Understanding connection to nature in Turkish middle school children: Personal factors and Nature's restorative effect

Menşure Alkış Küçükaydın

Necmettin Erbakan University, Konya, Turkey

ARTICLE INFO

ABSTRACT

A connection to nature can be healing and restorative for children, especially when they are coping with psychological symptoms. Better understanding the essence of this connection and investigating the associated variables can, therefore, prove useful. This research consisted of three studies measuring the connection to nature among youth in Turkey's unique, non-Western context. In Study-1 ($n = 214$), the 14-item Connection to Nature Index (CNI) was tested with confirmatory factor analysis. The results showed that the CNI was a valid and reliable instrument in the Turkish sample. Study-2 ($n = 375$) examined personal factors predicting children's connection to nature. Regression analysis showed that gender was a significant predictor of CNI. We also found that connection to nature increased as screen time decreased and the frequency of contact with nature increased. In Study 3 ($n = 404$), we found that hope and satisfaction with life acted as serial and complete mediators between CNI and psychological symptoms. Unlike the results of previous studies conducted in the West, this study highlights for the first time the importance of children's connection with the natural world in Turkey, an Eastern society.

1. Introduction

A "connection to nature" is an expression used to explain the closeness between humans and the natural world (Otto & Pensini, 2017). Many studies have reported that exposure to nature deeply affects the individual in positive and even restorative ways (Biedenweg et al., 2017; Fyfe-Johnson et al., 2021). This is because human beings have an instinctive need to connect with everything that is alive and vital (Pretty, 2004). Even in our modern lives, the sprawling image of a natural landscape we choose for the computer background, the bouquet of flowers we place on the desk, and the relaxing effect of a walk in the park helps explain the structure of human beings in relation to nature. Wilson (1984) calls this innate potential to connect psychologically with nature "biophilia". Connecting to nature can happen at any age for biophiles (Zhang et al., 2014), although establishing such a connection in childhood is important in terms of both nature conservation and individual well-being later in life (Ives et al., 2018). Children's connection to nature can help generate care and compassion towards the natural world as they move forward in life (Mayer & Frantz, 2004; Natural England, 2009). Moreover, children are future consumers, policy makers and parents (Soga & Gaston, 2016). It is, therefore, important to understand children's connection to nature.

Various instruments have been developed and presented in the literature to understand the link between individuals and nature, with a focus on diverse samples. Schultz (2001) measured attitudes towards environmental concerns in a sample of university students, providing insights into the younger generation's perspectives. Mayer and Frantz (2004) also developed the connection to nature scale, a new measure of individuals' emotional connection to the natural world, in a sample of university students. Natural England (2009) took a step further by developing an instrument to measure the connection to nature for three different samples: adults under the age of 50, adults aged 50 and over, and children aged 7–11, ensuring a comprehensive understanding across age groups. Nisbet and Zelenski (2013) attempted to assess the connection to nature in three different samples of university students and adults with a short 6-item measurement tool, broadening the participant scope of the study. As can be seen, the instruments used to determine the connection to nature in the previous literature were generally used in adult or university student samples. In contrast, Richardson et al. (2019) developed the Monitor of Engagement with the Natural Environment Survey for children and adults. Even if these instruments have been used in child samples, there is a need for instruments to measure children's connection nature. In this context, Cheng and Monroe (2012) developed the Connection to the Nature Index (CNI) to measure children's emotional attitudes towards the natural environment. The index was developed in a sample of all fourth-grade public school students in Florida. Other researchers have frequently proposed and used Cheng and Monroe's (2012) scale (Arola et al., 2023; Bragg et al.,

Note: Low-resolution images were used to create this PDF. The original images will be used in the final composition.

2013). Given the popularity of Cheng and Monroe's (2012) CNI, we decided to use this scale. Previous literature on the connection to nature in children has linked it to personal factors. Accordingly, the increasing use of technology and related screen time unsurprisingly limits children's outdoor time (Larson et al., 2019). In contrast, regular contact with nature provides positive and enjoyable experiences (Gotch & Hall, 2004). Reducing children's screen time and increasing time spent in nature is an inexpensive and easy way to increase environmentalism (Cheng & Monroe, 2012). According to Collado et al. (2015), an increased connection to nature also helps children develop ecological and pro-environmental behaviours. Thus, interest in environmentally friendly practices also increases.

Being connected to nature varies according to gender (Rosa, Larson, et al., 2023) and socioeconomic status (Lackey et al., 2022). Evidence suggests adult women are more concerned about the environment and exhibit pro-environmental attitudes than men (Gifford & Nilsson, 2014). Similarly, studies focusing on young people have found that girls generally have a more vital emotional closeness or connection to nature than boys (Larson et al., 2013). Lackey et al. (2022) reported that socioeconomic status and race were essential variables in participation in outdoor recreation activities and connection to nature in their study conducted with young people aged 18–25. However, the relationship between these personal characteristics and being connected to nature still needs to be clarified in the child sample.

In addition, a solid connection to nature brings psychological empowerment (Bratman et al., 2019; Chawla, 2020; Norwood et al., 2019). Although the number of studies conducted with children connected to nature literature is small, similar results have been found regarding the contributions of being connected to nature. For example, it has been reported that children with strong ties to nature show better self-regulation skills (Bakir-Demir et al., 2019), are mentally healthier (Piccininni et al., 2018), exhibit better mood (Laurens et al., 2017), and are happier (Cui & Yang, 2022; Jackson et al., 2021). Accordingly, nature relaxes and helps to heal, leading to better well-being (Arola et al., 2023; Ives et al., 2018; Pretty, 2004).

Sobko et al. (2018) report that children with a strong connection to nature can empathize with plants and animals, exhibit positive social behaviours, and have fewer problems linked to hyperactivity or inattention. This can increase children's hope for the future by increasing trust, compassion and connection with others (Bowers et al., 2021). Understanding the relationship between connection to nature and hope in children is important. Connecting to nature improves mood by reducing stress (Fyfe-Johnson et al., 2021) and increases mental well-being (Dean et al., 2018). This, in turn, can support a sense of hope. Moreover, connecting to nature can also improve empathy (Norwood et al., 2019). Individuals who develop empathy support each other more closely (Tam, 2013). This reciprocal relationship affects children's emotional (Bowers et al., 2021), intellectual (Jackson et al., 2021) and social development (Gifford & Nilsson, 2014). Additionally, time spent in nature leads to adopting healthy living habits, and physical health increases a sense of hope (Fyfe-Johnson et al., 2021). Therefore, healthy individuals have more positive expectations for the future (Chawla, 2022).

