



Nature Connectedness and Life Satisfaction: Exploring the Mediating Effect of Loneliness

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ABSTRACT

Objective: This study investigated the relationship between nature connectedness and life satisfaction among adolescents, with a specific focus on the mediating role of loneliness and the moderating effects of gender and family structure.

Methods: A cross-sectional survey was conducted with 700 adolescents ($M = 16.4$, $SD = 1.2$; 54% female) from secondary and higher secondary schools in Gujrat and Sambriyal. Participants completed standardized measures assessing nature connectedness, life satisfaction and loneliness. Pearson correlation, multiple regression analyses and mediation analysis were conducted to explore the direct and indirect relationships and moderation effects of gender and family structure were also tested.

Results: The results demonstrated that the life satisfaction multiple regression analysis predicted by nature connectedness and loneliness was statistically significant, $R^2 = .43$, $F(2, 697) = 260.20$, $p < .001$. Nature connectedness was a statistically significant positive predictor of life satisfaction, ($\beta = .36$, $p < .001$) while loneliness was a statistically significant negative predictor of life satisfaction, ($\beta = -.38$, $p < .001$). A mediation analysis indicated that loneliness partially mediated the nature connectedness to life satisfaction relationship. Correlational analyses showed that nature connectedness was significantly positively correlated with life satisfaction ($r = .56$, $p < .01$) and significantly negatively correlated with loneliness ($r = -.54$, $p < .01$), while loneliness was significantly negatively correlated with life satisfaction ($r = -.58$, $p < .01$). We discovered the following differences in relation with gender and family structure noting that males and adolescents from nuclear families had higher levels of nature connectedness and life satisfaction, while having lower levels of loneliness than females and adolescents from non-nuclear families.

Conclusion: The results above emphasize loneliness as a crucial psychological mechanism of nature connectedness influencing well-being in adolescents. The findings also indicate the need to account for demographic and social characteristics, such as gender and family structure, in the development of nature-based interventions to promote adolescent mental health.



Introduction

In modern era individual are busy their own life they faced a lot of stressful situations. In urbanization pace and advancement technological and changes the lifestyles have major effect on the individual's mental health that because disconnection form the nature which leads to a certain mental health issues like depression, anxiety, and stress (Bratman et al., 2019; Capaldi et al., 2015). On the other hand, many studies have revealed that improved well-being and life satisfaction can be promoted through many factors, including exposure natural environments (Mayer et al., 2009). Nature is a broad concept and has many dimensions with regard to living organisms, ecosystems, and physical natural phenomena such as natural landscapes, trees, and animals. Connectedness to nature is the mental and emotional attachment we have with the natural world. An important aspect of our connection and connectedness to nature is how we make sense of and relate to nature (Zelenski & Nisbet, 2014).

First of all, the term nature connectedness was introduced by Stephan Kaplan in 1995. In his research Kaplan illustrate that the connectedness to nature can improve the emotional and mental health of human beings. Mariani et al. (2021) demonstrated that stronger environmental sensitivity and a view of nature from the home are beneficial for mental health. Mariani et al. further argue that adding natural elements into our living environments provides support for well-being. Earlier, Wilson (1984) introduced the biophilia hypothesis as a human basic love for nature (bio = life, philia =love), which influences our behaviour and well-being through our relationship(s) with our environments. Howell et al. (2011) investigated the relationship between connectedness to nature, well-being, and mindfulness. Their results suggested that those individuals that reported feeling greater connectedness to nature reported greater feelings of happiness and life satisfaction. Those individuals who were more connected with nature reported greater levels of mindfulness and were therefore more aware of the present moment and surroundings. The study indicates that enhancing one's connection with nature may promote mental health and positive psychological well-being.

The empirical evidences suggested that the extent to which individual connect with the nature including in which they feel a sense of fascination, curiosity or a feeling of appreciation for nature. Life satisfaction is also a multidimensional phenomenon it is the state of human mind in which an individual having the feelings of satisfaction towards her life. It is the feeling of enjoyment happiness a feeling of acceptance or pleasure. Moreover, life satisfaction defines that how much a person happy their life (Nisbet et al., 2009). Zullig et al. (2005) examined the relationship between health related quality of life and life satisfaction among adolescents. They found that adolescents with better physical and emotional health feel more satisfied with their lives. The study shows that positive health status is closely linked to overall life satisfaction in teenagers.

