Biodiverse Landscapes and Restoring Benefit: A Connection Through Naturalness

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Abstract

Context

Research has been associating urban nature with health and wellbeing; whereas many focus on the benefits of the availability of green spaces, only a few focus on the quality of natural environments. Moreover, the mental health of urban residents has become an issue in society. Therefore, thinking about ecological health and human health when designing green spaces is critical.

Objectives

This study asked the extent to which biodiversity of landscapes is associated with attention restoration and if naturalness is the characteristic shared between biodiverse landscapes and the restoring perception of landscapes.

Methods

This study conducted laboratory experiments. We used bird survey data of the Taipei Metropolitan area to represent the biodiversity levels of landscapes and took photographs on-site of those survey sites to be the intervention. Participants viewed the images and evaluated their restoring and natural perceptions of landscapes.

Results

There were 128 participants who attended the experiments. This study reported landscapes with greater avian species richness and the avian Shannon diversity index score were evaluated as more natural. Naturalness, the avian species richness, and the avian Shannon diversity index were all associated with higher attention restorativeness. Bird abundance did not find associations with either variable. The findings demonstrated that viewing landscape images of bird biodiverse landscapes reported with same restoring effects.

Conclusion

This study demonstrated direct and measurable mental wellbeing benefits of urban bird diversity from viewing images of landscapes. This research supports previous research findings and suggests the connections between bird diversity and mental wellbeing need more investigation.

Introduction

Urban green spaces are facing challenges to fulfill multiple goals, including making the environments resilient and elevating residents' wellbeing. Creating green spaces enables to reduce severeness of environmental issues resulting from urbanization, which also promotes human health and wellbeing with more urban nature accessible (Hartig et al., 2014). There is potential to create green spaces with rich biodiversity mitigating the environmental issues in cities (Schewenius et al., 2014). While many studies compare the effects of the types and aesthetic characteristics of landscapes, the associations between the ecological quality of green spaces and health in an urban setting are overlooked (Houlden et al., 2021). Green spaces support wildlife as habitats but are also part of human habitats, and it is critical to design spaces targeting both groups in cities. Although the effects of biodiversity in animals, plants, and habitats on physical health, mental health, mental wellbeing, and social wellbeing have begun to be explored, more studies are required to illustrate the whole picture (Sandifer et al., 2015; Houlden et al., 2021).

How might the biodiversity of environments bridge to human health? Marselle, Hartig, et al. (2021) proposed four pathways of this relationship: reducing harms, building capacities (Knobel et al., 2021; Roslund et al., 2020), restoring capacities (Cox et al., 2017; Methorst et al., 2021), and causing harm through transporting diseases (Wood et al., 2017). The present paper focuses on the restoring capacities of the biodiversity-health relationship, and the remaining gaps in this field of research are discussed below.

Biodiversity, perceived naturalness, and perceived restorativeness

The ability to recognize the species of plants or animals might be restricted only to people with professional training, which might be an obstacle for the public to experience the diversity of natural environments and habitats. Instead, there are hints of characteristics that allow people to assess the biodiversity of a habitat. Ode et al. (2008) and Tveit et al. (2006) proposed that biodiversity quality contributes to the aesthetics of landscapes. They used characteristics to describe landscapes visually from aspects of aesthetics and human experiences, including complexity, coherence, imageability, ephemerality, and stewardship, to name a few.

The aesthetic characteristics are used to discuss the potential health benefits people receive from contacting natural landscapes. Landscapes with low maintenance and wildness have been reported to provide greater levels of health benefit potentials (Chiang et al., 2017). Some characteristics of vegetation are linked to restoring perceptions. These characteristics include vegetation density (Zhao et al., 2020) and multilayers of structure (Hoyle et al., 2017) associated with restorative effects. Another feature, naturalness, examined by the perceptions of biodiversity, was found to be significantly correlated with restoration (Hoyle et al., 2019). One study showed inconclusive results that did not find differences in restorativeness among different levels of naturalness (Van den Berg et al., 2014). Hence, this study will examine if naturalness is a factor people perceived from biodiverse landscapes that promote the restoring capacities.

