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# The Relationship between Connectedness to Nature and Well-Being: A Meta-Analysis

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### \*Corresponding author

Celeste Jones, Department of Clinical Psychology, George Fox University, USA

### Key Words

Connectedness to Nature; Nature Relatedness; Well-Being; Life Satisfaction; Meta-Analysis

### Abbreviations

FT: Frilufsterapi; LEQ: Life Effectiveness Questionnaire; ACT: Acceptance and Commitment Therapy; FE: Fixed-Effects; RE: Random-Effects; NBR: Nature-Based Recreation; OAG: Outdoor Adventure Groups; GHQ: General Health Questionnaire; MLQ-P: Meaning in Life Questionnaire; PWBI: Psychological Well-Being; WEMWBS: Warwick-Edinburg Mental Well-being Scale

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Naomi Wu and Celeste Jones\*

Department of Clinical Psychology, George Fox University, USA

### Abstract

Ecotherapy and nature-based interventions have been shown to be evidence-based treatment for physical and mental health. The rekindling of relationships between humans and nature helps cultivate a bi-directional, reciprocal circle of healing. The resulting benefit is the increased well-being of individuals, society, and the Earth. This study is a meta-analytic review of 13 articles (22 studies) examining the relationship between connection to nature and various domains of well-being, including emotional, psychological, social, and overall well-being. The eligibility criteria for this study were the inclusion of at least one measure of connectedness to nature, one measure of well-being or life satisfaction, and a quantitative measure of their relationship. This meta-analysis combined quantitative results from multiple studies to summarize the empirical knowledge on the relationship between connection to nature and well-being/life satisfaction. A random-effects model was used to find one common effect size, showing the overall magnitude of the relationship among these variables. The results yielded moderate to large effect sizes, revealing a positive relationship between connectedness to nature and the various domains of well-being. The findings have valuable implications, highlighting the imperative necessity to reconnect and heal our relationship with the earth in order to embrace embodiment, to advocate for social justice for a more inclusive and equitable world, and to cultivate holistic health and healing.

### Introduction

Through research, anecdotal evidence, and personal stories, Louv [1], argued that a strong connection to nature is an essential aspect of human health and flourishing. Connectedness to nature expands one's sense of self and promotes self-exploration and well-being. Additionally, connectedness to nature is hypothesized to increase opportunities to experience awe and wonder, strengthen social bonding, and reignite the sense of being fully alive. Wilson [2] introduced the term biophilia, which alludes to humans' innate tendency to be drawn to and to focus on life and other living organisms and processes. Further expanding on this, Kellert & Wilson [3] suggested a "biophilia hypothesis," meaning that humans possess an innate tendency to seek connections with nature and other life forms in addition to social contact with other humans. Because most human evolutionary history occurred in the natural environment, with successful adaptation and survival depending on a connection with land and resources, the biophilia hypothesis suggests that connection to the natural world provided an evolutionary advantage [3]. In addition to the evolutionary and utilitarian benefits of the natural world (e.g., beyond the provision of necessary resources to meet basic needs), the study of ecopsychology is interested in connection with nature as the "soul of the world" [4]. Fisher describes an innate connection among the natural world, with humanity being a subcomponent of a vastly interconnected reality. This is in contrast to the human-centeredness of Western colonial and capitalistic values, in which dominance and power are highlighted in human relationships with the natural world. An important perspective of ecopsychology is viewing psychological matters from the perspective of integrating other-than-human relationships and acknowledging the bi-directionality of humans and the larger natural world [4].

Louv [1] introduces the "nature principle," a concept about conservation that includes a bi-directional cycle of healing describing how the earth is benefitted from greater human healing and connectedness to nature. Bronfenbrenner's Ecological model is similar to the "nature principle," emphasizing how surrounding social contexts influence individuals' development and vice versa [5]. Individual development does not occur in a vacuum, but rather occurs through the process of complex, reciprocal interactions between various systems. Bronfenbrenner [6], states that "evolving biopsychological human organisms" are influenced by active interactions of "persons, objects, and symbols in its immediate external environment." Although Bronfenbrenner's bio-ecological model specifically addresses human and social contexts, it can be argued that this concept can be expanded to include one's natural surroundings in their external environment. Thus, the natural ecosystem has an influence on individuals' biopsychosocial development, and in turn, one's development has an impact on the natural environment. Holistic human health exists in the presence of a healthy, comprehensive community and a natural environment.