Life satisfaction is an important factor in positive psychology (Gilman & Huebner, 2003). Human being show more struggle to attain satisfaction in her life (Tatarckiewics, 2008). Life satisfaction is said to be the achievement of something what the human ecology think that it is essential for life (Seligman et al., 2000). Moreover, when an individual's attain their goals feeling safe in specific area of their life like fear of crime, discrimination and feeling secure and safe in the people around them which he live. Krömer et al. (2022) examined the relationship between life event and life satisfaction. They found that life events effect the life satisfaction and negative events have a long-lasting effect rather than positive ones. The study examined that life events has a significant effect on the life satisfaction.

Life satisfaction can be affected by external and internal factors; Personal goals, self-concept, social issues, and physical and mental health are all cited as factors affecting life satisfaction

(Diener et al., 1999; Lyubomirsky et al., 2005). Loneliness is a major negative influence on life satisfaction. Loneliness, as defined by Weiss (1973), is a complex and painful emotional experience that includes the discrepancy a person experiences in his or her social relationships compared to the desired social state. Weiss (1973) describes two types of loneliness: emotional loneliness, where there is an absence of a meaningful emotional attachment (e.g., a spouse or parent), and social loneliness, which is due to either the absence of a larger social network or the absence of a sense of belonging. In their research, Pinquart and Sörensen (2001) and Barreto et al. (2021) found that, in general, women reported greater feelings of loneliness than men, and attributed these differences to social expectations or differences in emotional expression.

Loneliness is a growing global health problem often associated with depression, stress, and serious physical ailments like heart disease and dementia. Studies have shown that people with introverted personalities or poor social skills tend to experience more loneliness (Russell et al, 1984). In the absence of social interaction during the COVID-19 pandemic, prolonged isolation amplified those feelings. Environmental factors may play a key role in repairing feelings of loneliness. Browning et al (2024) specifically identified that community attachment and green space reduce loneliness levels. The results of their study indicate 26% reduced risk of experiencing loneliness in those who lived where 30% or larger proportion of the area was covered by green space. According to Godly and Piff (2020), time spent outdoors in nature enriches social bonding and meeting new people in more meaningful ways. Much of the researchers show that loneliness is found in the adolescent and late adolescent rather than the other development stages (Rubenstein & shaver, 1982). Nature connectedness promote life satisfaction and well-being. people who live green spaces less feel lonely as compared to those who live and spend more time in the home. Many of teenagers who are neglected child and who are isolated by their peers and also siblings feel lonelier (Cheng & Furnham, 2002). Loneliness is also related to low self-esteem and people are trying to commit suicide. In studies with the students that show people who more spent their time with the internet having an increased chances of loneliness (Matsuba ,2006).

Numerous studies show that individual who have a large capacity to connect with nature can lead to a positive effect like these individuals report the highest satisfaction level because when individuals connect with nature they have a less stress level enhanced the quality of life and spend the good quality of time within the nature. People have a greater sense of meaning and some ambitions in their life. Howell et al. (2013) investigated how nature connectedness relates to well-being, with a specific focus on the mediating role of meaning in life. Their research revealed that individuals who feel closely connected to nature tend to report higher well-being, including greater happiness and life satisfaction. The study also found that the sense of meaning derived from nature significantly mediates this relationship, suggesting that nature contributes to well-being not just by improving mood but also by providing a sense of purpose. These results emphasize the psychological importance of developing meaningful connections with the natural world.

The current study's primary goal is to investigate relationships between nature connectedness, life satisfaction and loneliness during pre-adolescents and adolescents. Specifically, this study will examine whether higher levels of nature connectedness increase life satisfaction and lower levels of feelings of loneliness. The study will also examine whether loneliness mediates the relationship between nature connectedness and life satisfaction, because if nature connectedness can ultimately be a protective factor for mental wellbeing.

Based on this aim, this study will test the following hypothesis:

- There is a significant relationship between nature connectedness and life satisfaction and loneliness acts as mediating variable.

