=167)	Below £10,000 (N=30, 17.96%)
	£10,001 - £20,000 (N=29, 17.36%)
	£20,001 - £30,000 (N=39, 23.35%)
	£30,001 - £40,000 (N=23, 13.77%)
	Above £40,000 (N=46, 27.54%)
Shopping Frequency (N=175)	Extremely frequently (N=9, 5.14%)
	Very frequently (N=46, 26.28%)
	Moderately frequently (N=75, 42.85%)
	Slightly frequently (N=39, 22.28%)
	Not at all frequently (N=6, 3.42%)
Whether viewing photo advert of shop before visiting (N=175)	Yes (N=86, 49.14%)
	No (N=89, 50.85%)

First, hypotheses 1–8 were tested; four multiple regressions were computed. The four predictors were set as the four attributes of biophilic design (visual connection with nature, biomorphic forms and patterns, material connection with nature, and complexity and order). The two outcomes were set as IR and IP. This study's analysis examined two

outcome variables for each store type (Anthropologie and Urban Outfitters). Second, the two paired-sample t-tests were conducted for Hypotheses 9 and 10. To that end, the two outcome variables were paired and computed. First, IR was compared for the high BSD store and the low BSD store. Second, IP was compared for the high BSD store versus the low BSD store. The descriptive statistics are presented in table 3. The means within pairs 1-4 were highly comparable, indicating that participants did not perceive differences in the four biophilic design attributes between the two stores. The IR means were similar for the high and low BSD stores. Surprisingly, the IP means were lower for the high BSD store than for the low BSD store. The next section contains table 3, which covers the descriptive statistics of four attributes, IR and IP) and a detailed discussion of the analysis.

Table 3: Descriptive statistics (four attributes, IR, and IP)

		Mean	N	Standard Deviation
Pair 1	**High visual connection with nature**	3.84	177	0.07
	Low visual connection with nature	3.73	177	0.07
Pair 2	**High biomorphic forms and patterns**	3.59	177	0.08
	Low biomorphic forms and patterns	3.47	177	0.07
Pair 3	**High material connection with nature**	3.94	177	0.07
	Low material connection with nature	4.03	177	0.07
Par 4	**High complexity and order**	3.80	177	0.07
	Low complexity and order	3.63	177	0.07
Pair 5	**Intention to recommend the store to others - High level of BSD**	14.16	177	0.24
	Intention to recommend the store to others - Low level of BSD	14.17	177	0.23
Pair 6	**Intention to purchase - High level of BSD**	13.51	177	0.26
	Intention to purchase - Low level of BSD	14.23	177	0.23

5.1 Multiple regression (Hypotheses 1–8)

1. Relationships between the four attributes and intention to recommend the store to others: high biophilic store design store

The first model examined Hypotheses 1, 3, 5, and 7 for the high BSD store. The R^2 revealed that the four predictors explained 44.1% of the variance in IR (R^2=.441). This model was significant (p<.001). Preferences for a visual connection with nature were not significantly related to IR (β=.09, p=.29), thus not supporting Hypothesis 1. However, preferences for biomorphic forms and patterns were positively and significantly related to IR (β=.31, p<.001), supporting Hypothesis 3. Preferences for a material connection with nature were also positively and significantly related to IR (β=.26, p<.01), providing support for Hypothesis 5. Finally, preferences for complexity and order were positively and significantly related to IR (β=.18, p<.05), providing support for Hypothesis 7. The full SPSS output for this regression model is in Appendix C-a.

2. Relationship between the four attributes and intention to purchase: high biophilic store design store

The second model examined Hypotheses 2, 4, 6, and 8 in the high BSD store context. The *R2* revealed that the four predictors explained 33.4% of the IP variance at this store (*R2*=.334). This model was significant (p<.001). Preferences for a visual connection with nature were not significantly related to IP (β=.14, p=.13), thus not supporting Hypothesis 2. However, preferences for biomorphic forms and patterns were positively and significantly related to IP (β=.22, p<.01), supporting Hypothesis 4. Preferences for a material connection with nature were also positively and significantly related to IP (β=.22, p<.01), providing support for Hypothesis 6. Finally, preferences for complexity and order were not significantly related to IR (β=.14, p=.12), supporting Hypothesis 8. The full SPSS output is in Appendix C- b.