### Nature-based and wilderness therapies

While the field of ecopsychology moves away from a human-centered perspective in some ways, the benefits of nature's connection to human well-being have been explored. The term "nature-deficit disorder" is termed as a collective disorder that "threatens our health, our spirit, our economy, and our future stewardship of the environment" [1]. From this perspective, greater disconnection from the natural world as a result of urbanization and globalization has had a negative impact on human well-being and may be related to increased mental health difficulties. Conversely, connection to nature has been shown to have various beneficial effects on emotional and psychophysiological health. In an outcome study of a wilderness therapy intervention for adolescents, improvements in heart-rhythm coherence were found [7]. Another study on recreation in the natural environment compared cortisol levels between walking in nature, watching nature on TV, and walking on a treadmill [8]. This study found that all three interventions improved cortisol levels, but walking in nature had the most pronounced effects. In addition to the psychophysiological benefits of nature-related interventions, emotional benefits have also been associated with connectedness to nature. One study used a survey to explore the differences between how indoor exercise versus a combination of indoor and outdoor exercise impacts emotions and well being and also explored the role of connectedness to nature [9]. Findings indicated that those who engaged in a combination of indoor and outdoor exercises demonstrated more positive affect than those who engaged in indoor exercise alone. In addition, exercise improved



subjective well-being in individuals with greater connectedness to nature. Even virtual exposure to aspects of nature has resulted in emotional restoration and elevated positive mood [10] and reduced negative emotion and amygdala-hippocampus activation by downregulating physiological responses [11].

Additionally, nature-based therapies such as wilderness therapy, adventure therapy, and outdoor therapy provide a multidimensional approach to treatment. This represents a holistic care intervention that results in positive client outcomes. In a meta-analysis of adventure therapy outcomes, short-term adventure programs showed moderately positive, significant changes in measured outcomes between the beginning and end of treatment, but no significant changes were found for the alternative and no-treatment groups. Additionally, the short-term adventure therapy participant changes were maintained in longer-term or follow-up effect sizes [12]. Another study considered the subjective experiences of five women on a 10-day Scottish wilderness trip, focusing on well-being and environmental perceptions. The results showed a common positive experience of increased psychological well-being characterized by feelings of connectedness, aliveness, contemplativeness, self-discovery, confidence, and well-being [13]. Ferenc et al. [14] created a Norwegian adaptation of wilderness therapy called Friluftsterapi (FT), which was implemented as an adolescent mental health service in southern Norway. After time spent in nature, many participants reported experiencing calming responses to the external and internal stressors and pressures that normally surrounded them in their daily lives [14]. Similarly, Gabrielsen et al. [15] utilized FT and found that participants' here-and-now stress and anxiety levels decreased between pre and post-tests. Additionally, the strongest variable of improvement was on the Life Effectiveness Questionnaire (LEQ), which suggested that many participants felt more mastery and enjoyed life more than a year after the completion of FT [15].

Another type of outdoor adventure therapy that has shown positive benefits is surfing intervention programs. A study was conducted in the UK for children and young people excluded or at risk of exclusion from mainstream schooling. The results revealed significant decreases in heart rate (suggesting improved physiological health and fitness), increased satisfaction with appearance, more positive attitudes towards school and friendship, greater environmental awareness, and more positive teaching evaluations during post-intervention assessment [16]. A pilot study provided additional evidence to suggest that wilderness therapy is a promising integrative intervention for improving adolescent well-being and overall functioning. Participants and caregivers reported more persistent benefits in family functioning, while caregivers also reported improved psychological functioning in their children [7]. In addition, research has shown that adventure-based training programs significantly reduced depressive symptoms and anxiety levels, and increased self-esteem in Hong Kong Chinese schoolchildren [17]. Another study that combined Acceptance and Commitment Therapy (ACT) with adventure therapy suggested that these interventions may increase psychological well-being and skill development in at-risk children [18].