Studies also show positive relationships between time spent outdoors and satisfaction with life. Biedenweg et al. (2017) reported that recreational activities reduce stress and increase satisfaction with life, resulting in more robust mental well-being. MacKerron and Mourato (2013) reported that proximity to natural environments and time spent in nature are associated with happiness and satisfaction with life. Being connected to nature improves various areas of life. Therefore, recent scientific publications show doctors recommend contact with nature to improve children's health (Fyfe-Johnson et al., 2021; Norwood et al., 2019).

1.1. The current study

Previous literature has addressed connected to nature in different contexts and with samples from other regions (Table 1). The current study addresses connectedness to nature in terms of demographic and psychological components, and correlates. However, connectedness to nature has not yet been discussed in Turkey. Turkey is a country with different climatic and geographical regions. Various natural environments, such as the Aegean coastline, and the Mediterranean turquoise waters, diversify and enrich children's interactions with nature. Addressing the relationship between attachment to these natural environments and children's psychological states can provide a cultural richness in literature and thus contribute to expanding the literature.

Therefore, the study aims to understand children's connectedness to nature in the Turkish sample. We used three different study designs and three different samples for the designs. In this way, we aimed to make the results of the study more generalizable and adaptable for participants in different samples. In Study-1, we explored adaptation of a commonly-used CNI in a Turkish sample; in Study-2, we examined the relationship of connection to nature with various demographic characteristics; and in Study-3, using a serial mediation model, we examined the relationship between connection to nature and hope, satisfaction with life, and psychological symptoms. The research questions we addressed in this research are as follows:

1. Is the CNI discussed in Study −1 a valid and reliable tool in the Turkish sample?
2. Are the personal factors (gender, socioeconomic status, screen time, and frequency of contact with nature) considered in Study-2 a significant predictor of connection to nature?
3. Do hope and satisfaction with life play a mediator role in the relationship between connection to nature and psychological health, as discussed in Study-3?

Table 1
Previous studies on connectedness to nature.

Researchers	Topic Related to Connectedness to Nature	Country	Sample
Biedenweg et al. (2017)	Life satisfaction	USA	Adults
Cheng and Monroe (2012)	Emotional attitudes towards the natural environment	USA	Children
Cui and Yang (2022)	Happiness	China	Childrens
Dean et al. (2018)	Mental and physical health	Australia	Adults
Jackson et al. (2021)	Mental well-being	USA	Adolescents
Lackey et al. (2022)	Future career interest	USA	Youths
Mayer and Frantz (2004)	Emotional connection	USA	University students
Nisbet and Zelenski (2013)	Nature relatedness	Canada	University students and adults
Otto and Pensini (2017)	Environmental knowledge and ecological behaviour	Germany	Children
Piccininni et al. (2018)	Mental health	Canada	Adolescents
Richardson et al. (2019)	Nature connection	UK	Children and adults
Rosa, Larson, et al. (2023)	Outdoor preferences and nature-based recreation	Brazil and the United States	College students
Sobko et al. (2018)	Psychological functioning	Hong Kong	Preschool children

2. Study 1: adaptation of the CNI in Turkey

2.1. Participants

Our first study attempted to adapt the CNI to a Turkish sample. The participants of the study were middle school students studying in the Central Anatolia Region of Turkey. A convenience sampling technique was used to select the students. A total of 214 students, 125 (58.4%) girls and 89 (41.6%) boys, participated in the study. The mean age of the students was 12.34 years (range = 11–16 years). Eleven (5.1%) of the students defined themselves as low socioeconomic status, 133 (62.1%) as medium and 70 (32.7%) as high socioeconomic status.

2.2. Instruments

2.2.1. The demographic characteristics form

This form was prepared by the researcher to access the demographic information of the students for Study-1. Students were asked about their gender, age, and socioeconomic status. Children in the 11–16 age groups may describe their socioeconomic status as low, medium or high. In previous studies conducted with children, socioeconomic status information was asked this way (Mert et al., 2015).

2.2.2. Connection to Nature Index (CNI)

The CNI developed by Cheng and Monroe (2012) was used in the study. The CNI consists of 4 factors (enjoyment of nature, empathy for creatures, sense of oneness with nature, and sense of responsibility for the environment) and 16 items. The scale is scored on a 5-point Likert scale (1 = strongly disagree … 5 = strongly agree). Scoring is based on the total score obtained from the scale. Accordingly, a high score on the scale insinuates a strong connection to nature.

2.3. Procedure and data collection

A series of procedural steps were followed for the Turkish adaptation of the CNI (Beaton et al., 2000). Two bilingual translators, who are native speakers of Turkish and fluent in English, translated the CNI into Turkish independently of one another. One of the translators was a Ph.D. science educator who has conducted studies on nature and has previously conducted scale adaptations. The other was an expert in assessment and evaluation who completed his Ph.D. abroad with a major in English. After the translation was completed, the Turkish form was prepared once the mini-panel (which included the researcher) came to a consensus regarding the language in the translation. The form was back-translated into the native language with the help of two native English translators. The back-translated form was examined by the experts in the first mini-panel and compared with the original version of the scale. Then, the final revisions of the scale began. The Turkish form of the CNI was checked by two doctoral faculty members from the field of Turkish language teaching, and eight students outside the sample were asked for their opinions on the comprehensibility of the form. Thus, the scale was subjected to a pilot application in terms of comprehensibility.

After the adaptation of the scale, ethics committee permission was obtained for Study-1 and Study-2 and Study-3 (Human Research Ethics Committee of XX University- Ref. No = 2023-SBB-0530), and thus the data collection process started. Data were collected between September and October 2023. The relevant form was first delivered to the school principals and both parental permission and voluntary participation permissions were obtained from the students. All ethical concerns were addressed in accordance with the ethical standards of the 1964 Helsinki Declaration.

2.4. Data analysis

SPSS Statistics (ver. 26.0) was used for descriptive statistical analyses and AMOS 23.0 was used for confirmatory factor analysis (CFA) of CNI. The maximum likelihood method was adopted for data analysis. $\chi^2/df < 3$, AGFI (>.90), GFI (>.90), NFI (>.90), IFI (>.90), CFI (>.90), TLI (>.90), and RMSEA (<.08) values were taken into consideration in the evaluation of fit indices (Kline, 2011).