Restoration from mental fatigue is a huge demand of urban residents when they are often exposed to environments with many things happening physically or virtually that cost their attention. Attention Restoration Theory (ART) states that natural landscapes help an individual regain lost attention and recover from mental fatigue (Kaplan, 1995; Kaplan et al., 1998; Sullivan & Li, 2021). Research supports ART and finds that people experience greater recoveries from mental fatigue in natural landscapes than in urban landscapes (Van den Berg et al., 2014; Tang et al., 2017). Among natural landscapes, places with higher vegetation density are shown to be more restorative to people than others.

The biodiversity of landscapes has also been reported as a factor associating with their restorative effects. People perceived higher levels of perceived restorativeness from places with higher levels of overall biodiversity (Carrus et al., 2015; Wood et al., 2018). In addition, the researchers examined individual factors composing landscapes separately. Take the perceived number of plant species for example, gardeners reported higher perceived restorativeness from gardens where they felt more diverse plant species present (Young et al., 2020). Participants walked through varying gardens and parks and responded with a higher restoring perception at sites where they perceived they had more shrubbery (Hoyle et al., 2017). Plant and bird species richness in urban green spaces were positively associated with psychological health benefits that visitors experienced (Fuller et al., 2007). However, the directions of the relationships between biodiversity and restoration are mixed. While many studies, such as those mentioned above, revealed positive effects, Hoyle et al. (2018) found no significant relationships, and Dallimer et al. (2012) found negative relationships between actual plant diversity and restorative effects of the landscapes. Therefore, more studies are needed to evaluate the relationship between biodiversity and attention restorativeness (Marselle et al., 2021).

Exposure to biodiverse environments

Exposing participants to simulations of natural environments enabled the study to test multiple samples. Different from studies using a categorical scale for biodiversity variables (binary or ternary), this allows researchers to collect and explore a wide variety of levels of biodiverse environments. In addition, using simulations allows a single level of biodiversity to be represented by multiple samples, which helps increase the representation of the variable.

The bird community is a commonly used indicator to reflect the condition of the biodiversity of an area. Bird species have been well identified and are easy for the public to recognize. Moreover, some of the species are carnivores and are at the top of the food chain; therefore, their species and abundance can reflect the biodiversity of their prey. On the other hand, avian diversity changes through landscape types, characteristics, and geographic locations: richness decreases as green spaces decrease or when in the environments near the center of the urban area (Sandström et al., 2006). Moreover, the presence of wildlife species has also been shown to be correlated with changes in vegetation diversity in urban areas (Threlfall et al., 2017). Based on these reasons, bird diversity could reveal the condition in landscape of a larger area.

Aims of this study

In summary, there are studies showing positive effects of biodiversity on restorativeness with participants experiencing sites physically. These studies used actual and perceived plant and animal diversity to measure biodiversity. However, the outcomes were inconclusive. On the other hand, naturalness could be a function of the characteristics that biodiverse landscapes provide; it could be the landscape characteristics that people perceive as providing high restorativeness. Therefore, this study asks the extent to which varying levels of biodiversity are associated with levels of restorative perceptions by exposure to simulations and the extent to which levels of biodiversity are incongruent with perceptions of naturalness. There are two specific objectives: first, to examine the extent to which levels of biodiversity are related to the perceived naturalness in urban green spaces, and second, to examine the extent to which levels of biodiversity of the landscape are related to the perceptions of attention restorativeness.

Methods

The research sites for the study were selected based on avian diversity. The bird survey data were retrieved from the project Breeding Bird Survey Taiwan (<https://sites.google.com/a/birds-tesri.twbbs.org/bbs-taiwan>), organized by the Endemic Species Research Institute, Taiwan, the Institute of Ecology and Evolutionary Biology at National Taiwan University, and the Taiwan Wild Bird Federation. The data retrieved were two observations conducted in March 2015 and May 2015, including 15 survey blocks consisting of 107 survey points. The area of each survey block was 1 km x 1 km, and within the square, each survey point was 200 m apart to avoid duplicating records of the same bird at two sites. The point count method was used; investigators stopped at each point for six minutes and recorded the birds seen and heard within a distance of 100 m. The procedure of creating stimuli images are explained below and in Fig. 1.