A wilderness program was also effective in increasing self-esteem and resulted in a significant shift from an external to a more internal locus of control in "at risk" adolescent boys [19]. Similarly, outdoor adventure therapy increases self-esteem and mastery, and mastery of achievement of personal goals which may beneficially help young people journeying and healing from mental illness [20]. An Eco Wellness model was utilized within a wilderness therapy program and demonstrated its effectiveness in addressing the diverse mental health needs of participants [21]. Overall, these studies suggest that intentionally promoting nature connection and utilizing wilderness therapy may deepen and sustain positive short-and long-term physical and psychological client outcomes. These psychological benefits of well-being include alleviation of anxiety and depressive symptoms and improved family functioning, psychological functioning, daily functioning, social connectedness, self-confidence, self-esteem, internal locus of control, life satisfaction, skills development, and environmental awareness [12].

### Current study

Several meta-analyses have been published to examine the effects of natural environmental exposure and health, connection to nature and happiness, and adventure therapy on client outcomes [12,21,22,23]. However, a meta-analysis has not been conducted to comprehensively examine the relationship between connection

to nature and well-being/life satisfaction. The current study sought to systematically identify empirical outcome studies on the relationship between connection to nature and well-being/life satisfaction. Since many concepts and measures exist to assess the human-nature relationship, the umbrella term connection to nature was utilized for the purpose of this study to describe the common underlying construct, one's subjective connection to nature. These concepts and measures are highly correlated with one another and are similarly associated with well-being, personality characteristics, and environmental attitudes and behaviors [23,24]. Additionally, well-being can be utilized as an umbrella term that involves "experiences of positive emotional states", "habitual dispositions", "pleasurable affect", and "general life satisfaction" [25]. The concept of well-being can also be seen as an integration of physical, mental, and social health, which is closely related to quality of life and satisfaction in life. When conceptualizing satisfaction with life, it is important to note that it is a "global index of one's overall evaluation of their quality of life" [26], which would include both positively- and negatively-valenced emotions and factors [27].

### Hypothesis

This study sought to systematically identify, analyze, and quantify the outcomes of studies assessing the relationship between connection to nature and well-being/life satisfaction. This study hypothesized that there would be an overall positive relationship between connectedness to nature and well-being/life satisfaction. More specifically, with an increased sense of connectedness to nature, individuals would endorse higher levels of well-being and life satisfaction.

### Methods

This meta-analysis was completed by using a random-effects method to examine the strength of the relationship between connection to nature and well-being/life satisfaction.

### Selection of studies

Sources were located by conducting a systematic search of computerized databases including PsycInfo, Dissertation Abstracts, and Scopus from the years 2000-2020. To potentially access unpublished data on the topic of ecopsychology and connectedness to nature, five prolific authors conducting research in this domain were contacted, notifying them about the current meta-analysis assessing the relationship between connection to nature and well-being/life satisfaction, and inquiring as to any unpublished data they are willing to provide. No additional unpublished data were obtained from these authors. Searches were conducted using the following terms: connectedness to nature, nature connectedness, nature connection, connection to nature, nature relatedness, awe, wilderness therapy, wilderness experience, adventure therapy, ecotherapy, nature therapy, ecopsychology, outdoor therapy, environmental psychology, ecological psychology, wilderness, nature (environment), eco wellness, nature-based interventions, nature-based counseling, nature-based therapy in combination with well being, psychological wellbeing, emotional wellbeing, wellness, emotional health, hedonic wellbeing, eudemonic wellbeing, positive affect, happiness, meaning, life meaning, purpose, quality of life, life satisfaction, and satisfaction with life. Additionally, reference sections and bibliographies of pertinent studies were manually searched to identify relevant studies based on these search terms. This preliminary search process yielded 13 articles (22 studies) that were included in the meta-analysis.

### Inclusion and exclusion criteria

For studies to be included in this study, they were required to include at least one measure of connectedness to nature, one measure of well-being or life satisfaction, and a quantitative measure of their relationship. Because there was no theoretical or practical reason to exclude any age groups, all age groups were included as eligible samples. Additionally, there was no exclusion criteria placed on where the country the study was conducted, the language it was written in, or the ethnicity groups that were studied. Studies that were included had to provide sufficient information to code an effect size so that the results between studies could be analyzed together. (Tables 1,2&3) provide further information on the inclusion criteria.