Methods

Participants and procedures

Data were collected using questionnaires administered to 700 adolescents from Gujrat and Sambriyal through purposive sampling. Participants were conveniently recruited from grade 9-12 in public and private secondary schools (grades 9-10) and higher secondary schools (grades 11-12). The final sample consisted of 378 girls and 322 boys, with representation from both urban and rural areas. Demographic variables included gender, educational level, place of residence and socioeconomic status. To ensure data quality control questions were embedded in the questionnaires.

Measures

Socio demographic variables: Participants reported Socio demographic characteristics including gender, age, educational level, place of residence (urban/rural), socioeconomic status (low, middle, upper class) and family structure (nuclear/joint).

Connectedness to Nature Scale (CNS): The 14-items connectedness to nature scale (Mayer & Frantz, 2004) assessed emotional and cognitive attachment to nature (e.g., "I often feel a sense of oneness with the natural world"). Items were rated on a 5-point Likert scale (1= Strongly disagree to 5= Strongly agree), with higher scores indicating stronger nature connectedness. The scale demonstrated strong reliability in prior research ($\alpha \geq .80$).

Satisfaction with Life Scale (SWLS): The 5-item Satisfaction with Life Scale (Diener et al., 1985) measured global life satisfaction (e.g., "In most ways my life is close to my ideal"). Responses used to Likert scale (1= Strongly disagree to 07 Strongly agree). Higher scores indicate greater satisfaction, with established reliability ($\alpha = .87$).

UCLA Loneliness Scale: The 20-item UCLA Loneliness Scale (Russell, 1996) evaluated perceived loneliness (e.g., "How often do you feel left out?"). Responses ranged from 0= Never to 3 = Often. The scale shows excellent psychometric properties ($\alpha = .89-.94$; test- retest * $r^* = .73$).

Procedure and Ethical considerations

Ethical approval was obtained from institutional administration and school authorities. Participants provided informed consent before data collection. After explaining study objectives and confidentiality protocols, paper questionnaires were administered during school sessions. Incomplete responses (<95% completion) were excluded prior to analysis

Analysis Plan

Data were analysed using SPSS Statistics. Pearson correlation examined the relationship between nature connectedness, loneliness and life satisfaction. Multiple regression tested loneliness as a mediator

Results

Descriptive Analysis

Table 1 shows the descriptive statistics for all participants whereas table 02 03 04 and 5 shows the correlation and regression Analysis among the key variables.

Table 1: Demographic Characteristics of Participants (N=700)

Group	N	M.	SD
Total sample	700	26.83	6.01
Male	266	28.77	5.09
Female	434	25.65	6.23
Rural	416	26.35	5.98
Urban	284	27.54	6
Nuclear families	454	27.92	5.69
Joint families	246	25	6.01

Table 2: Correlation among Study Variables

Variables	1	2	3
Life Satisfaction	-	-	-
Nature connectedness	.546**	-	-
Loneliness	-.581**	-.535**	-

** $p < .01$

Pearson correlation revealed significant association among key variables. Life satisfaction was strongly positively correlated with nature connectedness ($r = .564$ and $p < .01$) and negatively correlated with loneliness ($r = -.581$, $p < .01$). Similarly, nature connectedness was negatively correlated with loneliness ($r = -.535$, $p < .01$) in table 02 (see table 02).

Table 3: Regression Analysis Predicting Satisfaction

Predictor	B	SE B	β
Constant	18.08	1.63	—
Nature Connectedness	0.21	0.02	.36**
Loneliness	-0.26	0.02	-.38**

Note. $p < .001$ **

We ran a multiple linear regression analysis to assess whether nature connectedness and loneliness significantly predicted life satisfaction. The overall model was significant, $F(2, 697) = 260.20$, $p < .001$, with a significant effect on explaining 43% of variance in life satisfaction ($R^2 = .43$). As summarized in Table 3, both nature connectedness ($\beta = .36$, $p < .001$) and loneliness ($\beta = -.38$, $p < .001$) were significant predictors. Higher nature connectedness and lower loneliness were associated with higher life satisfaction

Table 4: Group Differences by Gender (N=700)

Variable	Gender	n	M	SD	t	df	p	Cohen's d
Life Satisfaction	Male	266	28.70	5.09	7.24	643.58	<.001	0.54
	Female	434	25.65	6.23				
Nature Connectedness	Male	266	69.06	8.16	5.98	671.52	<.001	0.43
	Female	434	64.73	10.93				
Loneliness	Male	266	17.05	7.00	-7.96	681.15	<.001	-0.55
	Female	433	21.93	9.76				