The chosen survey blocks encompassing diverse landscape types to get a wide range of bird diversity—campuses, urban parks, urban forest trails, riverside parks, and built environments in Taipei City and New Taipei City, Taiwan. The remainder of the study was established in four phases of preparation. In phase one, the avian Shannon Diversity Index (SHDI, introduced in Method section) is calculated for each of the 107 sites, sorted sites based on the SHDI score, and divided sites into three groups equally, representing the high, medium, and low bird diversity environments. Researchers used satellite images to examine whether the landscape structure of the survey sites in 100-m radii buffers of the survey points represents the context of the area. Sites were excluded if their landscape structure in the buffer was strongly divergent from their surroundings. Researchers also excluded sites where there was potential hidden space that might influence the biodiversity of the environment but out of sight, such as a vacant lot behind a wall. After this procedure, there were 75 survey sites left.

In phase two, researchers visited the sites and took photographs in the summer of 2016. Researchers excluded those that were not accessible and had significant disturbances, such as those undergoing construction. Sites where there were structures obstructing the view were excluded. Researchers took photographs (at the height of 1.6 meters above ground) at each site and compared the current situations with the previous maps on Google map and the Taiwan Map Service, National Land Surveying and

Mapping Center (<https://maps.nlsc.gov.tw/>). Sites where the landscapes had changed since the bird surveys were excluded. Moreover, the sites with SHDI values toward the minimum, median, and maximum among all data were first considered so that the independent variable had a wide range of SHDI values and kept the groups distinguishable from each other. Ten sites were selected from each low, medium, and high SHDI group that fulfilled the above criteria.

Intervention photographs were determined in phase three; researchers selected two photographs for each of the 30 sites based on the below standards. The contents captured in the photograph had to represent individual sites and be clear, legible, and easy to understand. The habitat of each site was also captured. In addition, the views of the photos showed vistas, and the intensity of the light was adequate and similar to other photographs taken at other sites. As a result, 60 images demonstrating 30 urban open spaces (research sites) were used as stimuli.

In the final phase, researchers reorganized the research sites into different combinations to randomly assign the intervention to participants and to reduce the number of sites a single participant needed to evaluate. Three sets of stimuli were created, A, B, and C, with each of them including all 30 research sites. The 30 sites were randomly split into two groups, creating two alternative stimulus A options, A-1 and A-2. The sites in stimuli B and C were processed in a similar way. Therefore, the six subsets of stimuli (A-1 to C-2) each consisted of 15 different research sites.

Landscapes of the study sites in these three groups can be roughly categorized by the levels of human interference. The 10 sites in the low avian biodiversity group were urban streets, pocket parks, and campuses with a few trees or lawns mixed within dense buildings in highly urbanized areas, and one site was at the lawn area of a riverside park. The 10 sites of the medium avian diversity group were located in similar environments, however, with a higher vegetation density and consisting of more layers of different plants. The high avian diversity group was situated in the botanical gardens, parks, and trail areas at the fringe of urban areas, with the highest vegetation density, the wildest forms, and a minimum of artificial structures.

The study compared the composition of the bird species found in the three bird diversity groups and specified the differences. The most frequently observed species in the low-diversity groups were the sparrow (*Passer montanus*), light-vented bulbul (*Pycnonotus sinensis*), and Japanese white-eye (*Zosterops japonicus*), while one crested goshawk (*Accipiter trivirgatus*) was observed. Other species presents were those that were highly adapted to the urban environments. In the medium diversity group, the birds observed often were sparrow (*Passer montanus*) and light-vented bulbul (*Pycnonotus sinensis*). There were 42 (16.7%) individuals of 11 species absent in sites of the low-diversity group but found in the middle-diversity group, and some of these species were larger in size. In the high diversity group, the most frequently observed species were red-billed starling (*Sturnus sericeus*), light-vented bulbul (*Pycnonotus sinensis*), cattle egret (*Bubulcus ibis*), common myna (*Acridotheres tristis*), Taiwan barbet (*Megalaima nuchalis*), and black bulbul (*Hypsipetes leucocephalus*). There were 106 (36.4%) individuals of 15 species

observed in the high diversity group that were not found in the medium group. The proportion of the urbanized species dropped sharply in the high biodiversity groups compared to the other two groups.

Independent variable measurements

Bird diversity was measured by three indicators: Shannon Diversity Index (SHDI), species richness, and abundance. Bird species richness is the number of species observed, and bird abundance is the total number of individuals of all birds observed at a given point. SHDI is calculated with the equation

$SHDI = -\sum_{i=1}^s p_i \ln p_i$, where s is the number of species, p is the proportion (n/N) of individuals of the i species observed (n) divided by the total number of individuals found (N), and $\ln$ is the natural log. The larger the value of the diversity index, the higher the diversity and the number of birds appearing. The species richness and abundance measures used in this study were the sums of two surveys conducted in March 2015 and May 2015, and the SHDI value of each site was the outcome of the sums, as shown in Table 1.