**Table 1:** Connectedness to nature measures included.

Measure	Citation	Study Number (see Table 3)
Allo-Inclusive Identity Scale	Leary et al. [28]	1,6,7
Connectedness to Nature Scale	Mayer and Franz [29]	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 18, 19, 21
Connectedness to Nature Scale-single item	Cervinka et al. [25]	3, 4
Inclusion of nature in self	Schultz [30]	17
Nature Relatedness Scale	Nisbet et al. [31]	6, 7, 13, 14, 15, 16,
Nature Relatedness Scale-Short Version	Nisbet and Zelenski, [32]	14, 15, 16

**Table 2:** Well-being and life satisfaction measures included.

Measure	Citation	Study Number (see Table 3)
Emotional and psychological and social well-being	Keyes [33]	5, 6, 7, 8
Flourishing Scale	Diener et al. [34]	21
General Health Questionnaire – 12 (GHQ-12)	Goldberg & Williams [35]	12
Meaning in Life Questionnaire (MLQ-P)	Steger Frazier, Oishi, & Kaler [36]– Canadian sample	2, 3, 4, 7, 8
	Steger, Kawabata, Shimai, & Otake [37] – Japanese sample	
	Osin, Kuznetzova, & Malyutina [38]– Russian sample	
Mental Health Continuum-Short Form (Psychological and Social Scale)	Lamers, Westerhof,Bohlmeijer, ten Klooster, & Keyes [39]– Canadian sample	2
	Ozawa-de Silva, Ozawa-de Silva, & Keyes [40] – Japanese sample	
	Zemojtjel-Piotrowska et al. [41] – Russian sample	
Multidimensional Students' Life Satisfaction Scale	Huebner [42]	19
Ryff scale of Psychological Well-Being (PWBI)	Ryff [43]	5, 6, 7, 8, 14, 15, 16, 17, 18, 21
Satisfaction with Life	Diener et al. [26]	3, 4, 9, 10, 11, 14, 15, 20, 21
Sense of Meaning	Huta & Ryan [44]	1
Subjective Vitality Scale	Ryan and Frederick [45]	1, 8, 9, 16
Vitality Scale Short Form (36) Health Survey	Bulliger and Kirchberger [46]	3, 4, 16, 21, 22
Warwick-Edinburg Mental Well-being Scale (WEMWBS)	Tennant et al. [47]	12

**Table 3:** Descriptive information of included samples.

Measure	Citation	Study Number (see Table 3)
Emotional and psychological and social well-being	Keyes [33]	5, 6, 7, 8
Flourishing Scale	Diener et al. [34]	21
General Health Questionnaire – 12 (GHQ-12)	Goldberg & Williams [35]	12
Meaning in Life Questionnaire (MLQ-P)	Steger Frazier, Oishi, & Kaler [36]– Canadian sample	2, 3, 4, 7, 8
	Steger, Kawabata, Shimai, & Otake [37]– Japanese sample	
	Osin, Kuznetzova, & Malyutina, [38] – Russian sample	
Mental Health Continuum-Short Form (Psychological and Social Scale)	Lamers, Westerhof,Bohlmeijer, ten Klooster, & Keyes [39] – Canadian sample	2
	Ozawa-de Silva, Ozawa-de Silva, & Keyes [40] – Japanese sample	
	Zemojtjel-Piotrowska et al. [41]– Russian sample	
Multidimensional Students' Life Satisfaction Scale	Huebner [42]	19
Ryff scale of psychological well-being (PWBI)	Ryff [43]	5, 6, 7, 8, 14, 15, 16, 17, 18, 21
Satisfaction with Life	Diener et al. [26]	3, 4, 9, 10, 11, 14, 15, 20, 21
Sense of Meaning	Huta & Ryan [44]	1
Subjective Vitality Scale	Ryan and Frederick [45]	1, 8, 9, 16
Vitality Scale Short Form (36) Health Survey	Bulliger and Kirchberger [46]	3, 4, 16, 21, 22
Warwick-Edinburg Mental Well-being Scale (WEMWBS)	Tennant et al. [47]	12

Studies that met the selection criteria were coded based on definitions established by the authors of the nature relatedness and well-being scales (see Tables 4&5). The nature relatedness scale [31] was utilized as a framework to code connectedness to nature. In this framework, connectedness to nature is measured as an overall index that includes three subdomains of emotional (self), cognitive (perspective), and physical (experience). For the purposes of this study, only measures that represented overall connectedness to nature were included. Well-being and life satisfaction were coded based on Keyes [33] concept of mental health and well-being, including categorization into a summary score (overall well-being index) and three different subdomains: emotional well-being, social well-being, and psychological well-being. Emotional well-being, psychological well-being, social well-being, and overall well-being were utilized as the well-being outcomes explored in this study. Further details are provided in (Tables 4&5).