Convergent validity and discriminant validity were examined in testing the construct validity of the CNI. Also, average variance extracted (AVE >.50) and composite reliability (CR > .70) values were calculated (Hu & Bentler, 1999). In evaluating discriminant validity, maximum shared variance (MSV) and average shared variance (ASV) checks were performed (Fornell & Larcker, 1981). For reliability, Cronbach's alpha (α), CR, and McDonald's omega (ω) coefficients were calculated.

2.5. Results

According to the CFA results for the CNI, the scale consisting of 16 items and 4 dimensions showed an excellent fit model: $\chi^2/df = 1.35$, AGFI = .90, GFI = .93, NFI = .90, IFI = .96, CFI = .96, TLI = .95, and RMSEA = .04 (CI = .02/.05). The structure of the scale consisting of 16 items and 4 dimensions explained 56% of the variance. The factor loadings of the scale ranged between .538 and .921. In the analyses conducted for validity, it was seen that the AVE value was above .50 and the AVE value was above both MSV and ASV values. For reliability, Cronbach's alpha (α ranged = .72 - .77), McDonald's omega (ω ranged = .73 - .83) and CR values (CR ranged = .71 - .85) were within the acceptable range. As a result, the model of the CNI was validated in the Turkish sample. Other descriptive statistical information about the scale is presented in Table 2.

3. Study-2: the relationship between connection to nature and personal factors

3.1. Participants

Our second study explored personal factors that are assumed to be related to the connection to nature in a different Turkish sample. The participants of the study were students from the northern part of Turkey. The students were between the ages of 8 and 16 (M = 12.13, SD = 1.64). A total of 375 students, 209 (40.3%) girls and 166 (32%) boys, participated in the study. Of the students, 9 (1.7%) identified themselves as having low socioeconomic status, 206 (39.8%) as medium, and 160 (30.9%) as high socioeconomic status.

3.2. Instruments

3.2.1. The demographic characteristics form

In the form prepared to access student information within the scope of Study-2, students were asked about their gender, age, and socioeconomic status. In addition, the amount of time children spend in front of screens (TV, tablet, and computer) on a daily basis (0–1 h/1–2 h/2–3 h/3–4 h/4–5 h/more than 5 h per day) and the frequency of contact with nature were also investigated. A 4-item measurement tool was used for this purpose.). There were also two specific items assessing the frequency by which students engage in certain natural environments: 1) "How often have you spent time in natural places such as the countryside, the beach, the mountains, etc.?" and "2) "How often have you visited places such as zoos or aquariums" (Collado et al., 2015; Gotch & Hall, 2004; Larson et al., 2011). Students answered this question between 1 (never) to 5 (more than 10 times). In addition, students were asked two questions regarding their experiences in nature: 3) "Do you play in natural places after school time?" and 4) "Do you play in natural

Table 2

Factor loading, mean, *SD*, AVE, CR, MSV, ASV, Cronbach's alpha, and McDonald's omega values of CNI in a sample of Turkish youth.

Items	Factor loading	Mean	*SD*	α	CR	ω	AVE	√AVE	MSV	AVS	1	2	3	4
Enjoyment of nature														
I like to hear different sounds in nature	.874	3.66	1.27	.77	.85	.78	.50	.71	.34	.25	-			
I like to see wild flowers in nature	.709	3.81	1.34											
When I feel sad, I like to go outside and enjoy nature	.563	3.53	1.42											
Being in the natural environment makes me feel peaceful	.688	3.83	1.27											
I like to garden	.681	3.64	1.30											
Collecting rocks and shells is fun	.720	3.42	1.45											
Empathy for creatures														
I feel sad when wild animals are hurt	.672	3.77	1.25	.77	.79	.77	.51	.71	.35	.26	.55[a]	-		
I like to see wild animals living in a clean environment	.691	3.94	1.23											
I enjoy touching animals and plants	.538	3.84	1.24											
Taking care of animals is important to me	.921	3.96	1.21											
Sense of oneness with nature														
Humans are part of the natural world	.848	3.84	1.26	.72	.71	.73	.56	.74	.39	.28	.56[a]	.53[a]	-	
People cannot live without plants and animals	.633	4.05	1.19											
Being outdoors makes me happy	.761	3.90	1.38											
Sense of responsibility														
My actions will make the natural world different	.732	3.19	1.14	.72	.79	.83	.52	.72	.36	.27	.42[a]	.42[a]	.56[a]	–
Picking up trash on the ground can help the environment	.627	4.20	1.15											
People do not have the right to change the natural environment	.798	3.33	1.42											

[a] *p* < .001.

places during the weekends?" Students responded to these questions on a scale of 1 (never) to 5 (all the time). The Cronbach's alpha coefficient for this 4-item measure is .75.**3.2.2. CNI-Turkish Form.**

Within the scope of the study, the CNI, which was adapted into Turkish in Study-1, was used. The Cronbach's alpha coefficient of the CNI for Study-2 was .87. The goodness-of-fit index values of the CNI-Turkish form for this sample were as follows: $\chi^2/df = 2.60$, AGFI = .92, GFI = .94, NFI = .90, IFI = .94, CFI = .93, TLI = .92, and RMSEA = .05 (CI = .04/.06).

3.3. Data analysis

In the study, descriptive statistics and primary analyses were conducted with SPSS Statistics (ver. 26.0). Regression analysis was performed to find the predictor variables of connection to nature. We calculated the mean score for each sub-dimension of the CNI. The tolerance value was between .96 and .99 in the regression analysis, and the VIF values were between 1.00 and 1.03 in the analyses, suggesting no problems of multicollinearity. In addition, the highest correlation value between binary variables was found to be .64 (Field, 2005). During the analysis, the responses for gender, socioeconomic status, and screen time were transformed into dummy variables. Due to the low number of students who reported themselves to be at a low socioeconomic status (1.6%), the data at this level were recorded as "below average" and "above average". We created a socioeconomic status table according to the household income reported by the Turkish Statistical Institute. Based on the table, an artificial reference was prepared for those below a certain income and those above this income. In this way, the analysis was carried out in a binary categorization. Accordingly, the gender categorical variable was coded as "female", the socioeconomic status category as "below average", and the time spent in front of the screen category as "0–1 h per day" was coded as reference group. Previous literature findings were taken into consideration in this coding (Collado et al., 2015; Lackey et al., 2022; Larson et al., 2019; Rosa, Larson, et al., 2023). Accordingly, we predicted that connection to nature would vary according to gender, socioeconomic status, and screen time. We expected that less screen time, female gender, and lower socioeconomic status would positively affect connection to nature.

