

Article

Biophilic Experience in High-Rise Residential Areas in China: Factor Structure and Validity of a Scale

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Abstract: The increasing popularity of high-rise, high-density residential areas in urban environments has brought about problems such as isolation from nature and increasingly depauperate ecological conditions, and consequently, adverse effects on residents' health and environmental sustainability. Therefore, creating a high-quality biophilic living space environment is key to solving this conflict, considering the health benefits that nature brings to people. However, there are currently no appropriate assessment tools to measure the biophilic living environment of high-rise residential areas. In response, we have developed an environment assessment scale for measuring the Biophilic Experience in High-Rise Residential Areas (BornA) based on resident experiences. Semi-structured interviews were conducted to identify the measurement items relevant to their biophilic living experiences and behaviors. Exploratory factor analysis and confirmatory factor analysis were performed to identify the scale's structure and examine its reliability and validity. The study resulted in the development of an 18-item BornA, comprising five dimensions: natural landscape, natural interaction, cultural identity, neighborhood interaction, and personal space. The BornA contributes to the assessment of the biophilic living space environment in high-rise residential areas from the perspective of resident behavior and perception, identifying health intervention environments for sample populations and understanding how the residential environment affects residents' health.

Keywords: biophilic; high-rise residential area; scale; nature connectedness; sustainability



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1. Introduction

The United Nations formulated the 2030 agenda for sustainable development, highlighting the significant role of natural environments and green spaces in urban sustainability. Natural environments not only provide physical sustenance but also contribute to a sense of relaxation, comfort, and happiness through the physical and emotional connection between humans and nature [1–3]. However, rapid urbanization has led to the increasing popularity of high-rise and high-density residential areas in cities [4–7], resulting in the isolation of urban living spaces from nature, deteriorating ecological conditions [8,9], and various urban issues such as high stress levels and fast-paced lifestyles [10]. Therefore, under the dual requirements of limited space and efficient living, creating high-quality residential environments to meet human beings' inherent affiliation with nature (biophilia) [11] and drive lifestyle changes becomes crucial for enhancing their health and well-being in urban settings [12–16]. Although there have been biophilic residential design system frameworks proposed from the designers' perspective [17–19], there is currently no suitable assessment tool available to determine which environmental features effectively support healthy living and meet residents' biophilic preferences. This paper describes the development of the Biophilic Experience in High-Rise Residential Areas Scale (BornA), a space environment assessment tool based on residents' perceptions and behaviors.

Existing measurement tools for biophilia mainly fall into two categories: nature connectedness scales and restorative environment scales. The commonly used nature connectedness scales include the Inclusion of Nature in the Self Scale (INS) [20], Connectedness to Nature Scale (CNS) [21], and Nature Relatedness Scale (NR) [22]. INS measures the degree to which an individual incorporates nature into their self-concept. CNS assesses how much an individual feels they belong to nature and are equal to the organisms within it. NR evaluates an individual's appreciation, tolerance, and understanding of the interconnectedness between humans and nature. The commonly used restorative environment scales include the Perceived Restorativeness Scale (PRS) [23] and the Restorative Components Scale (RCS) [24]. The dimensions of PRS align with the four environmental characteristics identified by Attention Restoration Theory, namely being away, fascination, extent, and compatibility. RCS further divides the "being away" dimension into novelty and escape based on PRS. The development ideas and specific contents of these scales provide references for the development of a high-rise residential area space environment assessment scale based on residents' biophilic experiences.

When individuals' biophilia needs are met, they experience psychological benefits known as nature connectedness (NC) [21,22]. The degree of NC reflects the intensity of one's affiliation with nature [25,26] and serves as an important predictor of health and well-being [27–29]. Residents' NC is influenced by two categories of factors: environmental experiences and environmental exposures. The former refers to the experiences within and around residential spaces, including perceptible natural elements, biodiversity, familiarity, multisensory experiences, and indirect forms of engagement. The latter pertains to behavioral activities in the residential environment, such as walking or engaging in physical exercise in natural surroundings near residential areas, as well as interacting with the natural environment through activities like gardening (Table 1). However, despite the proven health-promoting effects of many factors, the comprehensive impact of residential spatial environments on residents' NC remains unclear, and previous studies have paid limited attention to high-rise, high-density residential environments.

Table 1. The Influencing Factors Contributing to Enhancing NC in Residential Environments.

Category	Factors	Examples
Indoor and outdoor environmental experiences	Perceptible Natural Elements	A large number of natural elements [30,31]; community gardens with frequent access [32]; prolonged opportunities for engagement [33], as well as easy accessibility [34]
	Biodiversity	Neighborhood green spaces with high biodiversity and well-designed ecosystems [35]; rustic-style cottage gardens with wild plants [36]; thriving plants [37]
	Familiarity	Regularly encountering and feeling familiar with natural environments [38,39]; local attachment and social identity [40]
	Multisensory Experiences	Soundscapes [41]; sound of waterfalls and streams [38]; walking barefoot in nature [42]
	Indirect Natural Experiences	Window views of trees and parks adjacent to buildings [43]; wooden walls and floors [44]; biophilic design in residential interiors such as natural images, forms, colors, and materials [45]
Residential activities	Physical movement in natural environment	Frequent visits to green space, water, and other landscapes by walking, running, and cycling [46]; physical exercise [47,48]
	Interactions with natural environment	Natural environment for sitting, touching, and playing with [49]; urban gardening accompanied by nature observation, leisure, physical exercise, social interaction, and knowledge acquisition [50]; community gardening activities [37,51]

The purpose of this paper is to develop an effective tool in the form of a scale for evaluating the biophilic spatial environment in high-rise residential areas. Specifically,

there are two objectives: (a) to identify biophilic design features that enhance residents' NC in the spatial environment and (b) to examine the reliability and validity of the scale and analyze its structure. The research findings can provide support for healthy housing research and serve as a reference for healthy residential design.

2. Materials and Study Design

2.1. Study Design and Methodology

The design of this research was based on the classic scale development procedure [52] and the scale development practice related to spatial environment [53,54]. The first step involved determining the interview topics by identifying the conceptual scope through a literature review. This process resulted in the formulation of interview topics. In the second step, initial items were developed by conducting interviews and coding the interview data. These initial items were then refined through focus group discussions and pilot testing using questionnaires. The third step focused on exploring the dimensions of the scale. A sample of 140 participants completed the scale composed of the generated items, and exploratory factor analysis was conducted to determine the dimensions of the scale. In the fourth step, the reliability and validity of the scale were verified. A variable relationship model was constructed based on the identified dimensions of the scale, and confirmatory factor analysis and criterion correlation analysis were performed to assess the reliability and validity of the scale using a sample of 337 participants. Figure 1 shows the steps taken to develop the scale.

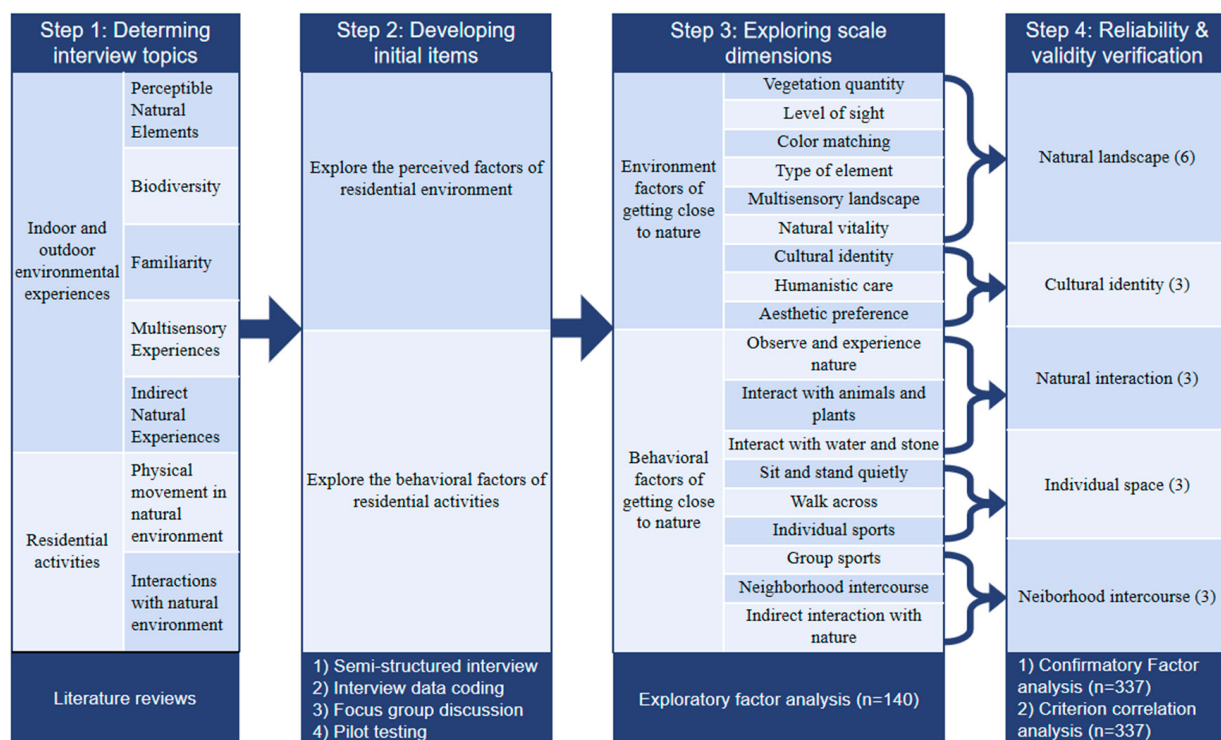


Figure 1. Steps taken to develop the 18-item BornA scale.