**Table 4:** Connectedness to nature: Definition and scales included.

Connectedness to Nature Overall Index
Definition: Overall NRS [31]: <ul style="list-style-type: none"> <li>• Appreciation for and understanding of our interconnectedness with all other living things on the earth</li> <li>• Summary score of overall connectedness to nature</li> <li>• Including overall connectedness to nature ratings</li> <li>• Including sense of oneness/interconnectedness with the natural world</li> </ul>
Connectedness to Nature Scale (CNS) – single: “My connectedness with nature is” (rating on 1-10) [25]
Connectedness to Nature Scale (CNS): Sense of oneness with the natural world - feels a sense of community, equality, kinship, embeddedness, and belongingness to nature [29]
Nature Relatedness Scale (NRS & NRS-short): How individuals relate to natural world overall through viewing their beliefs and physical connections [31,32]
Allo-Inclusive Identity Scale: Sense of interconnectedness with other people and the natural world [28]
Inclusion of nature in self: How individuals include nature within their views of themselves [30]

**Table 5:** Emotional, psychological, social, and overall well-being: definition and scales included.

Type of Well-Being	Definition	Scales Included
Emotional	(Keyes [33]): Positive affect, happiness, interest in life, satisfaction with life	Mental Health Continuum (MHC) short
	Including life satisfaction across key domains (family, friends, school, living environment, and self)	Multidimensional Students' Life Satisfaction Scale [42]
	Including global cognitive judgment of one's life satisfaction	Satisfaction with Life Diener, et al. [26]
Psychological	(Keyes [33]): Self-acceptance, positive relations with others, personal growth, purpose in life, environmental mastery, and autonomy	MHC short: Psychological Flourishing Scale (Diener et al. [34])
	Including self-perceived success in relationships, self-esteem, purpose, and optimism	Meaning in Life Questionnaire (MLQ-P): Presence Subscale
		Scale of psychological well-being (PWBI [43])
	Including sense of meaningful existence, meaningfulness in activities and experiences	General Health Questionnaire (GHQ)-12 (Goldberg & Williams [35])
Sense of Meaning [44]		
Social	(Keyes [33]): Social acceptance, social actualization, social contribution, social coherence, and social integration	MHC short Social
	Including social contribution, integration, actualization/growth, acceptance, and coherence/interest	

Overall	(Keyes [33]): combination of emotional, psychological, and social well-being to reach optimal mental health, providing a sense of energy and vitality	Vitality Scale Short Form [46] Subjective Vitality Scale [45]
	Including life satisfaction	Warwick-Edinburg Mental Well-being Scale (WEMWBS) [47]
	Including vitality, being full of energy, vigor, feeling alive and alert, having energy available to self	Multidimensional Students' Life Satisfaction Scale [42]
	Including feeling and functional aspects of mental well-being	Satisfaction with Life Diener, et al. [26]

### Data analysis

Meta-analysis is a quantitative technique that synthesizes the results of multiple studies on a specific phenomenon or focuses on specific relationships between variables by “combining the effect size estimates from each study into a single estimate of the combined effect size” (APA Dictionary of Psychology, n.d.). In a meta-analysis, weights are assigned to each study based on the inverse of the overall study error variance (i.e., 1/variance). Studies with a precise estimate of the population effect size (low variance) are assigned more weight, while studies with a less precise estimate of the population effect size (high variance) are assigned less weight. Meta-analyses can be conducted using a Fixed-Effects (FE) model, which assumes that differences between study effect sizes and the population mean are a result of subject-level sampling error. An alternative to the FE model is the Random-Effects (RE) model, which assumes the influence of both sampling error and randomly distributed sources of variance [48]. The RE model has the advantage of permitting inferences to studies with participants and measures different from those included in the meta-analysis, whereas the FE model limits inferences to studies with parameters identical to those of the included studies [49]. This meta-analysis was conducted using an RE model to examine the strength of the relationship between the variables of connectedness to nature, well-being, and life satisfaction. The RE model finds the estimated mean of the distribution of true effects, allowing for more balanced weights to be placed on the studies [50]. Heterogeneity tests (Q statistics) indicate whether distributions of effect sizes show greater variance than expected due to sampling error. The articles and data that were analyzed were entirely quantitative. Because most studies provided correlations between continuous measures of connectedness to nature and well-being, a correlation was selected as the effect size measure. Both RE and FE models were calculated, and data analysis followed the procedures described by Borenstein, et al. [50], and used Fisher's Z-transformed correlation coefficients weighted by the inverse of the variance.