3.4. Results

3.4.1. Descriptive analysis

Descriptive analyses were conducted first (Table 3). A score above the midpoint was reached ($M_{enjoyment\ of\ nature} = 3.66$, $SD = .83$; $M_{Empathy\ for\ creatures} = 3.81$, $SD = .88$; $M_{Sense\ of\ oneness\ with\ nature} = 3.89$, $SD = .91$; $M_{Sense\ of\ responsibility} = 3.49$, $SD = .77$) in all sub-dimensions. Based on this, students have a high level of connection to nature. However, the average time students spend in front of the screen was 3 h per day. In addition, the average number of activities spent in nature in the last year and the frequency of contact with nature scored below 10. In other words, this indicates that it is below the midpoint. The table also includes the percentages of the responses given by the participants. According to this, the rate of 4-point responses in the sub-dimensions of CNI varies between 17.83% and 21.01%, and the rate of 5-point responses varies between 23.60% and 33.60%. While 21.6% of the participants spent less than 1 h in front of the screen daily, 5.4% reported spending more than 5 h in front of the screen daily. While 14.7% of the participants had not spent time in natural environments in the last year, 7.1% reported participating in more than ten activities in the last year. Finally, 18.25% of respondents reported never experiencing nature on

Table 3

Descriptive analysis results Turkish Children's connection to nature and its sub-dimensions, time spent in front of the screen, activity time spent within the last year and nature experiences.

Variables	Range	*M*	*SD*	% of Participants	
CNI				*4-point*	*5-point*
Enjoyment of nature	1–5	3.66	.83	21.01	25.81
Empathy for creatures	1–5	3.81	.88	17.65	30.92
Sense of oneness with nature	1–5	3.89	.91	18.80	33.60
Sense of responsibility	1–5	3.49	.77	17.83	23.60
				0-1 h	*5+ hours*
Time spent in front of the screen	1–6	2.58	1.51	21.6	5.4
				Never activity	*More than 10 times activity*
Activity time spent within 1 year	1–5	2.55	1.08	14.7	7.1
				Never experiences in nature	*All the time experiences*
Nature experiences	1–5	2.53	1.24	18.25	15.15

weekends or after school, compared to 15.15% who reported the opposite.

3.4.2. Regression analyses

Following the descriptive analyses, we tested whether personal characteristics were significant predictors of connection to nature (Table 4). Gender, socioeconomic status, time spent in front of the screen, and contact with nature variables had a significant relationship with the connection nature has in children (R = .74, R^2 = .60, p = .00). Together, these four variables explain approximately 60% of the total variance in the connection to nature.

According to the standardized regression coefficient (β), the relative order of importance of the predictor variables on the connection to nature was contact with nature (B = .17, p < .01), time spent in front of the screen (B = −.16, p < .01), and gender (B = .16, p < .01).

4. Study-3: investigating the relationship between connection to nature and hope, satisfaction with life, and psychological symptoms

4.1. Participants

In our third study, the relationship between psychological health, satisfaction with life, and hope was examined using the CNI in Turkish children. This study's participants were different from Study-1 and Study-2. They were students aged 10–15 from southern Turkey (M = 12.58, SD = 1.63). A total of 404 students, 280 (51.2%) girls and 124 (22.7%) boys, participated in the study. Of the students, 9 (1.6%) identified themselves as low socioeconomic status, 253 (46.3%) as medium and 142 (26.0%) as high socioeconomic status.

4.2. Instruments

4.2.1. The demographic characteristics form

In Study-3, age, gender, and socioeconomic status information were using the same prepared form as in. in Study-1 and Study-2. The following instruments were added below the form respectively.

4.2.2. The international health behavior in school-aged children symptom checklist-(HBSC-SCL)

HBSC-SCL is used as a measure of psychological health. It is an 8-item scale measuring psychological and somatic symptoms in children (Haugland & Wold, 2001). In this study, the HBSC-SCL psychological subscale (4 items) was used. The HBSC-SCL subscale examines only psychological symptoms (complaints about feeling low or depressed, feeling irritable or bad-tempered, feeling nervous, and difficulties sleeping) in children (Gariepy et al., 2016).

Students were asked how many times they experienced each symptom in the previous six months. The possible answers are listed as follows: 1 = about every day, 2 = more than once a week, 3 = about every week, 4 = about every month, 5 = rarely or never. Some of the statements in the scale are as follows: "*I feel depressed*", and "*I have diffi-*

Table 4
Regression analysis of gender, socioeconomic status, screen time and contact with nature as predictors of the connection to nature in Turkish children.

Variables	B	Std.Error$_B$	β	p
Constant	4.12	.26	–	.00
Gender	.27	.08	.16	.00
SES	.08	.08	.05	.28
Time	−.08	.02	−.16	.00
CN	.16	.04	.17	.00
R = .74, R^2 = .60, F (4, 370) = 7.65, p = .00				

Note. SES = Socioeconomic status, Time = Time spent in front of the screen, CN = contact with nature.

culties sleeping". It is understood that psychosomatic symptoms are more significant as the score obtained from the scale increases. Therefore, the scale scores are reverse coded. The scale was adapted to Turkish within the scope of the study. The fit index values of the one-factor scale are as follows: χ^2/df = 2.16, AGFI = .98, GFI = .99, NFI = .99, IFI = .99, CFI = .99, TLI = .98, and RMSEA = .04 (CI = .00/.10). This shows that the model has an excellent fit value (Hu & Bentler, 1999). In addition, the AVE value of the scale is .56, CR value is .83 and Cronbach's alpha value is .78.

4.2.3. Satisfaction with life scale for children (SWLS-C)

The satisfaction with life scale for children developed by Gadermann et al. (2010) was adapted into Turkish by Altay and Ekşi (2018). The 5-point Likert-type scale (1 = disagree a lot … 5 = agree a lot) consists of one dimension and 5 items. A higher score denotes an increased satisfaction with life. The Cronbach's alpha coefficient calculated for this study is .80. Some of the statements in the scale are as follows: "*In most ways my life is close to the way I want it to be*", and "*Things in my life are perfect*".