3. Relationship between the four attributes and intention to recommend the store to others: low biophilic store design store

The third model further examined Hypotheses 1, 3, 5, and 7 for the low BSD store. The *R2* revealed that the four predictors explained 35.4% of the variance in IR (*R2*=.354). This model was significant ($p<.001$). Preferences for a visual connection with nature were not significantly related to IR (β=.04, $p=.68$), thus not supporting Hypothesis 1. However, the remaining attributes were positively and significantly related to IR in this model, similar to the high level of BSD and IR. Preferences for biomorphic forms and patterns were positively and significantly related to IR (β=.24, $p<.01$), supporting Hypothesis 3. Preferences for a material connection with nature were also positively and significantly related to IR (β=.28, $p<.001$), providing support for Hypothesis 5. Finally, preferences for complexity and order were positively and significantly related to IR (β=.20, $p<.01$), supporting Hypothesis 7. The full SPSS output is in Appendix C-c.

4. Relationship between the four attributes and intention to purchase: low biophilic store design store

The fourth model further assessed Hypotheses 2, 4, 6, and 8 for the low BSD store. The *R2* revealed that the four predictors explained 39.9% of the IP variance at this store (*R2*=.399). This model was significant ($p<.001$). Preferences for a visual connection with nature were not significantly related to IP (β = .14, $p = .10$), thus not supporting Hypothesis 2. Preferences for biomorphic forms and patterns were positively and significantly related to IP (β =.25, $p<.01$), supporting Hypothesis 4. Preferences for a material connection with nature were also positively and significantly related to IP (β=.19, $p<.05$), supporting Hypothesis 6. Finally, preferences for complexity and order were positively and significantly related to IP (β=.25, $p<.01$), supporting Hypothesis 8. The full SPSS output is in Appendix C-d.

5.2 Paired-sample t-tests (Hypotheses 9 and 10)

1. Comparison of intention to recommend the store to others for the high versus low biophilic store design stores

The first paired-sample t-test examined Hypothesis 9: whether IR was higher for the high BSD store (Anthropologie) versus the low BSD store (Urban Outfitters). The results revealed that IR did not differ between the high BSD (M=14.16, SD=3.24) store and the low BSD (M=14.17, SD=3.02) store, $t(176)$=-.02, p=.98. Therefore, Hypothesis 9 was not supported. The full SPSS output for this t-test is in Appendix D-a.

2. Comparison of intention to purchase for the high versus low biophilic store design stores

The second paired-sample t-test assessed Hypothesis 10: whether IP was higher for the high BSD store (Anthropologie) versus the low BSD store (Urban Outfitters). Surprisingly, in contrast to Hypothesis 10, the results revealed that IP was significantly higher for the low BSD (M=14.23, SD=3.12) store than for the high BSD (M=13.51, SD=3.40) store, $t(176)$=-2.99, p<.01. The full SPSS output is in Appendix D-b.

5.3 Supplementary analyses

As there were no significant differences between the high and low BSD stores regarding IR, and as the participants were significantly more likely to purchase from the low BSD store (Urban Outfitters), a series of supplementary analyses were conducted. These comprised four paired-samples t-tests to assess whether the participants rated each of the four attributes (in terms of preferences) differently for the high BSD store versus the low BSD store. The full output and descriptive results are in Appendix E. Interestingly, there were no significant differences between any of the attributes' ratings. These findings were evaluated in line with the main study findings in the discussion.

6. Discussion

This work examined whether the four attributes of biophilic design (visual connection with nature, biomorphic forms and patterns, material connection with nature, and complexity and order) are related to consumer responses (IR and IP); specifically, whether consumer preferences for these attributes are positively related to these responses. To the authors' knowledge, existing research has solely focused on establishing the attributes of biophilic design. However, no research has investigated biophilic design's specific attributes and how they may differentially impact significant consumer responses, such as purchasing products and recommending retail stores. In remedying this literature gap, this study adopted a quantitative methodology to test a series of hypotheses via multiple regression models and paired-sample t-tests based on the BSD literature and ART.