### Results

#### Descriptive results

(Tables 4&5) present connectedness to nature and well-being codes for individual studies. (Table 6) provides the descriptive statistics for the studies included. Most studies were based on self-reports of connectedness to nature and well-being in undergraduate students or other adults recruited online. Effects were computed between overall connectedness to nature and two levels of well-being (overall and subdomains of emotional well-being, psychological well-being, and social well-being). A correlation of .10 was considered a small effect, .30 a medium effect, and .50 a large effect [51]. The effect size measures the strength of the relationship between two variables, connectedness to nature and a specific domain of well-being. Mean effects were in expected directions, with connectedness to nature positively associated with overall well-being (ES= .51), emotional well-being (ES=.31), psychological well-being (ES=.53), and social well-being (ES=.49). Statistical significance was computed using the Wald test.

Table 6: Meta-analytic results summary.

	Overall Well-Being	Emotional Well-Being	Psychological Well-Being	Social Well-Being
k	9	21	19	9
N	3,202	35,580	11,019	5,672
SE	0.009	0.003	0.002	0.013
Range of d unbiased	0.22-0.77	0.34-0.56	-1.11	0.28-0.70
Weighted average ES: RE model (95% CI)	0.51*** (0.501 - 0.519)	0.31** (0.307 - .313)	0.53*** (0.528 - 0.532)	0.49** (0.477 - 0.503)
Z (p-value)	Z=59.58 (p < .001)	Z=116.59 (p < .001)	Z=234.09 (p < .001)	Z=35.91 (p < .001)
Heterogeneity Q (df)	5149348540 (df=8)	3550.26 (df=20)	11931475.34 (df=18)	1297.97 (df=8)
I <sup>2</sup>	99.99%	99.77%	99.99%	99.38%

Source: \*\*Medium effect, \*\*\*Large effect.

I<sup>2</sup> and Q statistics were used to assess heterogeneity in pooled effect sizes [52]. Cochran's [53] Q statistic reflects the total variance in the meta-analysis, whereas the I<sup>2</sup> statistic represents heterogeneity [54]. All tests of heterogeneity were significant, indicating that effect sizes were heterogeneous and that variation in effect sizes was not simply due to sampling error. Given this heterogeneity, the RE results are likely more generalizable [55].

### Discussion

In the field of ecopsychology, it has been argued that a strong connection to nature is an essential aspect of human health and flourishing, expanding one's sense of self, promoting, self-exploration, and improving well-being [1]. An important perspective of ecopsychology is viewing psychological matters from the perspective of integrating other-than-human relationships and acknowledging the bi-directionality of humans and the larger natural world [4]. Greater disconnection from the natural world as a result of urbanization and globalization has negatively impacted human well-being and may be related to increased mental health difficulties [1]. Conversely, connection to nature has shown a variety of beneficial effects on emotional and psychophysiological health including improvements in heart-rhythm coherence [7], improved cortisol levels [8], increased positive affect and improved subjective well-being [9], and emotional restoration and elevated positive mood [10]. Research on wilderness therapy interventions suggests that intentionally promoting nature connection and utilizing wilderness therapy may deepen and sustain positive short-and long-term physical and psychological client outcomes such as alleviated anxiety [14], decreased depressive symptoms [17], and improved psychological functioning [18].

Several meta-analyses have been published to examine natural environmental exposure and health, connection to nature and happiness, and adventure therapy on client outcomes [12,22,23]. However, a meta-analysis has not been conducted to comprehensively examine the relationship between the connection to nature and well-being/life satisfaction. This study strives to provide a quantitative summary of the literature on the relationship between connectedness to nature and well-being across various domains, including psychological, emotional, social, and overall well-being. This study explored overall connectedness to nature. This concept represents not just love of nature, enjoyment of nature, or the frequency of one's activities in nature, but also a deep understanding and awareness of all aspects of the natural world and individuals' interconnectedness with all living things. It involves the intersection of affective, cognitive, and experiential aspects of an individual's connection to nature [56]. It was hypothesized that one's connectedness to nature would be related to one's well-being across various domains, including psychological, emotional, social, and overall well-being. The different domains of well-being are defined below. Through a comprehensive meta-analytic review of empirical studies, the results supported and elaborated on prior research indicating a link between connectedness to nature and well-being/life satisfaction. These promising results open the door for future research and clinical implications for ecopsychology and ecotherapy, which are growing branches within the field of psychology.