Dependent variable measurements

A question related to perceived naturalness was asked to understand the extent to which participants regarded landscapes as nature. A single question was asked: "I think the environment of this place is very natural." The short-form Perceived Restorativeness Scale (PRS) was used to measure participants' perceived restorativeness of environments (Berto, 2005). It contains five items representing the five aspects of Attention Restoration Theory: being away, fascination, coherence, scope, and compatibility. All questions were asked on a 7-point Likert scale (1 = strongly disagree and 7 = strongly agree).

Data collection and analysis

During the experiments, participants were randomly assigned to one of the stimulus sets and asked to imagine that they existed at the site while viewing the stimuli photographs; two photographs of one site were projected on a 70-inch screen (1980*1080) for 20 seconds. After viewing each set of photographs, participants answered seven questions, including questions on perceived naturalness, PRS, and preference (omitted in the discussion in this study); they could have as much time as they needed to answer the questions. This procedure was repeated for 15 sets, and there was a one-minute break after the seventh set. It took about 40 minutes to complete each experiment.

The analyses were conducted with Statistical Product and Services Solutions (SPSS 22.0). A reliability test on the PRS items was conducted before testing the hypotheses. Pearson correlation tests was used to examine the extent to which levels of avian diversity were associated with perceived naturalness and perceived restorativeness. The tests were conducted based on the means of the 30 study sites.

Results

There was a total of 128 participants. The subset A-1, A-2, B-1, and B-2 interventions were each evaluated by 21 people, and the C-1 and C-2 interventions were each shown to 22 people. In total, every site was viewed and evaluated by 64 participants. Overall, the participants were composed mostly of females (73; 57.03%), aged between 19 and 32, and the average age was 23.9 (SD = 2.57).

A reliability test was conducted for the perceived restorativeness scale. The results reported that one of the items, coherence, had a low total correlation with the scale ($r = 0.12$), and the Cronbach's alpha value of the scale was 0.79. Therefore, researchers deleted that item from the analysis, and the Cronbach's alpha value increased to 0.87. Hence, further analyses of the overall restorativeness effect only considered the results of the other four items (being away, fascination, extent, and compatibility).

The outcomes of the Pearson correlation showed SHDI and avian species richness had a significant medium correlation with the overall perceived restorativeness, as Table 2 shows ($r = 0.56$, $p = 0.001$ and $r = 0.50$, $p = 0.005$, respectively). Regarding individual items of the PRS, SHDI and species richness had a medium association with being away ($r = 0.56$, $p = 0.001$; $r = 0.46$, $p = 0.011$), fascination ($r = 0.59$, $p = 0.001$; $r = 0.52$, $p = 0.003$), and extent ($r = 0.59$, $p = 0.001$; $r = 0.59$, $p = 0.001$), and both items were not significantly correlated to compatibility. No significant correlation was found between bird abundance and any of these dependent variables.

Two of the three bird diversity indicators showed significant and positive relationships with a participant's perception of naturalness. The results of the Pearson correlations showed that bird diversity, including SHDI and species richness, were significantly and strongly associated with perceived naturalness ($r = 0.73$, $p < 0.001$; $r = 0.65$; $p < 0.001$) (see Table 2). Bird abundance, however, did not show any statistically significant relationship with perceived naturalness. Perceived naturalness is reported with a strong association with the overall restorativeness score ($r = 0.71$, $p < 0.001$).

Discussion And Conclusion

The present study explored two gaps in the existing literature with a laboratory experiment setting: the extent to which levels of landscape biodiversity are related to people's perceptions of restoration, and the extent to which naturalness performs as an intermediate characteristic between high bird biodiverse landscapes and restorative landscapes in the urban setting. As anticipated, our results showed medium to strong correlations among bird biodiversity, perceived restorativeness, and perceived naturalness.

Avian diversity and perceived restorativeness

Our result agrees with previous findings that bird species richness is positively related to mental well-being, including restorative perceptions (Fuller et al., 2007). Previous work found that the overall biodiversity (combining plants, birds, bees, and butterflies) of residents' living environments was positively related to their perceived restorativeness (Wood et al., 2018). Other studies that used perceived animal diversity also found a positive association with restoration during participants' walks or experiences in physical environments (Dallimer et al., 2012; Marselle et al., 2016; Nghiem et al., 2021).