4.2.4. Children's hope scale (CHS)

The Children's Hope Scale was developed by Snyder et al. (1997) and adapted into Turkish by Atik and Kemer (2009). The scale consists of two dimensions: pathways (items 1, 3, 5) and agency (items 2, 4, 6). The scale, which consists of a total of 6 items, is scored according to a 6-point Likert-type scale (1 = never … 6 = always). Scoring of the scale is based on the total score. A higher score on the scale is interpreted as a hopeful outlook. The Cronbach's alpha coefficient calculated within the scope of the study is .80. Some of the statements in the scale are as follows: "*I think I am doing pretty well*", and "*I can think of many ways to get the things in life that are most important to me*".

4.2.5. Connection to Nature Index-Turkish Form

In Study-1, the Connection to Nature Index (CNI) adapted to Turkish was used. Therefore, the same scale was used in Study-3 as in Study-2. The calculated Cronbach's alpha coefficient of CNI for Study-3 is .87. The goodness-of-fit index values of the CNI-Turkish form for this sample were as follows: χ^2/df = 2.66, AGFI = .91, GFI = .94, NFI = .91, IFI = .94, CFI = .94, TLI = .93, and RMSEA = .05 (CI = .04/.06). Also, CFA tables for the studies are presented in Appendix 1.

4.3. Data analysis

In Study-3, the scores obtained by the sample from CNI, CHS, SWLS-C, and HBSC-SCL scales were first analyzed by descriptive analysis. Then, the relationships between CNI, CHS, SWLS-C, and HBSC-SCL were examined with Pearson correlation analysis. Afterward, the hypothesized serial mediation model between these variables was tested with the AMOS 23.0 program. In this model, we tested whether the effect of the independent variable (CNI) passes through more than one mediator (CHS and SWLS-C) before affecting the dependent variable (HBSC-SCL).

4.4. Results

4.4.1. Descriptive analysis

Firstly, descriptive analyses of the scores obtained from CNI, CHS, SWLS-C, and HBSC-SCL were conducted (Table 5). The analyses for Study-3 showed that the scores obtained from CNI (M = 3.71, SD = .68), CHS (M = 3.88, SD = 1.00), and SWLS-C (M = 3.03, SD = .90) were above midpoint. Students appeared to demonstrate high levels of connection to nature, hope, and satisfaction with life. Their scores on the HBSC-SCL (M = 2.78, SD = 1.01) were below midpoint. This can be explained by a noted lack of debilitating psychological conditions.

Table 5

Descriptive analysis results and correlation values Turkish Children's scores on the connection to nature, psychological health, satisfaction with life, and hope scales.

Variables	Range	Mean	SD	Skewness (SE = .10)	Kurtosis (SE = .20)	1	2	3	4
1.CNI	1–5	3.71	.68	−1.22	1.70	–			
2.HBSC-SCL	1–5	2.78	1.01	−.03	−.37	−.17*	–		
3.SWLS-C	1–5	3.03	.90	−.11	−.00	.23*	−.49[a]	–	
4.CHS	1–6	3.88	1.00	−.31	.24	.38*	−.41[a]	.61[a]	–

Notes: CNI: connection to nature; HBSC-SCL: international health behavior in school-aged children symptom checklist; SWLS-C: satisfaction with life scale for children; CHS: children's hope scale.

[a] $p < .001$.

HBSC-SCL was negatively correlated with all variables. There was a low correlation between HBSC-SCL and CNI ($r = −.17$, $p < .001$), a moderate correlation between HBSC-SCL and SWLS-C ($r = −.49$, $p < .001$), and a moderate correlation between HBSC-SCL and CHS ($r = −.41$, $p < .001$). The strongest relationship was between SWLS-C and CHS ($r = .61$, $p < .001$).

4.4.2. Serial multiple mediational analysis

At this stage of the study, we examined the serial mediation role of CHS and SWLS-C between CNI and HBSC-SCL (Fig. 1). The values for the model tested for this purpose are as follows: $\chi^2/df = 1.69$, AGFI = .95, GFI = .96, NFI = .95, IFI = .97, CFI = .97, TLI = .97, and RMSEA = .03 (CI = .02/.14). The model showed excellent fit. Based on the results, CNI positively predicted CHS ($B = .84$, $p < .001$) and SWLS-C ($B = .97$, $p < .05$). Moreover, the total effect of CNI on HBSC-SCL was significant ($B = −.24$, $p < .05$). On the other hand, the (direct) effect of CNI on HBSC-SCL did not continue to emerge after controlling for the effects of CHS and SWLS-C ($B = −.01$, $p > .05$). Both CHS ($B = −.55$, $SE = .07$) and SWLS-SCL ($B = −.42$, $SE = .07$) were found to mediate the relationship between CNI and HBSC-SCL. CNI also appeared to predict HBSC-SCL via CHS followed by SWLS-C (i.e., serial mediation effect) ($B = −.91$, $SE = .02$). In conclusion, CHS and SWLS-C mediated serially and fully between CNI and HBSC-SCL. Accordingly, hope and satisfaction with life in children form a causal chain that connects to nature and psychological health. In other words, the connection to nature feeds hope, and hope increases satisfaction with life and decreases psychological symptoms in children (Fig. 1).

4.5. Discussion

In this study, we first adapted the CNI into Turkish (Study-1) and then examined the relationship between personal factors and connection to nature using the Turkish CNI (Study-2). Using a mediation model, we tested the relationship between the CNI and hope, satisfaction with life, and psychological symptoms (Study-3).

4.5.1. Turkish adaptation study of the CNI

Our analysis confirmed that the 16 item, 4 factor structures was preserved as in the original structure of the CNI. No items were added or removed in the Turkish version of the CNI. Therefore, it is possible to say that the basic theoretical structure of the CNI is also valid for the Turkish sample. As Rosa, Fried, et al. (2023) suggest, these results indicate that, the CNI can be subjected to rigorous validity and reliability analyses in different samples.

Most other instruments in the literature were aimed at adults (Mayer & Frantz, 2004; Nisbet & Zelenski, 2013). The CNI was developed to measure children's connection to nature (Cheng & Monroe, 2012). In this respect, the CNI, which includes emotional elements such as interest in nature, enjoyment of nature, and empathy, can be considered a good tool for determining children's connection to nature (Arola et al., 2023). Considering all these, there are no obstacles to the application of the CNI in the Turkish sample.