2.2. Data Collection

2.2.1. Investigation Sample

High-rise residential areas are a typical form of residential architecture in Chinese cities. In residential constructions in China after 2015, 71% consist of buildings with 15 floors or more. According to China's "Unified Standard for Civil Building Design (GB 50352-2019)," ref. [55] residential buildings with a height greater than 27 m are classified as high-rise residential buildings. High-rise residential areas refer to residential clusters enclosed by urban roads or natural boundaries composed of high-rise residential buildings with a

service radius of approximately 500 m. This study takes the densely populated area on the east side of the Heihe–Tengchong Line in China as the approximate sample area range and selects densely populated cities as sample cities (Appendix A). To avoid sample variations due to differences in accessibility to high-quality public natural resources, this study selects high-rise residential areas within a 1000-m radius without large parks or scenic spots as the source of respondents.

2.2.2. Semi-Structured Interview

The topics in the semi-structured interviews were based on several main aspects identified through background literature research (Table 2). Based on a previous random online pre-survey conducted by the authors, participants in the semi-structured interviews were sampled from the pool of respondents based on the following criteria: (a) residing in high-rise residential buildings within high-rise residential areas; (b) having lived in the current residential area for at least one year; (c) covering three age groups (18~40, 41~60, >60). The semi-structured interview survey was conducted from July 2023 to November 2023 using both face-to-face interviews and targeted online surveys. To mitigate potential limitations arising from the respondents' awareness, we will first introduce some basic knowledge of natural perception and activities, as well as previous research, and aim to conduct interviews in green spaces, parks, or squares near the respondents' homes. Considering the cognitive and expressive abilities required for participants to comprehend the interview topics, individuals aged 18 and above were included in the scope of the interviews. Moreover, based on recent statistical data indicating that the average life expectancy in most provinces of China falls within the range of 66 to 72 years, the research individuals were aged 66 and below. With the participants' permission, the interviews were recorded digitally or in writing. Continuous data analysis was performed to determine theoretical data saturation when no new topics emerged, achieving sufficient sampling representation [56]. The survey collected 20 valid responses from 17 provinces of China, covering the eastern, northern, central, and western regions. Considering factors such as communication, cognition, and average life expectancy, participants across multiple age groups ranging from 18 to 66 years were included in the study (Appendix B).

Table 2. Topics for Semi-Structured Interview.

Classification	Problem	Subproblem
(1) Exploring elements of environmental perception	Which environmental elements can make you feel more connected to or closer to nature?	What are the characteristics of these environmental elements, and what makes them particularly impressive to you?
(2) Exploring elements of behavioral activity	What activities can you do at home or within your community to feel more connected to or closer to nature?	Why do these things bring about a sense of connection to nature, and what specific feelings do they evoke?

2.2.3. Questionnaire Survey

The survey on biophilic experience in high-rise residential area environments was conducted in China from 3 to 18 December 2023 using an online survey website (<https://www.wjx.cn>, accessed on 1 December 2023). This website is widely used in China and provides convenient services for uploading and publishing questionnaires as well as downloading collected data. We invited residents from 23 provinces in China to complete the online questionnaire through the popular social media platform WeChat, covering most regions of China (Figure 2). Participants were informed of the research purpose, which was to explore environmental and behavioral factors in high-rise residential areas that enhance a sense of affiliation with nature. Individuals who have less than one year of experience living in high-rise residential areas were excluded from the survey. The questionnaire survey included the BornA Scale and the INS Scale. The BornA scale, based on previous research, was developed to assess residents' biophilic experiences. The INS scale is a widely used and well-established scale, employed in this study to measure residents' NC

and validate the BornA scale. Numerous empirical studies have indicated that various perceptual and behavioral factors of the residential environment can influence residents' NC [31,43,57]. Therefore, we hypothesize that the comprehensive experience of the residential environment also affects residents' NC. The online survey website recorded the completion time and IP address of each respondent. Duplicate submissions or completing the questionnaire within a short period of time using the same IP address were considered invalid and removed from the analysis. The questionnaire survey was administered in two stages. The first administration collected 155 questionnaires, out of which 140 were deemed valid and utilized for exploratory factor analysis. The second administration collected 380 questionnaires, out of which 337 were considered valid and used for confirmatory factor analysis. Table 3 shows the participants' demographic information.



Figure 2. Regional Distribution of Survey Participants (Covering 23 Provinces in China).

Table 3. Demographic information.

Measure	Items	Frequency (n = 140)	Percentage (n = 140)	Frequency (n = 337)	Percentage (n = 337)
Gender	Male	73	52.1%	157	46.6%
	Female	67	47.9%	180	53.4%
Age	18~40	76	54.3%	207	61.4%
	41~60	61	43.6%	126	37.4%
	>60	3	2.1%	4	1.2%
Education Level	Graduate	4	2.9%	7	2.1%
	Junior College or University	76	54.3%	250	74.2%
	Other	60	42.8%	80	23.7%

2.3. Data Analysis

The key themes, concepts, and descriptive vocabulary that appeared in the text were recorded using open coding [58]. The interview data were analyzed and classified based on the themes and concepts identified in the literature review. A focus group discussion was conducted with six experts, followed by a pilot test involving 15 university students to generate the initial items for the scale. Subsequently, the Mean score of each item and the Corrected Item-Total Correlation (CITC) were calculated using SPSS software (IBM SPSS

Statistics 26) to conduct a preliminary selection of the initial items to obtain the formal measurement items ($n = 140$). Furthermore, the Kaiser–Meyer–Olkin (KMO) value and Bartlett’s sphericity test were performed. Exploratory factor analysis was conducted using Principal Component Analysis to extract and establish reasonable Construct factors from the formal measurement items.

Subsequently, a Structural Equation Model (SEM) was established using AMOS software (IBM SPSS Amos 21.0.0), and the Maximum Likelihood estimation method was selected for Confirmatory Factor Analysis ($n = 337$). The Construct factors extracted from Exploratory Factor Analysis were treated as latent variables, while the formal measurement items that had been coded and screened were used as observed variables. Model fit indices were utilized to evaluate the goodness of the model fit. Drawing on the recommendations made by Joseph [59] and Wu [60], this paper employed the following fit indices and criteria: χ^2 , normed chi-square (χ^2/df), Goodness-of-Fit Index (GFI), Root Mean Square Error of Approximation (RMSEA), Normed Fit Index (NFI), Comparative Fit Index (CFI), Tucker–Lewis Index (TLI), and Incremental Fit Index (IFI).

Next, the reliability and validity of the scale were further tested, including Composite Reliability (CR), Convergent Validity, and Discriminant Validity. It is generally believed that when the CR value exceeds 0.700, the sample data has good CR [61]. As for Convergent Validity, meeting the following criteria indicates good Convergent Validity: (1) Standard factor loading is above 0.500 [62]; (2) Average Variance Extracted (AVE) is greater than 0.500 [63]; (3) CR value is greater than 0.700. Regarding Discriminant Validity, if the correlation coefficients between any two factors are all smaller than the square root of their respective AVE values, it indicates good Discriminant Validity between the factors [64].

The ability of a scale to predict existing variables is an important criterion for determining the reliability of the scale as a measuring tool, known as Criterion Validity [65]. In the Criterion Validity study of biophilic environments, the mature construct of “Natural Connectedness” was used as the outcome variable. If the biophilic environment can affect residents’ NC, it indicates that the developed scale meets the requirements of Criterion-related Validity. The NC data measured by the INS scale (Figure 3) were statistically analyzed. Pearson’s Correlation Coefficient was used to calculate the correlation between each measurement item of the BornA scale and the NC data, so as to further test the Criterion Validity of the BornA scale.

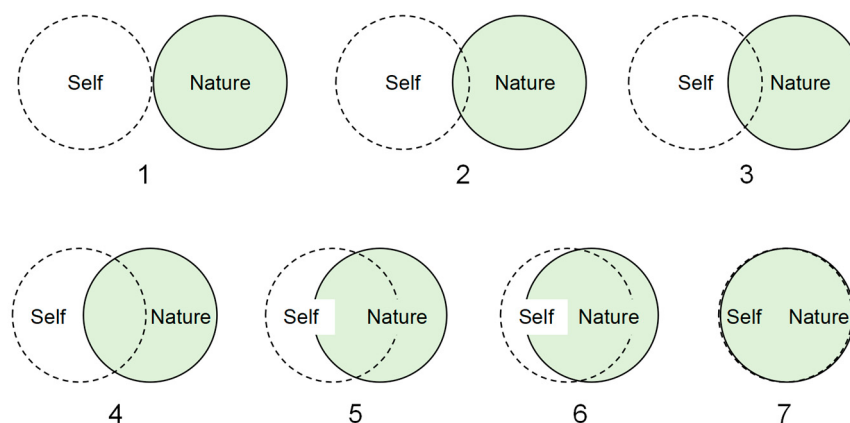


Figure 3. Inclusion of Nature in the Self scale (INS) [20].