The difference between our study and the previous ones is the method of exposure to biodiverse landscapes. This study found that showing photographs of landscapes with different bird diversity had the same positive perception of restorativeness as those who were given actual contact with biodiversity.

On the contrary, this study found an insignificant outcome regarding bird abundance and restoration. Similar to previous findings, bird abundance was not correlated with mental and physical health across a country (Methorst et al., 2021), and perceived animal abundance was not associated with restorativeness level (Nghiem et al., 2021). This may result from bird abundance being distributed differently from species richness. Ortega-Álvarez and MacGregor-Fors (2009) found that bird abundance was the highest in commercial areas, while bird species richness was the highest in vegetated areas. Bird abundance might be less influenced by the characteristics of landscapes and more influenced by the behaviors of the bird species themselves, as it resulted in a nonsignificant correlation with restoration.

The effects of bird abundance may be impacted by people's perceptions. Cox et al. (2017) found bird abundance observed in the afternoon to be associated with a smaller population of depression, anxiety, and stress, but not bird abundance collected at regular survey times (early morning). This difference in survey time was designed considering the possibility that people perceived the birds because it had fewer people active in the early morning, so less likely for most people to experience birds at the regular survey time. Therefore, if bird abundance could be interpreted by the landscapes and if people perceive the birds could impact an individual's perception of restoration. More research is needed to better understand these subtleties.

Avian diversity, naturalness, and perceived restorativeness

This study demonstrated that the perception of naturalness was positively associated with levels of biodiversity in landscapes through photographs, supporting the previous study that people perceive biodiverse landscapes as naturalness. Hoyle et al. (2019) reported people's evaluations of naturalness are impacted by the context. Compared to a more biodiverse garden, participants perceived untended green spaces as more natural, even when they were less biodiverse. This study used actual bird diversity to represent the biodiversity of a site that did not separate the effect of context from biodiversity. Inevitably, the types of surrounding landscapes, vegetation diversity, and overall biodiversity appertained together. Future research could examine the effects of biodiversity within the same context of environmental settings.

This study reported that the higher the naturalness one recognized from the landscapes, the greater the restorativeness that was perceived, which is similar to previous findings. Studies have found that perception of naturalness is related to self-reported restoration in green spaces on university campuses (Liu et al., 2018) and urban areas (Fisher et al., 2021). Carrus et al. (2013) compared urban green spaces, pine woods, a botanical garden, and a peri-urban area, and found naturalness positively correlated with the potential perceived restorative. This study used bird biodiversity to represent the overall biodiversity based on their sensitive reactions to changes in habitats (MacGregor-Fors, 2008). Landscapes with high bird biodiversity could be highly vegetated and wild; they could also be intermediate landscapes of

natural and urbanized landscapes with high heterogeneity (Ortega-Alvarez & MacGregor-Fors, 2009). These natural and complex landscapes in urban areas provide residents with a sense of fascination and being away, the two components of ART (Kaplan, 1995), which are different from living environments in the cities.

Implications

This study was conducted in Taipei Metropolitan, a highly developed urban area with a high population density; the outcomes discovered could be a reference for cities with similar characteristics when planning and designing open green spaces. Creating habitats that attract birds in green spaces could benefit users by boosting their sense of naturalness and restorativeness. This idea fulfills needs from both ecological and cultural aspects, which supports maintaining biodiversity and promoting health. Although this is outside the scope of this research, it is fundamental to balance the naturalistic design and the signs of maintenance while applying our findings to practice. A sense of human intervention being used and clear sightlines are the basis of recreational experiences that provide a sense of safety (Sreetheran & Van Den Bosch, 2014) and high legibility (Kaplan, 1995; Kaplan et al., 1998), such as clear paths of trails and steady structures. Moreover, creating high biodiverse green spaces provides activities that low biodiverse settings cannot, for example, bird watching. In turn, these different activities attract people to contact nature.