The results obtained in Study-1 showed that the Turkish version of the CNI is a valid and reliable instrument. This is important for determining children's connection to nature and understanding sensitivity and adaptation to nature. Thus, the influential role of connection to nature can be discussed in improving physical and mental health and intervention programs for children (Bowers et al., 2021).

In addition, although there are significant findings regarding the psychometric properties of the CNI, the current study also has some limitations that should be considered when interpreting the results. Certain procedural steps were followed at this stage. Translation and back-translation procedures were performed for the adapted scale in this context. Then, analyses were conducted to determine validity and reliability. Cronbach's alpha, CR, and McDonald's omega coefficients were evaluated for convergent and discriminant validity and reliability. In the future, different measurements (e.g. the test-retest reliability coefficient) can be used to determine the validity and reliability of the
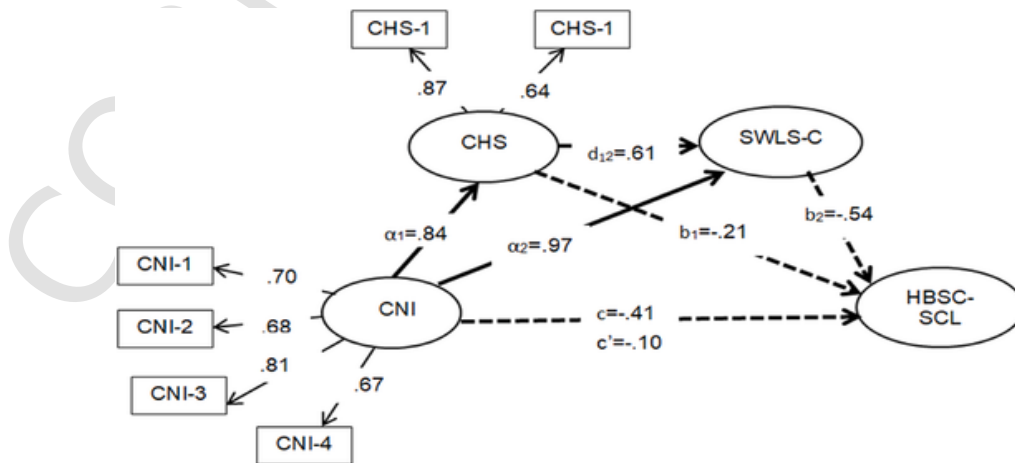

Fig. 1. A serial multiple mediational model testing the relationship between the connection to nature, hope, satisfaction with life and psychological health in Turkish children (*Notes*: CNI: connection to nature; HBSC-SCL: international health behavior in school-aged children symptom checklist; SWLS-C: satisfaction with life scale for children; CHS: children's hope scale).

CNI. However, only data collected from a certain region of Turkey were used in the scale adaptation. Therefore, more work could be done with young people in the future in the context of the Global South.

4.5.2. Connection to nature and personal factors

In Study-2, we found that gender, screen time, and frequency of contact with nature were predictors of being connected to nature. The results of the study were supported by previous literature. It had previously been reported that females show more pro-environmental behavior and have more connection to nature than do males (Gifford & Nilsson, 2014; Rosa, Larson, et al., 2023). In this study, we also found that Turkish girl students had a higher level of connection to nature. In the literature, this is explained by the fact that girls have a more emotional connection with nature (Dean et al., 2018). However, there are also study results that report the opposite. For example, Soga et al. (2018) reported that females are less connected to nature than men because they experience time constraints in outdoor experiences. Of course, this may be related to cultural norms and social structure (Bakir-Demir et al., 2019). It may be a good idea to promote environments that appeal to both genders and examine the barriers to connection to nature.

Connection to nature has also been associated with screen time and frequency of contact with nature (Larson et al., 2019). Our study shows that connection to nature increases as screen time decreases and the frequency of contact with nature increases. This is an important finding in terms of children's health, well-being (MacKerron & Mourato, 2013) and cognitive development (Chawla, 2022; Dean et al., 2018). This may mean that factors that reduce experiences of nature may also be a barrier to positive initiatives towards nature (Soga et al., 2018). These individuals, still in childhood, will determine public support for nature conservation in the future. Encouraging experiences in nature while also reducing the time spent in front of screens can help strengthen a connection to the natural world.

4.5.3. Relationship between connection to nature and hope, satisfaction with life, and psychological symptoms

In Study-3, satisfaction with life and hope in children were found to play serial and full mediation roles between connection to nature and psychological health. Accordingly, being connected to nature is negatively related to psychological symptoms, whereas connecting to nature increases hope and satisfaction with life. Intervention programs to increase students' connection to nature may be effective in curbing psychological symptoms. Mackay and Neill (2010) reported that activities in nature are an important factor in reducing symptoms. Arola et al. (2023) emphasized that connection to nature affects well-being in a systematic review of 72 studies on the relationship between connection to nature and child well-being. Also, Jackson et al. (2021) reported the direct relationship between connection to nature and happiness and hope in children.

Finally, Chawla (2022) reported that children with a high connection to nature look hopefully to the future. Biedenweg et al. (2017) found positive correlation values between increased outdoor recreation activities and satisfaction with life. Chang et al. (2020) reported that not only physical experiences in the natural world, but even the view of nature through the window increased satisfaction with life. Finally, Bowers et al. (2021)associate a positive youth with an increased connection to nature. Educators have a clear responsibility to cultivate a respect and need for experiences in the natural world among their students as this clearly aids physical and cognitive development, as well as the mental health of children.

4.6. Limitations and future research

The current study examined the connection to nature only regarding gender, SES, screen time, and frequency of experiencing nature. How-

ever, other personal factors and parental attitudes (Larson et al., 2013) may also be practical. For example, the impact of parents' attitudes towards nature on their children's connection to nature in the Turkish sample has yet to be discovered. Alternatively, the effect of the environmental attitude that parents bring from their childhood on their children's connection to nature is still being determined. Therefore, in the future, parental attitudes and backgrounds can be considered a personal factor in the Turkish sample.

However, the study has other limitations. First, it only covers children in Turkey, which reflects a very small sample. More data is, therefore, needed, especially across the Global South. There is also a need to test ways of promoting a connection to nature across different groups. The present study does not go beyond gender; SES is considered relatively narrowly. Therefore, issues such as race and income can be addressed in a broader range.