3. Results

3.1. Interview Analysis

Participants identified numerous influential factors based on their daily life experiences that contribute to their sense of connection with nature. In terms of environmental perception, the quantity, variety, and design effects of natural elements were most frequently mentioned, along with various social and cultural factors. Regarding behavioral

activities, both physical activities and neighborhood social interactions were found to have an impact on residents' overall experiences. Although there were variations in preferred attribute characteristics among different age groups, such as the middle group placing more emphasis on the richness, aesthetics, and novelty of elements and the elderly group prioritizing stability, harmony, and cultural connotation, the overall categories of influential factors remained similar. Through coding analysis of interview data, 65 initial elements were identified. These elements were then categorized into 19 main thematic categories by combining the 70 attributes from Kellert's [66] six dimensions of Biophilic Design and the 14 patterns proposed by Browning [67], as shown in Table 4.

Table 4. Data Analysis of Semi-Structured Interview Collection.

Category	Influencing Factors
Space Environment	Vegetation quantity (high vegetation coverage, high proportion of green plants in the field of view); Visual hierarchy (wide field of view, layered with highs and lows); Color matching (rich plant colors, properly matched); Types of natural elements (including sunshine, plants, water features, animals, rocks and sand, gentle breezes, etc.); Multisensory experience (incorporating visual (landscape), tactile (texture), olfactory (floral scents, a refreshing air), auditory (quietness, bird chirping, water sound), etc.); Natural vitality (thriving and growing vigorously, displaying a variety of colors and forms); Historical and cultural heritage (reflecting the local history and culture, evoking a sense of familiarity and identification); Humanistic care (such as windproof and rainproof, design for the elderly and children, climate-adaptive design); Neat and tidy (clean and well-maintained).
Behavioral Activity	Observing experiences (smelling flower fragrance, observing insects and animals, enjoying the scenery, sunbathing, sitting on the grass); Interacting with animals and plants (planting, harvesting, caring for animals, catching fish and shrimp); Interacting with sand and stones (playing in the water, playing with sand, climbing rocks, exploring caves); Sitting or standing quietly (reading, drawing, using a phone); Crossing the greenway (commuting, traveling, shopping); Personal exercise (walking, running, cycling, rollerblading); Group exercises (playing ball, practicing Tai Chi, square dancing); Social activities (chatting, playing with friends, community events); Indirect interaction (taking care of children, walking dogs, watching birds); Facility usage (swinging on a swing, playing on a hammock, setting up a tent, using fitness equipment).

3.2. Exploratory Factor Analysis

During the initial screening of measurement items, any item with a mean score less than 3 and a CITC less than 0.4, which would increase Cronbach's α value if deleted, was eliminated. As a result, Item 19 (facility usage) was removed. Following the reliability test, the overall Cronbach's α coefficient for the scale was 0.883, indicating high internal consistency. Subsequently, exploratory factor analysis was conducted using the remaining 18 measurement items.

A valid questionnaire containing 18 items was administered to 140 respondents. Kaiser–Meyer–Olkin (KMO) value and Bartlett's Test of Sphericity were conducted, yielding a KMO value of 0.838 and a significant Bartlett's test statistic of 1170.332 (Sig. = 0.000, $p < 0.01$), indicating that exploratory factor analysis is appropriate. Then, Principal Component Analysis with maximum orthogonal rotation was performed. The first five factors with eigenvalues greater than 0.98 were extracted based on the scree plot (Figure 4), explaining 69.3% of the total variance, which exceeded the threshold of 60.0% [68]. All items corresponded to unique factors, and their factor loadings were greater than 0.5.

The results of the reliability test indicate that Cronbach's α coefficient for the first to fifth factors are all greater than 0.700, which suggests a high level of internal consistency [69]. Overall, this indicates that the reliability of the questionnaire is high, and the

dimensional structure is stable. Based on the content and characteristics of the measurement items included in each factor, they were, respectively, named Natural Landscape, Nature Interaction, Cultural Identity, Neighborhood Communication, and Individual Space (Table 5).

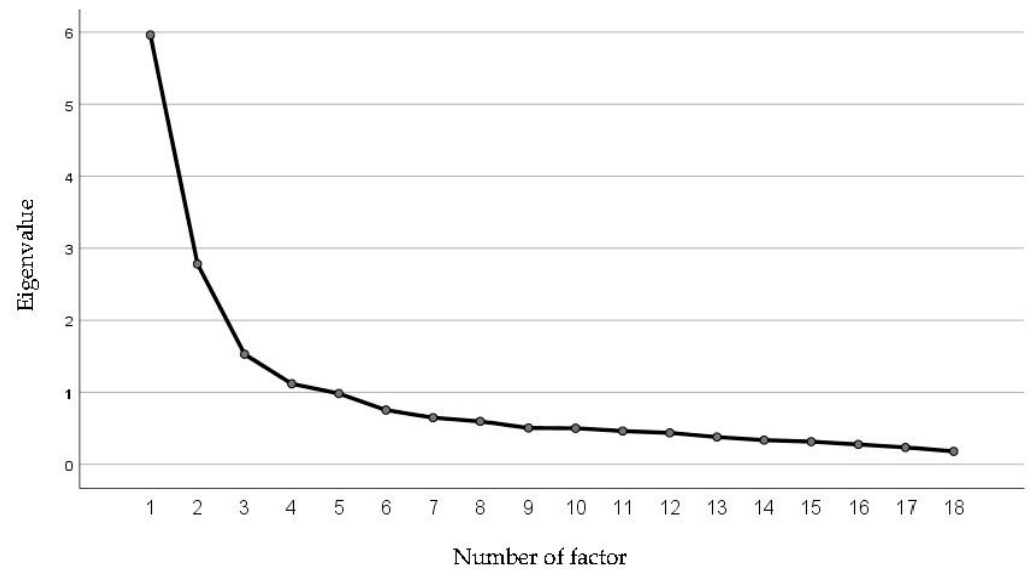


Figure 4. Scree plot of exploratory factor analysis (EFA) with 18 items.

Table 5. Results of Exploratory Factor Analysis.

Factor	Code	Item	Factor Loading	Eigenvalue	Explanatory Variance/%	Cumulative Explanatory Variance/%	Cronbach's α
Natural Landscape	A1	The vegetation coverage and green vision rate were high.	0.832	6.095	33.862	33.862	0.884
	A2	The view is wide and the landscape is layered.	0.699				
	A3	Plants are rich in color and well-matched.	0.817				
	A4	Both sunshine, plants, water features, animals, sand, breeze, and other natural elements, rich and diverse.	0.781				
	A5	Landscape design can provide a multisensory experience with sight, hearing, smell, taste, and touch.	0.840				
	A6	Reflect the dynamic change of natural vitality.	0.592				
Nature Interaction	B1	Provide space to observe and experience nature.	0.793	2.765	15.361	49.223	0.763
	B2	Provide space for natural interaction, such as planting and picking.	0.806				
	B3	Provide a natural space environment for fun.	0.619				
Cultural Identity	C1	Reflect the local history and culture.	0.738	1.527	8.484	57.707	0.738
	C2	Reflect the humanistic care of shading the sun and rain, suitable for the old and young.	0.601				
	C3	Conform to aesthetic preference and maintain clean and tidy.	0.662				

Table 5. Cont.

Factor	Code	Item	Factor Loading	Eigenvalue	Explanatory Variance/%	Cumulative Explanatory Variance/%	Cronbach's α
Neighborhood Communication	D1	Provide a neighborhood space close to nature.	0.769	1.101	6.117	63.824	0.781
	D2	Provide fitness facilities and a square close to nature.	0.647				
	D3	Provide an interactive space for parenting and cute pets close to nature.	0.800				
Individual Space	E1	Provide natural leisure space for quiet solitude.	0.731	0.983	5.459	69.283	0.746
	E2	Provide accessible landscape green space.	0.641				
	E3	Provide continuous walking trails close to nature.	0.615				

3.3. Confirmatory Factor Analysis

The ability of the model obtained through exploratory factor analysis to fit actual observation data was examined by confirmatory factor analysis. As shown in Table 6, all model fitting results meet the fitting standards and demonstrate good model fitting performance.

Table 6. The overall fitting results of the model.

Fitting Index	Fitting Standard	Statistical Result
χ^2	The smaller, the better	324.419
Normed chi-square (χ^2/df)	<3.000	2.595
Goodness-of-Fit Index (GFI)	>0.900	0.908
Root Mean Square Error of Approximation (RMSEA)	<0.080	0.069
NFI ^a /CFI ^b /TLI ^c /IFI ^d	>0.900	0.931/0.956/0.946/0.956

Note: ^a NFI = Normed Fit Index; ^b CFI = Comparative Fit Index; ^c TLI = Tucker–Lewis Index; ^d IFI = Incremental Fit Index; the same applies to the following.

As shown in Table 7, the composite reliability of the five-factor model is all above 0.700, indicating strong reliability of the scale. Moreover, the results of confirmatory factor analysis demonstrate that the standard factor loadings of the measurement items are all higher than 0.500, the composite reliability values are all greater than 0.700, and the Average Variance Extracted (AVE) values are all above 0.500. Therefore, it can be concluded that the scale possesses good convergent validity.