6.1 Relationships between attributes of biophilic design and consumer responses

The regression models yielded consistent and significant findings regarding the four hypotheses. Biomorphic forms and patterns and a material connection with nature were consistently and significantly related to IR and IP, regardless of BSD level. These findings suggest that biomorphic forms and patterns and a material connection with nature positively influence consumer responses, regardless of BSD level. These results further support Hypotheses 3, 4, 5, and 6. The findings of Hypotheses 3 and 4 did not support the theoretical including empirical studies of Keller (2008) because, as mentioned in the literature review, aesthetic and functional approaches have been adopted vastly in the biomorphic forms and patterns of literature.

In contrast to the results for Hypotheses 3 and 4, the findings for Hypotheses 5 and 6 are in line with studies finding that wooden furniture tends to have a positive impact on mood

and to reduce stress. These studies examined a material connection with nature's impact in a residential setting, representing a long-term interaction. However, a material connection with nature can positively influence consumers' restorative impact and responses even with relatively shorter interactions than those in residential settings which appeared contrast to Lipovac et al. (2020) findings that, exposure to a relatively small wooden surface does not significantly influence affective and cognitive outcomes.

Additionally, the attribute of complexity and order was significantly and positively related to IR at high and low BSD levels and IP at low levels of BSD. These findings suggest that complexity and order are also understood as a complex arrangement of natural elements and positively impact IR, regardless of the level of BSD, thus providing support for Hypothesis 7. However, interestingly, complexity and order were significantly related to IP for the low BSD store but not for the high BSD store, thus providing partial support for Hypothesis 8. These findings on complexity and order do not support theoretical or empirical studies. The existing literature has mainly discussed the complexity caused by fractal geometry, which is a different complexity source than that considered in this study. This work explored complexity resulting from natural elements' arrangement (Hagerhall et al., 2008).

Finally, while several theoretical and empirical studies have suggested that a visual connection with nature has a positive impact on mood and, thus, on consumer responses (Soderlun and Newman, 2015;), the findings of this work suggested that a visual connection with nature was consistently non-significant across the four regression models, meaning this variable is not significantly related to IR or IP, regardless of the level of BSD, providing no support for Hypotheses 1 and 2. This was an unexpected finding, although supported by Egner et al. (2020). This finding has several potential explanations. A visual connection with nature is not limited to plants; the variable

adopted in this study. Instead, it often combines other biophilic design attributes in conjunction with nature in the space, as mentioned in the introduction. For instance, in real life, the evidence of a connection with nature has often deemed a combination of visual connections and non-visual connections with nature, such as natural sounds and the store's atmosphere (Soderlund and Newman, 2015).

Moreover, natural elements are an essential source for the restorative impact of a visual connection with nature. Thus, the participants' appreciation of a visual connection with nature might have been less significant as compared to the rest of the attributes, which produced numerous significant results (eight out of ten hypotheses were significant), because the materials selected for this study excluded several critical features of a connection with nature, such as non-visual connections and the motion of natural elements.

6.2 Comparing high versus low biophilic store design stores on consumer responses

No significant differences were found between the high BSD and low BSD stores when examining consumers' IR (analysed via a paired-sample t-test). This finding did not support Hypothesis 9 and opposed the findings of Rosenbaum et al. (2016). The authors found that restorative shoppers have a higher IR than non-restorative shoppers. They focused on categorising shoppers as restorative or non-restorative and examined whether IR depends on the type of shopper. In contrast, this study focused on consumers' perceptions of stores in terms of preferences for BSD's four attributes and their influence on IR and IP. Thus, methodological differences may be responsible and warrant further research. More surprisingly, the second paired-samples t-test revealed a significant difference between the high BSD store and low BSD store regarding consumers' IP. However, IP was significantly higher for the low BSD store. This result was, therefore, the opposite of what Hypothesis 10 predicted.

To further analyse these results, supplementary t-tests were conducted to investigate whether participants rated the four attributes differently for the high BSD store and the low BSD store. However, the participants did not differentially perceive the attributes. As such, the participants were likely thinking about other factors when considering their IP for this study's questionnaire. For instance, as can be seen in the material selected for the questionnaire (see figures 1 and 2), some other brands were visible in the images of Urban Outfitters, including FILA, Calvin Klein, and Kappa. The presentation of those brands in the Urban Outfitters' images may have influenced the participants' IP. Besides, while not intended by the researcher, in the images, the presence of the four attributes of biophilic design seems to overshadow the actual products at Anthropologie. In contrast, the Urban Outfitters images contain a clearer view of the available products. Hence, the images might have highlighted Anthropologie's store design but Urban Outfitters' products, producing the findings counter to Hypothesis 10.