5. Conclusion

This study highlights the importance of examining connection to nature among youth and highlights ways in which that might be done. The study examined children's connection to nature in the Turkish sample and reached some important conclusions. A negative relationship between connection to nature and psychological symptoms was found. In addition, a positive relationship was found between connection to nature, hope in children and satisfaction with life. This can be an excellent idea for nature therapy centres. In a nature therapy centre in the Turkish context, children can develop an intrinsic connection to nature, and parents can develop nature-based parenting skills. Accordingly, nature walks and activities can be organized, gardening and plant care can be encouraged in children, opportunities for creative interaction with nature can be provided, and a sense of responsibility towards nature can be strengthened by participating in nature conservation activities to achieve the healing and hope provided by connection to nature. In this context, supporting policy development and implementation processes related to increasing nature interactions and access to green space is important. In addition, given the importance of CNI as an abstract concept representing a connection to nature, it needs to be measured effectively in different populations. In the present study, CNI was found to be culturally appropriate. Therefore, testing its appropriateness in different cultures may help provide inferences.

Data availability

The data that support the findings of this study are available from the corresponding author upon request.

Code availability

Not applicable.

Ethics approval

This study was approved by the ethics committee of the Bartin University (2023-SBB-0530).

Consent to participate

Informed consent was obtained from all individual participants included in the study.

a

Uncited References

.

CRediT authorship contribution statement

Menşure Alkış Küçükaydın: Writing – review & editing, Writing – original draft, Resources, Methodology, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

No potential confict of interest was reported by the authors.

Acknowledge

I want to thank two blind reviewers for their contributions to the development of this study.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jenvp.2024.102393.

References

Altay, D., & Ekşi, H. (2018). *Validity and reliability study of life satisfaction scale for children. 5. International symposium on educational sciences*. İstanbul: Yıldız Teknik University.

Arola, T., Aulake, M., Ott, A., Lindholm, M., Kouvonen, P., Virtanen, P., & Paloniemi, R. (2023). *The impacts of nature connectedness on children's well-being: Systematic literature review. Journal of Environmental Psychology, 85*, 101913.

Atik, G., & Kemer, G. (2009). *Psychometric properties of children's hope scale: Validity and reliability study. Elementary Education Online, 8*(2), 379–390.

Bakir-Demir, T., Berument, S.K., & Sahin-Acar, B. (2019). *The relationship between greenery and self-regulation of children: The mediation role of nature connectedness. Journal of Environmental Psychology, 65*, 1–7.

Beaton, D.E., Bombardier, C., & Guillemin, F.F.M. (2000). *Guidelines for the process of cross-cultural adaptation of self-report measures. Spine, 25*(24), 3186–3191.

Biedenweg, K., Scott, R.P., & Scott, T.A. (2017). *How does engaging with nature relate to life satisfaction? Demonstrating the link between environment-specific social experiences and life satisfaction. Journal of Environmental Psychology, 50*, 112–124.

Bowers, E., Larson, L., & Parry, B. (2021). *Nature as an ecological asset for positive youth development: Empirical evidence from rural communities. Frontiers in Psychology, 12*, 688574.

Bragg, R., Wood, C., Barton, J., & Pretty, J. (2013). *Measuring connection to nature in children aged 8-12: A robust methodology for the rspb*. University of Essex.

Bratman, G.N., Anderson, C.B., Berman, M.G., Cochran, B., De Vries, S., Flanders, J., … Daily, G.C. (2019). *Nature and mental health: An ecosystem service perspective. Science Advances, 5*(7), eaax0903.

Chang, C.C., Oh, R.R.Y., Le Nghiem, T.P., Zhang, Y., Tan, C.L., Lin, B.B., … Carrasco, L.R. (2020). *Life satisfaction linked to the diversity of nature experiences and nature views from the window. Landscape and Urban Planning, 202*, 103874.

Chawla, L. (2020). *Childhood nature connection and constructive hope: A review of research on connecting with nature and coping with environmental loss. People and Nature, 2*(3), 619–642.

Chawla, L. (2022). Childhood nature connection and constructive hope: Helping young people connect with nature and cope with environmental loss. In R., Jucker, & J.V., Au (Eds.), *High-quality outdoor learning: Evidence-based education outside the classroom for children, teachers and society* (pp. 95–122). Springer.

Cheng, J.C.H., & Monroe, M.C. (2012). *Connection to nature: Children's affective attitude toward nature. Environment and Behavior, 44*(1), 31–49.

Collado, S., Corraliza, J.A., Staats, H., & Ruiz, M. (2015). *Effect of frequency and mode of contact with nature on children's self-reported ecological behaviors. Journal of Environmental Psychology, 41*, 65–73.

Cui, W., & Yang, Z. (2022). *Association between connection to nature and children's happiness in China: Children's negative affectivity and gender as moderators. Journal of Happiness Studies, 23*(1), 47–63.

Dean, J., Shanahan, D., Bush, R., Gaston, K., Lin, B., Barber, E., … Fuller, R. (2018). *Is nature relatedness associated with better mental and physical health? International Journal of Environmental Research and Public Health, 15*(7), 1371.

Field, A. (2005). *Discovering statistics using SPSS*. SAGE.

Fornell, C., & Larcker, D.F. (1981). *Structural equation models with unobservable variables and measurement error: Algebra and statistics. Journal of Marketing Research, 18*(3), 382–388.

Fyfe-Johnson, A.L., Hazlehurst, M.F., Perrins, S.P., Bratman, G.N., Thomas, R., Garrett, K.A., … Tandon, P.S. (2021). *Nature and children's health: A systematic review. Pediatrics, 148*(4).

Gadermann, A.M., Schonert-Reichl, K.A., & Zumbo, B.D. (2010). *Investigating validity evidence of the satisfaction with life scale adapted for children. Social Indicators Research, 96*, 229–247.

Gariepy, G., McKinnon, B., Sentenac, M., & Elgar, F.J. (2016). *Validity and reliability of a brief symptom checklist to measure psychological health in school-aged children. Child Indicators Research, 9*, 471–484.

Gifford, R., & Nilsson, A. (2014). *Personal and social factors that influence pro-environmental concern and behaviour: A review. International Journal of Psychology, 49*(3), 141–157.

Gotch, C., & Hall, T. (2004). *Understanding nature-related behaviours among children through a theory of reasoned action approach. Environmental Education Research, 10*, 157e177.