Table 7. Results of Confirmatory Factor Analysis.

Factor	Code	Standard Factor Loading	Average Variance Extracted (AVE)	Composite Reliability (CR)
Natural Landscape	A1	0.891	0.715	0.938
	A2	0.831		
	A3	0.846		
	A4	0.854		
	A5	0.853		
	A6	0.796		
Nature Interaction	B1	0.853	0.669	0.858
	B2	0.802		
	B3	0.797		
Cultural Identity	C1	0.834	0.742	0.896
	C2	0.873		
	C3	0.876		

Table 7. Cont.

Factor	Code	Standard Factor Loading	Average Variance Extracted (AVE)	Composite Reliability (CR)
Neighborhood Communication	D1	0.806	0.633	0.837
	D2	0.847		
	D3	0.729		
Individual Space	E1	0.734	0.613	0.826
	E2	0.799		
	E3	0.813		

As shown in Table 8, the square root of the AVE values for the five factors that make up this scale are all higher than the correlation coefficients between each factor and other factors. This indicates that the scale has good discriminant validity. The correlation coefficient obtained by confirmatory factor analysis is shown in Figure 5.

Table 8. Results of Discriminant Validity Analysis.

	Natural Landscape	Nature Interaction	Cultural Identity	Neighborhood Communication	Individual Space
Natural Landscape	0.715				
Nature Interaction	0.652	0.669			
Cultural Identity	0.710	0.744	0.742		
Neighborhood Communication	0.571	0.717	0.701	0.633	
Individual Space	0.663	0.790	0.762	0.795	0.613
Square root of AVE	0.846	0.818	0.861	0.796	0.783

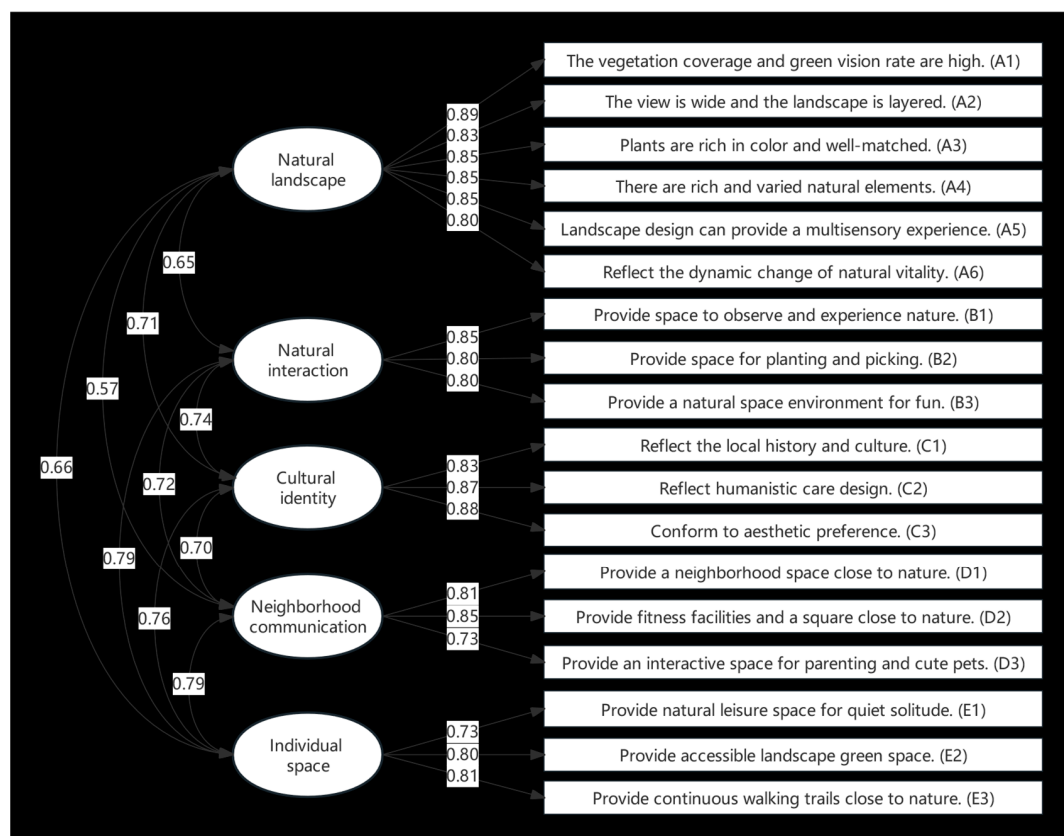


Figure 5. Factor Structure of the 18-item BornA Scale based on Confirmatory Factor Analysis (CFA).

3.4. Analysis of Criterion Validity

The relevant analysis results (Table 9) indicate that there is a significant positive correlation ($p = 0.000$) between the six dimensions and 18 items of the BornA scale and the criterion of NC.

Table 9. Pearson Correlation Analysis of Item and Criterion Validity.

Code	Mean	SD	NC	A1	A2	A3	A4	A5	A6	B1	B2	B3	C1	C2	C3	D1	D2	D3	E1	E2	E3
NC	3.25	0.962	1																		
A1	3.96	0.799	0.364**	1																	
A2	3.94	0.818	0.338**	0.748**	1																
A3	3.90	0.858	0.333**	0.745**	0.716**	1															
A4	3.99	0.842	0.295**	0.756**	0.691**	0.748**	1														
A5	4.06	0.827	0.354**	0.756**	0.687**	0.734**	0.749**	1													
A6	3.94	0.856	0.354**	0.732**	0.663**	0.637**	0.656**	0.677**	1												
B1	3.94	0.932	0.231**	0.436**	0.452**	0.413**	0.447**	0.503**	0.515**	1											
B2	3.83	0.924	0.250**	0.470**	0.436**	0.493**	0.453**	0.413**	0.451**	0.711**	1										
B3	3.80	0.968	0.240**	0.442**	0.484**	0.429**	0.432**	0.446**	0.529**	0.669**	0.618**	1									
C1	3.84	0.913	0.265**	0.521**	0.565**	0.438**	0.489**	0.450**	0.499**	0.537**	0.448**	0.548**	1								
C2	3.92	0.883	0.338**	0.556**	0.533**	0.441**	0.511**	0.519**	0.526**	0.515**	0.473**	0.577**	0.737**	1							
C3	4.05	0.829	0.266**	0.538**	0.571**	0.506**	0.572**	0.547**	0.550**	0.559**	0.505**	0.566**	0.719**	0.766**	1						
D1	3.84	0.963	0.291**	0.316**	0.407**	0.344**	0.336**	0.389**	0.358**	0.433**	0.358**	0.444**	0.454**	0.486**	0.488**	1					
D2	3.65	0.989	0.260**	0.372**	0.441**	0.423**	0.403**	0.432**	0.437**	0.503**	0.461**	0.522**	0.513**	0.507**	0.498**	0.707**	1				
D3	3.62	1.032	0.213**	0.398**	0.421**	0.395**	0.437**	0.392**	0.397**	0.511**	0.517**	0.556**	0.502**	0.487**	0.428**	0.585**	0.583**	1			
E1	3.76	0.924	0.263**	0.494**	0.442**	0.479**	0.417**	0.446**	0.461**	0.432**	0.456**	0.438**	0.483**	0.514**	0.510**	0.422**	0.446**	0.429**	1		
E2	3.82	0.867	0.195**	0.461**	0.451**	0.479**	0.393**	0.412**	0.424**	0.487**	0.447**	0.517**	0.531**	0.519**	0.547**	0.519**	0.577**	0.497**	0.609**	1	
E3	3.97	0.860	0.225**	0.470**	0.442**	0.456**	0.390**	0.420**	0.455**	0.618**	0.590**	0.529**	0.487**	0.495**	0.553**	0.505**	0.552**	0.478**	0.595**	0.636**	1

** : At level 0.01 (two-tailed), the correlation was significant.

3.5. Descriptive Statistical Analysis of Items

After conducting a statistical analysis of the scores for the 18 selected measurement items on “the intensity of feeling connected to or close to nature”, it was found that most of the evaluations were either “5-very strong” or “4-strong”, indicating the effectiveness of the measurement items in terms of closeness to nature (Figure 6). Based on these two evaluations, the top 8 effective contents for affiliation with nature are A5 (multisensory experiences, 82.1%), A4 (types of natural elements, 75.7%), C3 (neat and tidy, 75%), A1 (vegetation quantity, 72.8%), A2 (visual hierarchy, 72.2%), C2 (humanistic care, 71.4%), E3 (personal exercise, 70.7%), and A6 (natural vitality, 70.0%). These findings provide valuable guidance for residential environment design. Elements that have a significant impact on people’s experiences should receive greater attention and application during the design process.