7. Conclusions and contributions

The study considered "How do attributes of biophilic design impact consumers' IR and IP?" The aim investigated the impact of biophilic design attributes on consumers' IP and IR, which was addressed through three objectives: (1) Examination of the extent to which consumers prefer different attributes of biophilic design (visual connection with nature, biomorphic forms and patterns, material connection with nature, and complexity and order of nature) in retail stores. (2) Exploration of the relationship between these attributes and consumers' IP. (3) Exploration of the relationship between these attributes and consumers' IR.

The analysis of 177 completed questionnaires indicated that biophilic design attributes positively impacted consumer responses in retail settings. Thus, store designers or planners, architects, and facilities managers should consider the biophilic design attributes to produce positive consumer responses. Additionally, the simple presence of natural elements is not

sufficient to generate positive consumer responses. Instead, how they are displayed and arranged is crucial.

In testing hypotheses 1 to 8, regressions were run, and to test hypotheses 9 and 10, paired-sample t-tests were computed. Consistent and significant findings were observed for two attributes (biomorphic forms and patterns and a material connection with nature); meanwhile, the complexity and order variable were partially significant.

The findings support and further contribute to Egner (2020). The author highlighted that individuals would have increased attention to activities if their attentional fatigue can be reduced by interacting with the surrounding natural environment. This study demonstrates that three attributes of biophilic design (biomorphic forms and patterns, a material connection with nature, and complexity and order) are essential in driving positive consumer responses (IR and IP). Although a visual connection with nature was not significant, this finding does not mean that a visual connection is irrelevant for biophilic design. This attribute may not have been examined thoroughly due to methodological limitations. The study highlights that displaying natural elements is not sufficient since the hypothesis on complexity and order was partially supported. In positively driving IR and IP, using a visual connection with nature, how natural elements are displayed, shown, and arranged for consumers is more critical in producing a restorative impact. This implies that the designers, space planners, or facilities managers should have an amplified role for the visual connection with nature to be restorative by accommodating nature with the other biophilic design attributes. Besides, the findings should encourage store designers or facilities managers to purchase furniture, indicating a material connection with nature or objects with biomorphic forms and patterns. Thus, this study supports the ART, but only concerning specific attributes.

The focal findings of this study are as follows:

- Biophilic design attributes have a positive impact on consumer responses in retail

settings. Thus, store designers or planners, architects, and facilities managers should consider biophilic design attributes to produce positive consumer responses.

- The simple presence of natural elements is not sufficient to generate positive consumer responses. Instead, how they are displayed and arranged is crucial.

These significant findings suggested which attributes should be highlighted by store designers or planners, architects, and facilities managers who wish to implement biophilic designs in stores. A visual connection with nature was not significant. However, given the significant relationships that emerged between the other attributes and IR and IP, it was advised that the display and arrangement (complexity and order) are essential for a visual connection with nature to influence someone experiencing a biophilic design restoratively. Besides its valuable practical implications, this dissertation has highlighted several important areas for future research, expanding on this study.

7.1 Limitations and areas of future research

Data for the study was collected via an image-based of two stores selected for the questionnaire, which meant a lack of generalisability. Based on the number of biophilic design attributes, there are 16 possible combinations of high and low levels of BSD. Future research should examine a wide array of stores that differ with regards to levels of the BSD attributes. Also, the study was limited in only being able to measure consumers' preference ratings for the biophilic attributes based on photographs and did not examine their likeability responses following physical immersion in those retail environments. These are considered limitations to the study.