Note. $p < .001$ **

Independent sample t -test revealed gender differences in all variables. Males reported significantly higher satisfaction (M= 28.7, SD= 5.09) than females (M= 25.65, SD= 6.23), $t(643.58) = 7.24$, $p < .001$ and $d = 0.54$. Similarly, males had stronger nature connectedness (M=69.06, SD= 8.16) than females (M= 64.73, SD =10.93), $t(671.52) = 5.98$, $p < .001$, $d = 0.43$ and lower loneliness (M=17.05, SD =7.00) than females (M=21.93, SD =9.76), $t(681.15) = -7.69$, $p < .001$ and $d = -0.55$

Table 5: Group Differences by Family Structure

variable	Family Structure	N	M	SD	T	Df	p	Cohen's d
Life satisfaction	Nuclear	454	27.92	5.09	6.19	461.76**	< .001	0.50
	Joint	246	25.00	6.01				
Nature connectedness	Nuclear	454	69.39	8.90	6.56	398.43**	< .001	0.56
	Joint	246	69.90	11.23				
Loneliness	Nuclear	454	18.60	8.52	5.44	436.26**	< .001	-0.45
	Joint	246	22.62	9.61				

Note. $p < .001^{**}$

Family Structure also influenced outcomes (see table 05) .Participants from nuclear families reported higher Satisfaction (M=27.92, SD= 5.69) than those from joint families (M=25.00, SD= 6.01) $t(461.76) = 6.19$, $p < .001$, $d = 0.50$. The nuclear families reported higher nature connectedness (M=69.93, SD =8.90) than those from joint families (M= 62.90, SD=11.23), $t(398.43) = 6.56$, $p < .001$ and $d = 0.56$ and participants from nuclear families reported lower loneliness (M= 18.60, SD = 8.52) as compared to those from joint families (M=22.62, SD =9.61), $t(436.26) = -5.44$, $p < .001$ and $d = -0.45$.

Mediation analysis

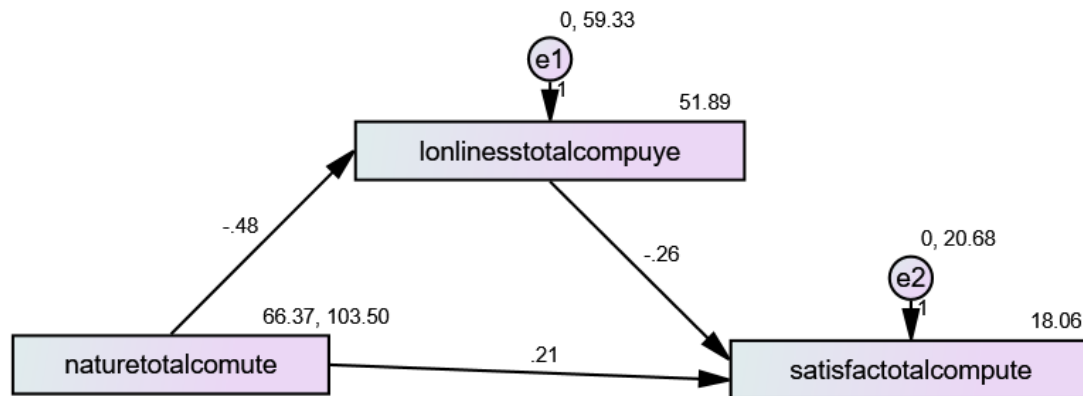
To examine whether loneliness mediates the relationship between exposure to nature and life satisfaction, a mediation analysis was conducted using structural equation modelling (see Figure 1). The model showed nature connectedness significantly predicted loneliness ($\beta = -.48$), meaning those feeling greater connectedness to nature, reported lower levels of loneliness. Moreover, loneliness significantly predicted life satisfaction ($\beta = -.26$), suggesting greater loneliness, was associated with lower life satisfaction.

The direct effect of nature connectedness on life satisfaction also remained significant ($\beta = .21$), indicating only some mediation. Which suggests, while loneliness is a mediating mechanism, nature connectedness is also directly contributing to greater life satisfaction, irrespective of loneliness.