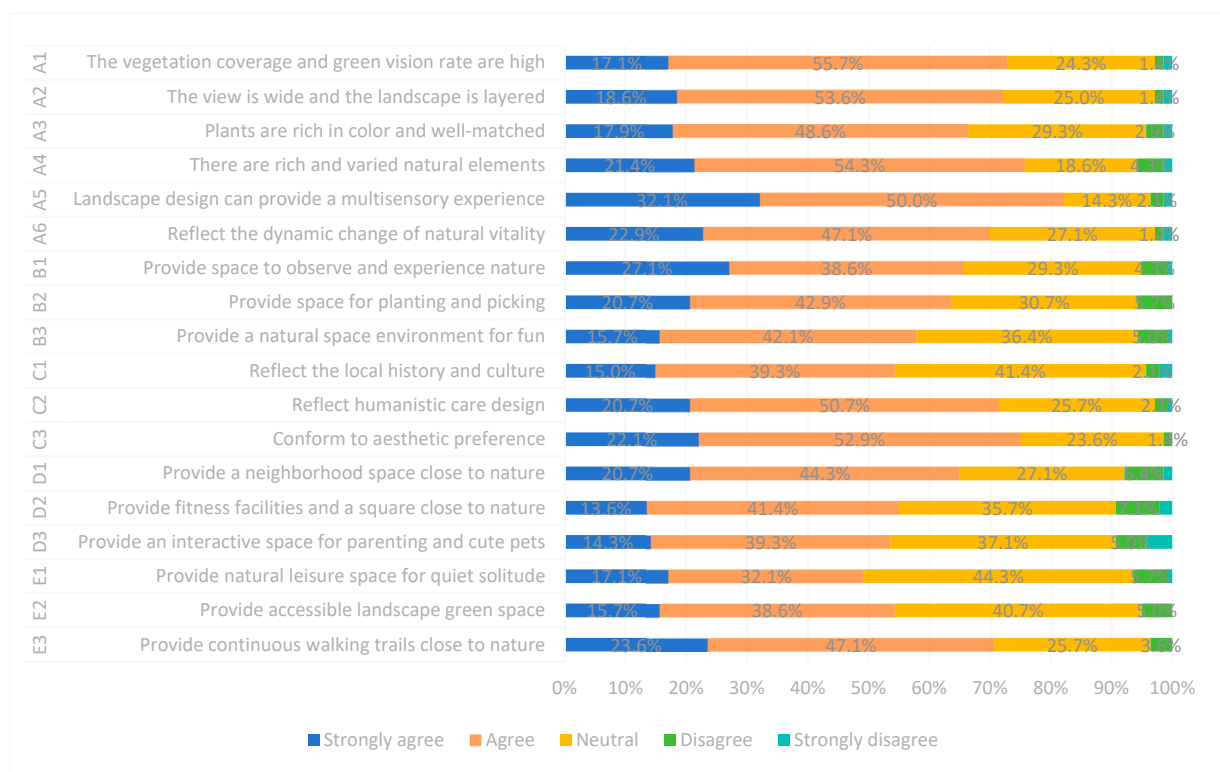


Figure 6. Proportion of Score Results of Each Item in the Scale.

4. Discussion

Based on Environment–Behavior Studies, this study developed the BornA scale consisting of 18 factors that evaluates the biophilic experience of high-rise residential environments according to residents' perceptions and behaviors. During the BornA scale assessment, participants scored each of the 18 factors on a Likert scale, and the final score is the sum of the Likert scores. This scale adopts a people-oriented approach [70], enabling respondents to extract effective factors from their daily living environment and behavioral activities. As such, respondents' evaluations and factor extractions are based on two principles: first, to consider the overall sensory experience provided by the spatial environment from the user's perspective rather than evaluating individual elements from an observer's perspective; second, to extract behavioral perceptions from the spatial environment based on daily life scenarios, rather than based on static spatial division. This approach can fully leverage respondents' subjectivity to conduct in-depth research into the spatial environments without any predefined boundaries [71] and guide the relevant strategy formulation for residential environmental design.

The analysis of the 18 measurement items revealed that the multisensory experience of various natural elements is the most crucial factor in enhancing people's affinity for nature. This may be attributed to the ability of different senses to stimulate corresponding neurons and the interconnected neural networks forming a multi-channel neural structure, thus enabling a more comprehensive and profound perception of the spatial environment [72,73]. In addition, the adequacy of vegetation greening in terms of quantity, aesthetic design, and vitality emerges as a significant aspect influencing people's perceptions. This aligns with the four characteristics of restorative environments: being away, extent, fascination, and compatibility [74]. Furthermore, the emphasis on humanistic care and individual exercise indicates the importance of natural spaces providing residents with comfortable activity areas, aiming to increase exposure to nature and promote proactive health by attracting residents' daily behavioral activities [46,47].

The 18-item BornA scale developed in this study demonstrated robust psychometric properties. Factor analysis revealed that the scale comprised five factors with satisfactory

internal consistency. The correlation between the measure of NC assessed by the INS scale provided further evidence for the external validity of the BornA scale. Based on these findings, a theoretical framework was proposed in which the intermediate factors of the natural landscape, natural interaction, cultural identity, neighborhood communication, and individual space interacted with each other, influencing different components of residents' affinity for nature in their living environment. From the perspective of environmental perception, pleasant natural landscapes and well-designed cultural identity can enhance residents' intimacy [75] and sense of belonging [76] with the natural environment, optimizing the design quality of spatial environments. This aligns with the research indicating that perceptions of natural residential environments enhance NC. Firstly, the dimension of natural landscapes is the most significant factor in the biophilic environment, serving as a key trigger for residents' ecological emotions [77]. Natural landscapes that align with aesthetic preferences evoke a love for nature in individuals [78], with individual environmental perceptions often seen as the beginning of natural experience and exploration behaviors [79]. Secondly, the dimension of cultural identity, while meeting the biophilic design attribute of connecting with the environment, history, and culture [66], can shape community identity and emotional connections [35], thereby strengthening local attachment [80]. From the perspective of behavioral activities, residents engaging in natural interactions, neighborhood interactions, and personal activities in a favorable natural spatial environment further enhance the deep emotional connection between people and nature [33]. These findings are consistent with research indicating that residential behavioral activities can enhance NC. Natural interactions not only satisfy human curiosity and exploration of nature [81] but also create rich and meaningful activity experiences for residents [82]; engaging in close interactions with nature in the neighborhood promotes community cohesion and harmonious neighborly relationships [51], reinforcing the formation of community consciousness; and engaging in individual activities such as exercise, walking, and rest in the natural environment can promote nature connection by increasing the frequency and duration of contact with nature [46]. Compared to existing biophilic residential frameworks [17,18], our study utilizes the degree of nature connection as a quantitative indicator, effectively ensuring the validity of the scale; relative to biophilic frameworks in other regions [83,84], our study, set against the backdrop of traditional Chinese culture and high population density, emphasizes the cultural and neighborhood values of the natural environment, which is of significant importance for the role of biophilic environments in promoting health.

The natural landscape factor in the BornA scale includes six elements: vegetation quantity, visual hierarchy, color matching, types of natural elements, multisensory experience, and natural vitality, indicating that the quantity and quality of natural elements and their combined environment form the foundation of biophilic environmental perception. According to evolutionary theory, human judgments of the functional aspects of the natural environment have been internalized as preferences for the natural environment [2]. Therefore, natural landscapes that align with environmental preferences trigger biophilic environmental perceptions by satisfying human biophilic tendencies [3]. Simultaneously, engaging in interactive activities with nature provides individuals with a sense of relaxation and pleasure [75,82]. The natural landscape factor and the natural interaction factor together constitute the two most influential factors affecting individual biophilic experiences. Furthermore, cultural identity and neighborhood interactions have a significant impact on residents' perceptions of healthy living. Familiarity, consistency, and human care align with the Utilitarian, Humanistic, and Moralistic values in the biophilic value system [3], while a natural neighborhood environment fosters a comfortable and relaxed atmosphere for interpersonal communication, promoting positive social relationships [85]. Both factors can enhance residents' sense of belonging and neighborhood cohesion [86,87]. Finally, a biophilic environment provides favorable physical spaces for engaging in physical activities, facilitating residents' physical and mental well-being through the promotion of positive behavioral patterns [76,77]. Of particular importance, the five intermediate factors and the 18 measurement items identified in this study reveal how individuals process

environmental information through perception, cognition, and behavior to achieve a sense of intimacy and connection with nature [88]. This provides evidence of how residents experience the natural environment in high-rise, high-density residential areas, explains the role of natural factors in residents' healthy lifestyles, and contributes to research and development of healthy living environments.

The BornA scale provides an environmental assessment tool for investigating the biophilia hypothesis and evaluating the impact of residential environments on residents' health. Building upon this foundation, environmental intervention measures can be proposed from aspects such as natural landscapes, natural interactions, cultural identity, neighborhood interactions, and individual spaces to promote health. This can offer a comprehensive set of biophilic design strategies for high-rise, high-density residential areas to improve residents' health and well-being. For instance, to enhance environmental perception, strategies may include increasing green coverage at building interfaces, designing multi-level landscape paths with expansive views for exploration, using plants with wild natural characteristics, and incorporating natural textures or culturally significant installations. Furthermore, to optimize natural activity experiences, interventions could involve establishing community gardens, adding meandering paths within green spaces, designing enclosed rest areas with greenery, and incorporating interactive recreational facilities. These intervention measures and design strategies demonstrate the potential to improve residents' quality of life, lifestyles, and physical and mental health in a synergistic manner. They have the capacity to create a residential environment that promotes health and well-being.