Haugland, S., Wold, B., Stevenson, J., Aaroe, L.E., & Woynarowska, B. (2001). *Subjective health complaints in adolescence - a cross-national comparison of prevalence and dimensionality. The European Journal of Public Health, 11*(1), 4–10.

Hu, L.T., & Bentler, P.M. (1999). *Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural Equation Modeling, 6*(1), 1–55.

Ives, C.D., Abson, D.J., Von Wehrden, H., Dorninger, C., Klaniecki, K., & Fischer, J. (2018). *Reconnecting with nature for sustainability. Sustainability Science, 13*, 1389–1397.

Jackson, S.B., Stevenson, K.T., Larson, L.R., Peterson, M.N., & Seekamp, E. (2021). *Connection to nature boosts adolescents' mental well-being during the COVID-19 pandemic. Sustainability, 13*(21), 12297.

Kline, R.B. (2011). *Principles and practice of structural equation modeling* (3rd ed.). Guilford Press.

Lackey, N.Q., Meerts-Brandsma, L., & Rose, J. (2022). *Youth outdoor recreation experience, race, and socioeconomic status: Explaining connection to nature and future career interest. Journal of Outdoor Recreation, Education, and Leadership, 14*(4), 71–85.

Larson, L.R., Green, G.T., & Castleberry, S.B. (2011). *Construction and validations of an instrument to measure environmental orientations in a diverse group of children. Environment and Behavior, 43*, 72e89.

Larson, L.R., Szczytko, R., Bowers, E.P., Stephens, L.E., Stevenson, K.T., & Floyd, M.F. (2019). *Outdoor time, screen time, and connection to nature: Troubling trends among rural youth? Environment and Behavior, 51*(8), 966–991.

Larson, L.R., Whiting, J.W., & Green, G.T. (2013). *Young people's outdoor recreation and state park use: Perceived benefits from the parent/guardian perspective. Children, Youth, and Environments, 23*(3), 89–118.

Laurens, K.R., Tzoumakis, S., Dean, K., Brinkman, S.A., Bore, M., Lenroot, R.K., … Green, M.J. (2017). *The 2015 middle childhood survey (MCS) of mental health and well-being at age 11 years in an Australian population cohort. British Medical Journal Open, 7*(6), e016224.

Mackay, G.J., & Neill, J.T. (2010). *The effect of 'green exercise' on state anxiety and the role of exercise duration, intensity, and greenness: A quasi-experimental study. Psychology of Sport and Exercise, 11*, 238–245.

MacKerron, G., & Mourato, S. (2013). *Happiness is greater in natural environments. Global Environmental Change, 23*(5), 992–1000.

Mayer, F.S., & Frantz, C.M. (2004). *The connectedness to nature scale: A measure of individuals' feeling in community with nature. Journal of Environmental Psychology, 24*(4), 503–515.

Mert, M., Zurnaci, C., & Akgün, E. (2015). *An evaluation of outdoor activities on life satisfaction: An application of propensity score matching of a case in Turkey. Journal of Life Economics, 2*(1), 1–20.

Natural England. (2009). *Childhood and nature: A survey on changing relationships with nature across generations. London*.

Nisbet, E.K., & Zelenski, J.M. (2013). *The NR-6: A new brief measure of nature relatedness. Frontiers in Psychology, 4*, 813.

Norwood, M.F., Lakhani, A., Fullagar, S., Maujean, A., Downes, M., Byrne, J., … Kendall, E. (2019). *A narrative and systematic review of the behavioural, cognitive and emotional effects of passive nature exposure on young people: Evidence for prescribing change. Landscape and Urban Planning, 189*, 71–79.

Otto, S., & Pensini, P. (2017). *Nature-based environmental education of children: Environmental knowledge and connectedness to nature, together, are related to ecological behaviour. Global Environmental Change, 47*, 88–94.

Piccinini, C., Michaelson, V., Janssen, I., & Pickett, W. (2018). *Outdoor play and nature connectedness as potential correlates of internalized mental health symptoms among Canadian adolescents. Preventive Medicine, 112*, 168–175.

Pretty, J. (2004). *How nature contributes to mental and physical health. Spirituality and Health International, 5*(2), 68–78.

Richardson, M., Hunt, A., Hinds, J., Bragg, R., Fido, D., Petronzi, D., … White, M. (2019). *A measure of nature connectedness for children and adults: Validation, performance, and insights. Sustainability, 11*(12), 3250.

Rosa, C.D., Fried, E.I., Larson, L.R., & Collado, S. (2023b). *Four challenges for measurement in environmental psychology, and how to address them. Journal of Environmental Psychology, 85*, 101940.

Rosa, C.D., Larson, L.R., Collado, S., Cloutier, S., & Profice, C.C. (2023a). *Gender differences in connection to nature, outdoor preferences, and nature-based recreation among college students in Brazil and the United States. Leisure Sciences, 45*(2), 135–155.

Schultz, P.W. (2001). *The structure of environmental concern: Concern for self, other people, and the biosphere. Journal of Environmental Psychology, 21*(4), 327–339.

Snyder, C.R., Hoza, B., Pelham, W.E., Rapoff, M., Ware, L., Danovsky, M., … Stahl, K.J. (1997). *The development and validation of the children's hope scale. Journal of Pediatric Psychology, 22*(3), 399–421.

Sobko, T., Jia, Z., & Brown, G. (2018). *Measuring connectedness to nature in preschool children in an urban setting and its relation to psychological functioning. PLoS One, 13*(11), e0207057.

Soga, M., & Gaston, K.J. (2016). *Extinction of experience: The loss of human–nature interactions. Frontiers in Ecology and the Environment, 14*(2), 94–101.

Soga, M., Yamanoi, T., Tsuchiya, K., Koyanagi, T.F., & Kanai, T. (2018). *What are the drivers of and barriers to children's direct experiences of nature? Landscape and Urban Planning, 180*, 114–120.

Tam, K.P. (2013). *Dispositional empathy with nature. Journal of Environmental Psychology, 35*, 92–104.

Wilson, E.O. (1984). *Biophilia.* Harvard University Press.

Zhang, J.W., Howell, R.T., & Iyer, R. (2014). *Engagement with natural beauty moderates the positive relation between connectedness with nature and psychological well-being. Journal of Environmental Psychology, 38*, 55–63.