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Appendix A Full scale and Likert rating points for measures

Appendix A-a Measures for the scales of four attributes of biophilic design

- **Attribute 1 preference rating (visual connection with nature)** (adapted from Wolf, 2004)
  - On a scale of 1-5 (1 = do not like at all, 2 = somewhat dislike 3 = neutral, 4 = somewhat like 5 = very much like), how much do you like the plant and water features in this store
- **Attribute 2 preference rating (biomorphic forms and patterns)** (adapted from Wolf, 2004)
  - On a scale of 1-5 (1 = do not like at all, 2 = somewhat dislike 3 = neutral, 4 = somewhat like 5 = very much like), how much do you like the shape of the (object/furniture - to be specified later after selecting photo) In this store
- **Attribute 3 preference rating (material connection with nature)** (adapted from Wolf, 2004)
  - On a scale of 1-5 (1 = do not like at all, 2 = somewhat dislike 3 = neutral, 4 = somewhat like 5 = very much like), how much do you like the material of the interior design used in this store
- **Attribute 4 preference rating (complexity and order)** (adapted from Wolf, 2004)
  - On a scale of 1-5 (1 = do not like at all, 2 = somewhat dislike 3 = neutral, 4 = somewhat like 5 = very much like), how much do you like the arrangement and variety of the natural elements in this store (water, plants….)

Appendix A-b Measures for the scales of intention to recommend the store to others

- **Intent to recommend the store to others** (adapted from Rosenbaum et al., 2016)
  - On a 1-7 scale (1 = very strongly disagree; 2 = strongly disagree; 3 = disagree; 4 = neither agree nor disagree; 5 = agree; 6 = strongly agree; 7 = very strongly agree), please rate the following:
  - I will say positive things about this store to other people
  - I will recommend this store to someone who seeks my advice
  - I will encourage friends and relatives to shop at this store

Appendix A-c Measures for the scales of intention to purchase

- **Intention to purchase** (adapted from Bian and Forsythe, 2012)

One item was excluded, namely, "If I were shopping for a luxury brand, the likelihood I would purchase this luxury brand is high" (Bian and Forsythe, 2010, p.1447). This item was dropped because it was relevant to the brand's impact on IP since the brand's impact is not this study's variable.

- On a 1-7 scale (1 = very strongly disagree; 2 = strongly disagree; 3 = disagree; 4 = neither agree nor disagree; 5 = agree; 6 = strongly agree; 7 = very strongly agree), please rate the following:
- If I were going to make a new purchase, I would consider buying from this store
- My willingness to purchase from this store would be high if I were shopping
- The probability I would consider buying from this store is high

Appendix B Cronbach Alpha

Appendix B-a Cronbach Alpha of the measures of intention to recommend the store to others at the both high and low BSD

* HRec1 stands for the first measure for the intention to recommend the store to others at high BSD (HRec2 = the second measure; HRec3 = the third measure)

* LRec1 stands for the first measure for the intention to recommend the store to others at low BSD (LRec2 = the second measure; LRec3 = the third measure)

```
RELIABILITY
  /VARIABLES=HRec1 HRec2 HRec3
  /SCALE('Rec high Alpha') ALL
  /MODEL=ALPHA.
```

Reliability

```
[DataSet1] /Users/hyunwookyou/Desktop/Draft SPSS.sav
```

Scale: Rec high Alpha

Case Processing Summary

		N	%
Cases	Valid	177	100.0
	Excluded[a]	0	.0
	Total	177	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.926	3

```
RELIABILITY
  /VARIABLES=LRec1 LRec2 LRec3
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA.
```

Reliability

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	177	100.0
	Excluded[a]	0	.0
	Total	177	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.927	3

Appendix B-b Cronbach Alpha of the measures of intention to purchase at the both high and low BSD

* HInt1 stands for the first measure for the intention to purchase at low BSD (HInt2 = the second measure; HInt3 = the third measure)

* LInt1 stands for the first measure for the intention to purchase at low BSD (LInt2 = the second measure; LInt3 = the third measure)

```
RELIABILITY
  /VARIABLES=HInt1 HInt2 HInt3
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA.
```

Reliability

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	177	100.0
	Excluded[a]	0	.0
	Total	177	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.921	3

```
RELIABILITY
  /VARIABLES=LInt1 LInt2 LInt3
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA.
```

Reliability

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	177	100.0
	Excluded[a]	0	.0
	Total	177	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.918	3

Appendix C SPSS output – Multiple regression models

* Following is detail of the acronym used in the regression models
HVC/LVC = High/Low Visual Connection with nature
HBFP/LBFP = High/Low Biomorphic Forms/Patterns
HMCN/LMCN = High/Low Material Connection with Nature
HCO/LCO = High/Low Complexity and Order