5. Limitations and Further Research

The majority of participants in this study were residents who had independent access to online questionnaires, primarily consisting of middle-aged individuals aged 18–60. It remains uncertain whether the BornA scale is applicable to older adults and children. In future research, specific studies on biophilic residential environments tailored to older adults and children can be conducted. These studies can contribute to the development of a comprehensive age-friendly biophilic residential environment assessment tool or establish supplementary assessment tools for older adults and children.

While this study covered most provinces in China, it is important to adjust specific evaluation items for local climate and environmental suitability during practical application. Further research can concentrate on developing climate-specific measurement items and dimensions, thus creating a regionally tailored biophilic residential environment evaluation tool with climate adaptability.

This study focuses on the spatial environment of high-rise residential areas but lacks an investigation into the correlation with the surrounding environment and a classification based on the quality of natural resources in the vicinity. In further research, it is recommended to classify based on the characteristics of the surrounding environment and develop a targeted biophilic residential environment assessment tool.

6. Conclusions

High-rise residential areas, as the typical form of over 70% of new residential construction in China in the past decade, play a crucial role in shaping the living environment for urban dwellers. As more residents concentrate in metropolitan areas, many find themselves living in these efficient yet relatively isolated from nature spaces. This study examines the characteristics of the BornA scale, which consists of 18 factors, to measure residents' biophilic experiences in densely populated urban environments within high-rise buildings. The BornA scale serves as a scientific tool for measuring environmental experiential feelings with good reliability and validity. From the perspective of the availability of natural connections, the BornA scale and its five dimensions, including the natural environment perception factors of natural landscapes and cultural identity, as well as the natural activity experience factors of natural interactions, neighborhood interactions, and individual spaces, form the basis for studying biophilic environments. These five dimensions represent ef-

fective pathways for promoting residents’ healthy lifestyles in high-density residential areas. The scale can be utilized to assess the extent of residential environments’ impact on people’s biophilic perceptions and guide the development of health intervention measures and design strategies for spatial environments. In densely populated urban residential environments with high-rise buildings, clear factors influencing biophilic spatial environments will contribute to the systematic development of place-based intervention measures. Through environmental design that fosters a close connection between residents and nature, the establishment of ecologically healthy and sustainable communities can be achieved.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available due to involve respondents information.

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Appendix A

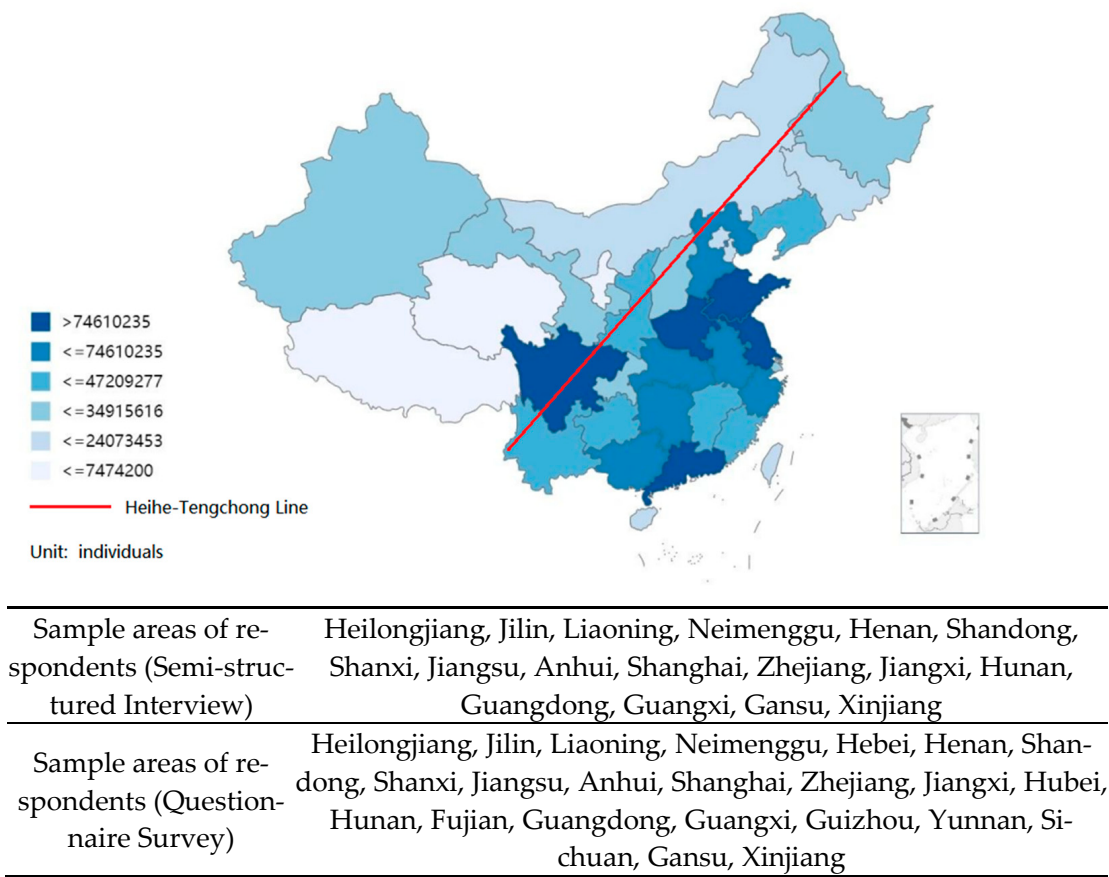


Figure A1. Population distribution map of the 7th census of China.

Appendix B

Table A1. Demographic information of Semi-Structured Interview.

Measure	Items	Frequency (n = 20)
Gender	Male	9
	Female	11
Age	18~40	9
	41~60	6
	>60	5

References

- Ulrich, R.S. View through a window may influence recovery from surgery. *Science* **1984**, *224*, 420–421. [[CrossRef](#)] [[PubMed](#)]
- Kaplan, S. A Model of Person-Environment Compatibility. *Environ. Behav.* **1983**, *15*, 311–332. [[CrossRef](#)]
- Kellert, S.R.; Wilson, E.O. *The Biophilia Hypothesis*; Shearwater Books: Washington, DC, USA, 1993.
- Jacobs, J. *The Death and Life of Great American Cities*; Vintage Books: Vancouver, WA, USA, 1962.
- Breheny, M. Centrists, Decentrists and Compromisers: Views on the Future of Urban Form. In *The Compact City: A Sustainable Urban Form*; Routledge: New York, NY, USA, 1996.
- Haaland, C.; van den Bosch, C.K. Challenges and strategies for urban green-space planning in cities undergoing densification: A review. *Urban For. Urban Green.* **2015**, *14*, 760–771. [[CrossRef](#)]
- Burton, E. The Compact City: Just or Just Compact? A Preliminary Analysis. *Urban Stud.* **2000**, *37*, 1969–2001. [[CrossRef](#)]
- Khomenko, S.; Cirach, M.; Pereira-Barboza, E.; Mueller, N.; Barrera-Gomez, J.; Rojas-Rueda, D.; Hoogh, K.D.; Hoek, G.; Nieuwenhuijsen, M. Premature mortality due to air pollution in European cities: A health impact assessment. *Lancet Planet. Health* **2021**, *5*, E121–E134. [[CrossRef](#)] [[PubMed](#)]
- Kabisch, N.; Haase, D. Green spaces of European cities revisited for 1990–2006. *Landsc. Urban Plan.* **2013**, *110*, 113–122. [[CrossRef](#)]
- Browning, M.; Rigolon, A.; McAnirlin, O.; Yoon, H. Where greenspace matters most: A systematic review of urbanicity, greenspace, and physical health. *Landsc. Urban Plan.* **2022**, *217*, 104233. [[CrossRef](#)]
- Wilson, E.O. *Biophilia*; Harvard University Press: London, UK, 1984.
- Hartig, T.; van den Berg, A.E.; Hagerhall, C.M.; Tomalak, M.; Bauer, N.; Hansmann, R.; Ojala, A.; Syngollitou, E.; Carrus, G.; van Herzele, A.; et al. Health Benefits of Nature Experience: Psychological, Social and Cultural Processes. In *Forests, Trees and Human Health*; Springer: Berlin/Heidelberg, Germany, 2011; pp. 127–168.
- Thompson, C.W.; Roe, J.; Aspinall, P.; Mitchell, R.; Clow, A.; Miller, D. More green space is linked to less stress in deprived communities: Evidence from salivary cortisol patterns. *Landsc. Urban Plan.* **2012**, *105*, 221–229. [[CrossRef](#)]
- Sallis, J.F.; Cerin, E.; Conway, T.L.; Adams, M.A.; Frank, L.D.; Pratt, M.; Salvo, D.; Schipperijn, J.; Smith, G.; Cain, K.L.; et al. Physical activity in relation to urban environments in 14 cities worldwide: A cross-sectional study. *Lancet* **2016**, *387*, 2207–2217. [[CrossRef](#)]
- Giles-Corti, B.; Vernez-Moudon, A.; Reis, R.; Turrell, G.; Dannenberg, A.L.; Badland, H.; Foster, S.; Lowe, M.; Sallis, J.F.; Stevenson, M.; et al. City planning and population health: A global challenge. *Lancet* **2016**, *388*, 2912–2924. [[CrossRef](#)]
- Chen, Y.; Yue, W.Z.; La Rosa, D. Which communities have better accessibility to green space? An investigation into environmental inequality using big data. *Landsc. Urban Plan.* **2020**, *204*, 103919. [[CrossRef](#)]
- Lee, E.J.; Park, S.J. Toward the Biophilic Residential Regeneration for the Green New Deal. *Int. J. Environ. Res. Public Health* **2021**, *18*, 2523. [[CrossRef](#)]
- Lee, E.J.; Park, S.J. Biophilic Experience-Based Residential Hybrid Framework. *Int. J. Environ. Res. Public Health* **2022**, *19*, 8512. [[CrossRef](#)]
- McGee, B.; Marshall-Baker, A. Loving nature from the inside out: A biophilia matrix identification strategy for designers. *HERD Health Environ. Res. Des. J.* **2015**, *8*, 115–130. [[CrossRef](#)] [[PubMed](#)]
- Schultz, P.W. Inclusion with Nature: The Psychology Of Human-Nature Relations. In *Psychology of Sustainable Development*; Schmuck, P., Schultz, W.P., Eds.; Springer: Boston, MA, USA, 2002; pp. 61–78.
- Mayer, F.S.; Frantz, C.M. The connectedness to nature scale: A measure of individuals' feeling in community with nature. *J. Environ. Psychol.* **2004**, *24*, 503–515. [[CrossRef](#)]
- Nisbet, E.K.; Zelenski, J.M.; Murphy, S.A. The Nature Relatedness Scale Linking Individuals' Connection With Nature to Environmental Concern and Behavior. *Environ. Behav.* **2009**, *41*, 715–740. [[CrossRef](#)]
- Hartig, T. Validation of a measure of perceived environmental restorativeness. In *Goteborg Psychological Reports*; Goteborg University: Göteborg, Sweden, 1996; Volume 26.
- Herzog, T.R.; Maguire, P.; Nebel, M.B. Assessing the restorative components of environments. *J. Environ. Psychol.* **2003**, *23*, 159–170. [[CrossRef](#)]
- Mayer, F.S.; Frantz, C.M.; Bruehlman-Senecal, E.; Dolliver, K. Why Is Nature Beneficial? The Role of Connectedness to Nature. *Environ. Behav.* **2009**, *41*, 607–643. [[CrossRef](#)]