### Outcomes

It was hypothesized that the meta-analysis results would indicate an overall positive relationship between connectedness to nature and well-being/life satisfaction, such that individuals who experienced a stronger sense of connectedness to nature were hypothesized to also endorse higher levels of well-being, across various domains. In sum, the results yielded moderate to large effect sizes categorizing the positive relationship between connectedness to nature and domains of well-being/life

satisfaction. It is important to understand that correlation does not equal causation. Correlation is the magnitude or strength between the relationships of the two variables, connectedness to nature and a domain of well-being, but does not explicitly identify the cause of change between the variables. (Table 6) presents the results.

**Connectedness to nature and emotional well-being:** The relationship between connectedness to nature and emotional well-being (e.g., positive affect, satisfaction with life, and happiness) was quantified by an effect size of .31. This suggests that while an individual's level of connectedness to nature is not the only influence on their emotional well-being, its predictive ability is moderate. This builds upon past studies that have explored NBR activities as related to increased well-being. One such study showed that Nature-Based Recreation activities (NBR) emphasizing connection to nature are positively associated with life satisfaction and happiness [57]. Another study revealed that fascination in nature and time in nature were associated with reduced negative affect and higher positive affect in some participants [58]. Additionally, one study showed that the more awe participants experienced while walking, rumination and negative affect significantly decreased [59]. Previous studies have shown that NBR activities, fascination and time in nature, and awe may have impacted emotional well-being. Expanding on this, the current study suggests that connectedness to nature may moderately increase individuals' positive affect and happiness and bolster their life satisfaction and interest across key domains, such as family, friends, school, living environment, and self.

**Connectedness to nature and psychological well-being:** The relationship between connectedness to nature and psychological well-being (e.g., self-esteem, mastery, and personal growth) revealed an effect size of .53. This may indicate that individuals' level of connectedness to nature largely impacts their psychological well-being. Previous studies have revealed that Outdoor Adventure Groups (OAG) and adventure-based training groups promote self-esteem and an increased sense of mastery [17,20]. Another study done by Lovoll, et al. [60] found that personal growth was correlated with feeling at home in nature. The meta-analysis builds on these findings, suggesting that individual's sense of self-esteem, mastery, and personal growth are positively associated with a higher level of connectedness to nature.

**Connectedness to nature and social well-being:** Additionally, the relationship between connectedness to nature and social well-being (e.g., social growth, social connectedness, and engagement) was explored, yielding an effect size of .47. This demonstrates a moderate to strong relationship between individuals' connectedness to nature and social well-being. Previous research has revealed mixed results regarding the relationship between experiences with nature and social well-being. Research by Schell et al. [20] revealed that adventure therapy increases self-esteem, which may facilitate social growth and development. Additionally, a study done by Moreton et al. [61] discovered small relationships between connectedness to nature and measures of loneliness, social disconnection, and connection to close others. However, it revealed consistent moderate correlations between connectedness to nature and connection to abstract social groups (e.g., collective humanity) and connection with distant others (e.g., people in need). The current study expands on past research, by revealing that social well-being appears to be moderately correlated with connectedness to nature.

**Connectedness to nature and overall well-being:** Regarding connectedness to nature and overall well-being, the meta-analytic results yielded an effect size of .51. This suggests that there is a significantly strong relationship between connectedness to nature and overall well-being. Overall well-being, which includes vitality, feeling alive and full of energy, and experiencing an optimal balance of emotional, psychological,



and social health, was shown to be positively correlated with individuals' connectedness to nature. In summary, the meta-analysis hypothesized that the results would indicate an overall positive relationship between connectedness to nature and well-being/life satisfaction. The data supported this hypothesis, revealing moderate to strong correlations across various domains of well-being, including emotional, psychological, social, and overall well-being. These findings support prior research indicating that nature connectedness is associated with greater vitality, positive affect, and life satisfaction [23]; is essential for mental well-being and aids in anxiety reductions [62]; and is a significant predictor of happiness and cultivating sustainable environmental and personal health behaviors [63]. This meta-analysis revealed that the internal value and sense of interconnectedness between individuals and nature/the larger world are related to well-being across various domains.