The model explained impartially large portions of the variance in loneliness ($R^2 = 51.89$) and life satisfaction ($R^2 = 18.06$), and the error variances were 59.33 and 20.68 respectively.

These findings support the hypothesis that loneliness partially mediates between nature connectedness and life satisfaction.

Figure 1: Mediation Model



The Sobel test was performed to look at whether loneliness significantly mediated the relationship between nature connectedness and life satisfaction. The Sobel test is designed to show whether the indirect effect of the independent variable (nature connectedness) on dependent variable (life satisfaction) through the mediator (loneliness) is statistically significant.

Discussion

The present study examined the relationship between nature connectedness, life satisfaction and loneliness, while also exploring demographic differences. Our findings supporting the ground body of evidence highlighting the psychological benefits of nature connectedness (Mayer et al., 2009; White et al., 2019) and extend this literature by demonstrating how these benefits vary across gender and family structure. Consistent with biophilia hypothesis (Wilson, 1984) and attention restoration theory (Kaplan, 1995) stronger nature connection was associated with greater life satisfaction and lower loneliness. The positive correlation between nature connectedness and life satisfaction ($r^* = .546$) align with prior work suggesting that nature foster positive effects and meaning (Capaldi et al., 2014). Notably nature connectedness remained a significant predictors of life satisfaction, reinforcing the idea that nature's benefit extends beyond more stress reduction (Bratman et al., 2014) miss reference in list. The negative correlation between nature connectedness and loneliness ($r = -.535$) suggest that nature may mitigate feeling of social isolation, possibly providing opportunities for solitude without loneliness (Petersen et al., 2021) or fostering social cohesion in natural settings (Jennings & bamkole, 2019). Future Research should explore mechanism (mindfulness) linking nature exposure to reduced loneliness.

Gender differences emerged across all variables, with male reporting higher life satisfaction, stronger nature connection and lower loneliness than females. This contrast with some studies finding no gender differences in nature connectedness but align with research suggesting women may experience greater social stressor (e.g. caregiving burdens) that offset nature's benefit (krendl & bodenhausen, 2020). Cultural norms (e.g. gendered socialization in outdoor activities) may also play a role and warrant investigation.

Family Structure differences revealed that individuals from nuclear families reported higher satisfaction, stronger nature connectedness and lower loneliness than those who lived in joint families. While joint families may offer social support, they could also entail conflict or reduced autonomy (Cheung & Kwan, 2009). Alternatively, nuclear families might have more resources to facilitate nature access (e.g. sub urban living). Future studies should examine mediating factors

(e.g. household density, shared outdoor activities). It is important to acknowledge specific limitations that warrant consideration for a comprehensive of our findings. Several limitations of this study warrant consideration. First, the cross-sectional design precludes causal inference about the relationship between nature connectedness, life satisfaction and loneliness. Future Research should employ longitudinal or experimental designs (e.g., randomized controlled trials of nature-exposure intervention) to establish temporal precedence and test mechanistic pathways (Bratman et al., 2019). Second the cultural specificity of our sample limits generalizability. While joint family system is prevalent in collectivist culture (Cheung & Kwan, 2009). Our findings may not extend to the individualistic context where family structure and nature engagement norms differ. Cross cultural replication particularly in global south countries- are needed to test the universality of these effect. Third, reliance on self- report measure introduce potential (social desirability, recall inaccuracy. Complementing survey with behavioural data (e.g. ecological momentary, assessment of nature exposure, GPS tracking of green space visits) would strengthen validity (White et al., 2019). Additionally, incorporating psychological measure (e.g. cortisol level for stress) could provide objective biomarkers of nature effects.

Conclusion

This study provides robust evidence that nature connectedness function both as a correlate of life satisfaction and as a potential protective factor against loneliness. These relationships appear to vary systematically by gender and family structure, emphasizing the importance of sociocultural context in shaping the psychological benefits of nature. Our findings align with foundational theories in environmental psychology including the biophilia hypothesis (Wilson, 1984) and attention restoration theory (Kaplan, 1995), and extend these frameworks by demonstrating how demographic characteristics modulate nature's -based intervention. Future Research should explore these dynamics further by examining cross-culture variations in nature-wellbeing association, testing the efficacy of nature-based loneliness intervention through randomized controlled trials and investigating the potential for digital nature experiences to supplement in-person exposure.

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