26. Nisbet, E.K.; Zelenski, J.M.; Murphy, S.A. Happiness is in our Nature: Exploring Nature Relatedness as a Contributor to Subjective Well-Being. *J. Happiness Stud.* **2011**, *12*, 303–322. [\[CrossRef\]](#)
27. Capaldi, C.A.; Dopko, R.L.; Zelenski, J.M. The relationship between nature connectedness and happiness: A meta-analysis. *Front. Psychol.* **2014**, *5*, 976. [\[CrossRef\]](#)
28. Cheng, X.Q.; Liu, J.X.; Liu, H.W.; Lu, S.S. A systematic review of evidence of additional health benefits from forest exposure. *Landsc. Urban Plan.* **2021**, *212*, 104123. [\[CrossRef\]](#)
29. Richardson, M.; Cormack, A.; McRobert, L.; Underhill, R. 30 Days Wild: Development and Evaluation of a Large-Scale Nature Engagement Campaign to Improve Well-Being. *PLoS ONE* **2016**, *11*, e0149777. [\[CrossRef\]](#) [\[PubMed\]](#)
30. DeVille, N.V.; Tomasso, L.P.; Stoddard, O.P.; Wilt, G.E.; Horton, T.H.; Wolf, K.L.; Brymer, E.; Kahn, P.H.; James, P. Time Spent in Nature Is Associated with Increased Pro-Environmental Attitudes and Behaviors. *Int. J. Environ. Res. Public Health* **2021**, *18*, 7498. [\[CrossRef\]](#)
31. Krols, J.; Aerts, R.; Vanlessen, N.; Dewaelheyns, V.; Dujardin, S.; Somers, B. Residential green space, gardening, and subjective well-being: A cross-sectional study of garden owners in northern Belgium. *Landsc. Urban Plan.* **2022**, *223*, 104414. [\[CrossRef\]](#)
32. Soga, M.; Gaston, K.J.; Koyanagi, T.F.; Kurisu, K.; Hanaki, K. Urban residents' perceptions of neighbourhood nature: Does the extinction of experience matter? *Biol. Conserv.* **2016**, *203*, 143–150. [\[CrossRef\]](#)
33. Cox, D.T.; Shanahan, D.F.; Hudson, H.L.; Fuller, R.A.; Anderson, K.; Hancock, S.; Gaston, K.J. Doses of Nearby Nature Simultaneously Associated with Multiple Health Benefits. *Int. J. Environ. Res. Public Health* **2017**, *14*, 172. [\[CrossRef\]](#) [\[PubMed\]](#)
34. Lengieza, M.L.; Swim, J.K. The Paths to Connectedness: A Review of the Antecedents of Connectedness to Nature. *Front. Psychol.* **2021**, *12*, 763231. [\[CrossRef\]](#) [\[PubMed\]](#)
35. Fleury-Bahi, G.; Galharret, J.M.; Lemee, C.; Wittenberg, I.; Olivos, P.; Loureiro, A.; Jeuken, Y.; Laille, P.; Navarro, O. Nature and well-being in seven European cities: The moderating effect of connectedness to nature. *Appl. Psychol. Health Well Being* **2022**, *15*, 479–498. [\[CrossRef\]](#) [\[PubMed\]](#)
36. Church, S.P. From street trees to natural areas: Retrofitting cities for human connectedness to nature. *J. Environ. Plan. Manag.* **2018**, *61*, 878–903. [\[CrossRef\]](#)
37. Dematte, M.L.; Zucco, G.M.; Roncato, S.; Gatto, P.; Paulon, E.; Cavalli, R.; Zanetti, M. New insights into the psychological dimension of wood-human interaction. *Eur. J. Wood Wood Prod.* **2018**, *76*, 1093–1100. [\[CrossRef\]](#)
38. Windhorst, E.; Williams, A. "It's like a different world": Natural places, post-secondary students, and mental health. *Health Place* **2015**, *34*, 241–250. [\[CrossRef\]](#) [\[PubMed\]](#)
39. Mangone, G.; Dopko, R.L.; Zelenski, J.M. Deciphering landscape preferences: Investigating the roles of familiarity and biome types. *Landsc. Urban Plan.* **2021**, *214*, 104189. [\[CrossRef\]](#)
40. Yoshida, Y.; Matsuda, H.; Fukushima, K.; Takeuchi, K.; Watanabe, R. The missing intangibles: Nature's contributions to human wellbeing through place attachment and social capital. *Sustain. Sci.* **2022**, *17*, 809–822. [\[CrossRef\]](#)
41. Francomano, D.; Rodríguez González, M.I.; Valenzuela, A.E.J.; Ma, Z.; Raya Rey, A.N.; Anderson, C.B.; Pijanowski, B.C. Human-nature connection and soundscape perception: Insights from Tierra del Fuego, Argentina. *J. Nat. Conserv.* **2022**, *65*, 126110. [\[CrossRef\]](#)
42. Rickard, S.C.; White, M.P. Barefoot walking, nature connectedness and psychological restoration: The importance of stimulating the sense of touch for feeling closer to the natural world. *Landsc. Res.* **2021**, *46*, 975–991. [\[CrossRef\]](#)
43. Hoyle, H.E. Climate-adapted, traditional or cottage-garden planting? Public perceptions, values and socio-cultural drivers in a designed garden setting. *Urban For. Urban Green.* **2021**, *65*, 127362. [\[CrossRef\]](#)
44. Freeman, C.; Buttery, Y.; Waters, D.L.; Van Heezik, Y. Older adults' domestic green environments: The preference for flowers. *Landsc. Res.* **2021**, *46*, 897–915. [\[CrossRef\]](#)
45. Chang, C.C.; Oh, R.R.Y.; Nghiem, T.P.L.; Zhang, Y.C.; Tan, C.L.Y.; Lin, B.B.; Gaston, K.J.; Fuller, R.A.; Carrasco, L.R. Life satisfaction linked to the diversity of nature experiences and nature views from the window. *Landsc. Urban Plan.* **2020**, *202*, 103874. [\[CrossRef\]](#)
46. Shanahan, D.F.; Bush, R.; Gaston, K.J.; Lin, B.B.; Dean, J.; Barber, E.; Fuller, R.A. Health Benefits from Nature Experiences Depend on Dose. *Sci. Rep.* **2016**, *6*, 28551. [\[CrossRef\]](#)
47. Legrand, F.D.; Jeandet, P.; Beaumont, F.; Polidori, G. Effects of Outdoor Walking on Positive and Negative Affect: Nature Contact Makes a Big Difference. *Front. Behav. Neurosci.* **2022**, *16*, 901491. [\[CrossRef\]](#)
48. Wyles, K.J.; White, M.P.; Hattam, C.; Pahl, S.; King, H.; Austen, M. Are Some Natural Environments More Psychologically Beneficial Than Others? The Importance of Type and Quality on Connectedness to Nature and Psychological Restoration. *Environ. Behav.* **2019**, *51*, 111–143. [\[CrossRef\]](#)
49. Tomasso, L.P.; Laurent, J.G.C.; Chen, J.T.; Catalano, P.J.; Spengler, J.D. Cultural Sets Shape Adult Conceptualizations and Relationships to Nature. *Sustainability* **2021**, *13*, 11266. [\[CrossRef\]](#) [\[PubMed\]](#)
50. Artmann, M.; Sartison, K.; Ives, C.D. Urban gardening as a means for fostering embodied urban human-food connection? A case study on urban vegetable gardens in Germany. *Sustain. Sci.* **2021**, *16*, 967–981. [\[CrossRef\]](#)
51. Ward, K.S.; Truong, S.; Gray, T. Connecting to nature through community engaged scholarship: Community gardens as sites for collaborative relationships, psychological, and physiological wellbeing. *Front. Psychiatry* **2022**, *13*, 883817. [\[CrossRef\]](#)
52. Churchill, G.A., Jr. A Paradigm for Developing Better Measures of Marketing Constructs. *J. Mark. Res.* **1979**, *16*, 64–73. [\[CrossRef\]](#)
53. Gan, D.R.Y.; Fung, J.C.; Cho, I.S. Neighborhood Experiences of People Over Age 50: Factor Structure and Validity of a Scale. *Gerontologist* **2020**, *60*, E559–E571. [\[CrossRef\]](#) [\[PubMed\]](#)