Appendix C-a Regression model for Examining the relationship between BSD attributes and intention to recommend the store to others: High level BSD, 'Anthropologie'

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.664[a]	.441	.428	2.44747

a. Predictors: (Constant), HCO, HBFP, HMCN, HVC

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	4.048	.914		4.430	.000
	HVC	.290	.273	.087	1.059	.291
	HBFP	.897	.195	.309	4.606	.000
	HMCN	.907	.258	.258	3.519	.001
	HCO	.580	.277	.175	2.095	.038

a. Dependent Variable: HTotalRec

Appendix C-b - Regression model for Examining the relationship between BSD attributes and intention to purchase: High level BSD, "Anthropologie"

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.578[a]	.334	.319	2.80862

a. Predictors: (Constant), HCO, HBFP, HMCN, HVC

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	4.087	1.049		3.897	.000
	HVC	.484	.314	.139	1.543	.125
	HBFP	.668	.223	.219	2.988	.003
	HMCN	.825	.296	.223	2.790	.006
	HCO	.502	.318	.144	1.580	.116

a. Dependent Variable: HTotalInt

Appendix C-c Regression model for Examining the relationship between BSD attributes and intention to recommend the store to others: Low level BSD, 'Urban Outfitters'

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.595[a]	.354	.339	2.45586

a. Predictors: (Constant), LCO, LBFP, LMCN, LVC

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	4.863	.980		4.963	.000
	LVC	.115	.282	.036	.408	.683
	LBFP	.813	.247	.244	3.288	.001
	LMCN	.931	.245	.284	3.793	.000
	LCO	.634	.235	.204	2.702	.008

a. Dependent Variable: LTotalRec

Appendix C-d Regression model for Examining the relationship between BSD attributes and intention to purchase: Low level BSD, 'Urban Outfitters'

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.632[a]	.399	.385	2.44656

a. Predictors: (Constant), LCO, LBFP, LMCN, LVC

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	4.148	.976		4.250	.000
	LVC	.465	.281	.139	1.653	.100
	LBFP	.854	.246	.248	3.468	.001
	LMCN	.628	.245	.185	2.567	.011
	LCO	.786	.234	.245	3.364	.001

a. Dependent Variable: LTotalInt

Appendix D SPSS output – paired-sample t-tests models

* HTotalRec stands for aggregates of the items of intention to recommend the store to others (HRec 1- 3) at high BSD.
* LTotalRec stands for aggregates of the items of intention to recommend the store to others (HRec 1- 3) at low BSD.
* HTotalInt stands for aggregates of the items of intention to purchase (HInt 1- 3) at high BSD.
* LTotalInt stands for aggregates of the items of intention to purchase (LInt 1- 3) at low BSD.

Appendix D-a Paired-sample t-test for the comparison of intention to recommend the store to others at high versus low level of BSD

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	HTotalRec - LTotalRec	-.00565	3.06834	.23063	-.46081	.44951	-.024	176	.980

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	HTotalRec	14.1638	177	3.23532	.24318
	LTotalRec	14.1695	177	3.01974	.22698

Appendix D-b Paired-sample t-test for the comparison of intention to purchase at high versus low level of BSD

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	HTotalInt	13.5085	177	3.40307	.25579
	LTotalInt	14.2316	177	3.12023	.23453

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	HTotalInt - LTotalInt	-.72316	3.22053	.24207	-1.20090	-.24543	-2.987	176	.003

Appendix E Supplementary analyses

		Mean	N	Std. Deviation
Pair 1	HVC	3.84	177	.976
	LVC	3.73	177	.932
Pair 2	HBFP	3.59	177	1.115
	LBFP	3.47	177	.905
Pair 3	HMCN	3.94	177	.921
	LMCN	4.03	177	.920
Pair 4	HCO	3.80	177	.977
	LCO	3.63	177	.974
Pair 5	HTotalRec	14.1638	177	3.23532
	LTotalRec	14.1695	177	3.01974
Pair 6	HTotalInt	13.5085	177	3.40307
	LTotalInt	14.2316	177	3.12023

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