Limitations and future research suggestions

The present study used bird diversity to indicate the overall biodiversity of the research sites and showed participants photographs of sites without the presence of birds. Whereas birds have been widely used to represent the biodiversity of urban environments, they were not the objects that people directly experienced in this study. Despite this limitation, we learned that creating landscapes that attract birds and enhance naturalness benefits mental wellbeing. Other landscape characteristics relating to biodiversity, such as complexity, structural coherence (Hunter & Askarinejad, 2015), or the low-level features of edge density and entropy (Karden et al., 2015) may also make differences and are still to be explored. Hence, there is a need for additional studies focusing on visual features connecting habitats of specific animals or species and mental well-being, and providing details about the designs of vegetation of a site.

In selecting research sites, those with high biodiversity are often in areas with lower urbanization and developed levels, like peri-urban areas. Although the levels of biodiversity are often linked to the location of the sites, future research may separate the effects of biodiversity and the factors from the surrounding areas. In addition, the influences of biodiversity on restorativeness and well-being could be distinct in different contexts, as Carrus et al. (2015) reported that biodiversity had greater effects in urban settings than in peri-urban settings. Future research could have more control over environmental settings to reveal a more detailed relationship between biodiversity, people's aesthetic perceptions, and mental well-being.

In the face of a global crisis such as biodiversity loss, cities are challenged to make green spaces diverse in composition and provide multiple functions. This study contributes to the literature in the field by

showing a medium-strong association between bird diversity and restorative and natural perceptions, as well as a medium relationship between naturalness and restorativeness. While both bird species richness and the SHDI showed significant relationships in the results, bird abundance did not, which suggested that bird abundance might not be interpreted from landscape scenes alone. Our findings assist in quantifying bird diversity and linking the values to the restorativeness and naturalness of people's experiences. They also provide opportunities for landscape planners and designers to build multifunctional landscapes and create favorable environments by enhancing the quality of scarce land resources.

Declarations

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Conflicts of interest/Competing interests

All the authors declare no conflicts of interest or competing interests with the publication of this study.

Ethics statement

This study was conducted clearly and honestly, has not been published elsewhere.

Consent to participate and for publication

All of the authors declare their consent to participate and for the publication of this study.

Authors' contributions -mandatory

Conceptualization: Joanne Chang, Chun-Yen Chang, Chia-Ching Wu; **Methodology:** Joanne Chang, Chun-Yen Chang; **Data collection:** Joanne Chang; **Formal analysis and investigation:** Joanne Chang, Chun-Yen Chang; **Writing—original draft:** Joanne Chang, Chia-Ching Wu; **Writing—review and revise:** Joanne Chang, Chun-Yen Chang, Chia-Ching Wu; **Funding acquisition:** Chun-Yen Chang. All authors read and approved the final manuscript.

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Tables

Table 1 *The characteristics of low, medium, and high avian biodiverse sites*

Indicators	Low (N = 10)	Medium (N = 10)	High (N = 10)
SHDI* Min, Max	0.42, 1.15	1.45, 1.62	1.77, 2.40
SHDI* Mean (<i>SD</i>)	0.91 (0.24)	1.54 (0.06)	2.04 (0.20)
Species Richness Min, Max	2, 8	5, 9	8, 17
Species Richness Mean (<i>SD</i>)	4 (1.70)	6.3 (1.16)	11.7 (2.91)
Abundance Min, Max	4, 191	13, 67	19, 136
Abundance Mean (<i>SD</i>)	50.50 (68.46)	28.80 (15.26)	47.60 (37.64)

Note. *Shannon diversity index

Table 2 *Correlation among avian biodiversity, perceived naturalness, and perceived restorativeness*

Variables	SHDI	Species Richness	Abundance	Perceived Naturalness
Correlation coefficient (p , two-tailed)				
Perceived Restorativeness	0.56 (0.001)	0.50 (0.005)	0.24 (0.204)	0.71 (<0.001)
Being away	0.56 (0.001)	0.46 (0.011)	0.23 (0.229)	0.68 (<0.001)
Fascination	0.59 (0.001)	0.52 (0.003)	0.21 (0.274)	0.70 (<0.001)
Extent	0.59 (0.001)	0.59 (0.001)	0.27 (0.149)	0.63 (<0.001)
Compatibility	0.29 (0.122)	0.22 (0.237)	0.20 (0.284)	0.37 (<0.001)
Perceived Naturalness	0.73 (<0.001)	0.65 (<0.001)	0.20 (0.298)	–

Note. N = 30. The boldface represents statistically significant results.

Figures

Figure 1