54. Rodiek, S.; Nejati, A.; Bardenhagen, E.; Lee, C.; Senes, G. The seniors' outdoor survey: An observational tool for assessing outdoor environments at long-term care settings. *Gerontology* **2016**, *56*, 222–233. [\[CrossRef\]](#) [\[PubMed\]](#)
55. GB 50352-2019; Unified Standard for Civil Building Design. China Architecture & Building Press: Beijing, China, 2019.
56. Tong, A.; Sainsbury, P.; Craig, J. Consolidated criteria for reporting qualitative research (COREQ): A 32-item checklist for interviews and focus groups. *Int. J. Qual. Health Care* **2007**, *19*, 349–357. [\[CrossRef\]](#)
57. Fouad, A.T.Z.; Sinnett, D.; Bray, I.; McClatchey, R.; Reece, R. Measures of Greenspace Exposure and Their Association to Health-Related Outcomes for the Periods before and during the 2020 Lockdown: A Cross-Sectional Study in the West of England. *Land* **2023**, *12*, 728. [\[CrossRef\]](#)
58. Glaser, B.G.; Strauss, A.L. *The Discovery of Grounded Theory: Strategies for Qualitative Research*; Routledge: New York, NY, USA, 2017.
59. Joseph, F.; Barry, J.B.; Rolph, E.A.; Rolph, E.A. *Multivariate Data Analysis*; Pearson Prentice Hall: Old Bridge, NJ, USA, 2010.
60. Wu, M. *Structural Equation Model: Operation and Application of AMOS*; Chongqing People's Publishing House: Chongqing, China, 2010.
61. Bagozzi, R.P.; Kimmel, S.K. A comparison of leading theories for the prediction of goal-directed behaviours. *Br. J. Soc. Psychol.* **1995**, *34*, 437–461. [\[CrossRef\]](#)
62. Bailey, R.; Ball, S. An exploration of the meanings of hotel brand equity. *Serv. Ind. J.* **2006**, *26*, 15–38. [\[CrossRef\]](#)
63. Bagozzi, R.P.; Yi, Y. On the evaluation of structural equation models. *J. Acad. Mark. Sci.* **1988**, *16*, 74–94. [\[CrossRef\]](#)
64. Fornell, C.; Larcker, D.F. Evaluating structural equation models with unobservable variables and measurement error. *J. Mark. Res.* **1981**, *18*, 39–50. [\[CrossRef\]](#)
65. Tull, D.S.; Hawkins, D.I. *Marketing Research: Measurement and Method: A Text with Cases*; Macmillan: New York, NY, USA, 1984.
66. Kellert, S.R. *Biophilic Design: The Theory, Science, and Practice of Bringing Buildings to Life*; John Wiley & Sons: Hoboken, NJ, USA, 2008.
67. Browning, W.D.; Ryan, C.O.; Clancy, J.O. *14 Patterns of Biophilic Design*; Terrapin Bright Green, LLC: New York, NY, USA, 2014.
68. Hair, J.F.; Black, W.C.; Babin, B.J.; Anderson, R.E. *Multivariate Data Analysis: A Global Perspective*; Pearson: London, UK, 2010.
69. Nunnally, J.; New, M.G. *Psychometric Theory*; McGraw-Hill: New York, NY, USA, 1978.
70. Kwan, M.-P. From place-based to people-based exposure measures. *Soc. Sci. Med.* **2009**, *69*, 1311–1313. [\[CrossRef\]](#)
71. Matthews, S.A.; Yang, T.-C. Spatial polygamy and contextual exposures (spaces) promoting activity space approaches in research on place and health. *Am. Behav. Sci.* **2013**, *57*, 1057–1081. [\[CrossRef\]](#)
72. Aristizabal, S.; Byun, K.; Porter, P.; Clements, N.; Campanella, C.; Li, L.H.; Mullan, A.; Ly, S.; Senerat, A.; Nenadic, I.Z.; et al. Biophilic office design: Exploring the impact of a multisensory approach on human well-being. *J. Environ. Psychol.* **2021**, *77*, 101682. [\[CrossRef\]](#)
73. Putrino, D.; Ripp, J.; Herrera, J.E.; Cortes, M.; Kellner, C.; Rizk, D.; Dams-O'Connor, K. Multisensory, Nature-Inspired Recharge Rooms Yield Short-Term Reductions in Perceived Stress Among Frontline Healthcare Workers. *Front. Psychol.* **2020**, *11*, 560833. [\[CrossRef\]](#)
74. Kaplan, R.; Kaplan, S. *The Experience of Nature. A Psychological Perspective*; Cambridge University Press: Cambridge, UK, 1989.
75. Maurer, M.; Zaval, L.; Orlove, B.; Moraga, V.; Culligan, P. More than nature: Linkages between well-being and greenspace influenced by a combination of elements of nature and non-nature in a New York City urban park. *Urban For. Urban Green.* **2021**, *61*, 127081. [\[CrossRef\]](#)
76. Nisbet, E.K.L. *Canadians Connect with Nature and Increase Their Well-Being: Results of the 2014 30x30 Nature Challenge*; David Suzuki Foundation: Vancouver, BC, Canada, 2014.
77. Lim, P.Y.; Dillon, D.; Chew, P.K.H. A Guide to Nature Immersion: Psychological and Physiological Benefits. *Int. J. Environ. Res. Public Health* **2020**, *17*, 5989. [\[CrossRef\]](#)
78. Appleton, J. *The Experience of Landscape*; Wiley: Chichester, UK, 1975.
79. Raanaas, R.K.; Patil, G.; Alve, G. Patients' recovery experiences of indoor plants and views of nature in a rehabilitation center. *Work-A J. Prev. Assess. Rehabil.* **2016**, *53*, 45–55.
80. Scannell, L.; Gifford, R. The experienced psychological benefits of place attachment. *J. Environ. Psychol.* **2017**, *51*, 256–269. [\[CrossRef\]](#)
81. Garza-Teran, G.; Tapia-Fonllem, C.; Fraijo-Sing, B.; Borbon-Mendivil, D.; Poggio, L. Impact of Contact With Nature on the Wellbeing and Nature Connectedness Indicators After a Desertic Outdoor Experience on Isla Del Tiburon. *Front. Psychol.* **2022**, *13*, 864836. [\[CrossRef\]](#)
82. McEwan, K.; Ferguson, F.J.; Richardson, M.; Cameron, R. The good things in urban nature: A thematic framework for optimising urban planning for nature connectedness. *Landsc. Urban Plan.* **2020**, *194*, 103687. [\[CrossRef\]](#)
83. Xue, F.; Gou, Z.H.; Lau, S.S.Y.; Lau, S.K.; Chung, K.H.; Zhang, J. From biophilic design to biophilic urbanism: Stakeholders' perspectives. *J. Clean. Prod.* **2019**, *211*, 1444–1452. [\[CrossRef\]](#)
84. Hung, S.-H.; Chang, C.-Y. How Do Humans Value Urban Nature? Developing the Perceived Biophilic Design Scale (PBDs) for Preference and Emotion. *Urban For. Urban Green.* **2022**, *76*, 127730. [\[CrossRef\]](#)
85. Grahn, P.; Stigsdotter, U.K. The relation between perceived sensory dimensions of urban green space and stress restoration. *Landsc. Urban Plan.* **2010**, *94*, 264–275. [\[CrossRef\]](#)

86. Fornara, F.; Troffa, R.; Valera, S.; Vidal, T. European and natural landscapes as carriers of place identity: A correlational study in Italian and Spanish regions. *Landsc. Res.* **2019**, *44*, 757–767. [[CrossRef](#)]
87. Hartig, T.; Mitchell, R.; De Vries, S.; Frumkin, H. Nature and Health. *Annu. Rev. Public Health* **2014**, *35*, 207–228. [[CrossRef](#)]
88. Nisbet, E.K.; Zelenski, J.M. The NR-6: A new brief measure of nature relatedness. *Front. Psychol.* **2013**, *4*, 813. [[CrossRef](#)]

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