### Limitations

The major limitations of this study include the heterogeneity within the results and the sample limitations within the selected studies. Across the results, the homogeneity analysis yielded high heterogeneity within the sample. A non-significant homogeneity analysis would indicate that study-to-study variability could be accounted for by sampling error alone. This may imply that there may be some variables moderating the magnitude of the effect size as the literature and studies used were diverse in nature and scope. There is often a significant discrepancy in effect sizes between different studies measuring the same outcome for various reasons. A potential reason may be the result of various conceptualizations and definitions of the study variables and the varying purposes that determined which questionnaires were utilized. Another reason could be the presence of moderators that were not accounted for. Thus, further research is needed to understand and explain the diversity and potential moderators presented in this study. Another limitation of the selected studies was that most participants were college students or adult workers who were recruited online. The lack of diversity in various identity markers within the sample limits the generalizability of these findings.

### Recommendations for future research/directions

Given the significant heterogeneity within the results, further research should include larger sample sizes to analyze for moderators. This can increase understanding of the possible reasons for the variance and diversity in connectedness to nature and well-being results. It would also be beneficial for future research to study the relationship between connectedness to nature and well-being by utilizing a diverse population sample that embodies various identity markers to improve the generalizability of the findings. In addition, future experimental studies should better be able to assess causation. It would also be beneficial for future research to continue studying how nature and our relationships and interactions with the outside world impact different aspects of human health and functioning. This can continue to provide valuable insight to bolster nature-based interventions and holistic conceptualizations. For example, perhaps attachment theory and analysis of the relationships between different attachment styles (i.e., secure, anxious-preoccupied, dismissive-avoidant, and disorganized) and nature [64] could provide insightful information on one's nature connectedness, environmental sustainability, and levels of health.

### Implications for clinical practice

These promising results provide helpful information that will benefit both clinicians and patients. One of the core implications of this study is that an individual's connectedness to nature is related to their well-being across various domains. Research suggests that nature-deficiency, alienation and disconnection from nature, contributes to higher rates of physical and emotional illnesses and behavioral problems [1]. Clinicians are responsible for providing the best care to their clients. Given that connectedness to nature is associated with well-being, connectedness to nature may be a variable that is underrecognized in traditional therapy, worthy of incorporation into transformed practices that are life-sustaining, deeply relational, nature-based, and accessible for all. In addition, increasing one's connectedness to nature has been described as being related to one's mind-body connection, self-attunement, and environmental attunement, all of which in turn decrease anxiety, stress, rage, and fear [65]. According to Buzzell and Chalquist, reliance solely on one's cognition and intellect, at the neglect of other parts of one's being can result in a disembodied experience in which we under-attend to and undervalue the wisdom attained in connection with one's physical body and nature. It is suggested that developing an increased connection with nature may contribute to individuals becoming more integrated and whole, potentially improving their overall well-being.

As noted earlier, ecopsychology views psychological matters from the perspective of integrating other-than-human relationships, and acknowledges the bi-directional relationships between humans and the larger natural world [4]. Rather than the human-centered values of Western colonial and capitalistic societies, in which dominance and power are exerted by humans in their relationship with the natural world, ecopsychology promotes an understanding of humanity as a subcomponent of a vastly interconnected reality, highlighting the interconnection between individual humans and their environments, between humans more collectively and between humans and the earth. This more collectivist worldview additionally underscores the importance of attending to social justice issues, with misuse of the land and the earth paralleling the mistreatment and marginalization of women, BIPOC individuals, and other groups of less privilege and power [65]. Improving connectedness to nature may be one aspect of an overall collective shift towards awareness of this broader interconnection, reinforcing ethics of inclusion, equity, and cultural sensitivity. As ecopsychology and ecotherapy continue to grow and integrate into the field of psychology, psychologists may benefit from more ecopsychology-focused continuing education workshops, conferences, and trainings. Additionally, spending more time connecting with nature may contribute to more proactive behaviors that promote environmental sustainability (Zelenski & Nisbet 2021). This symbiotic cycle of reciprocal giving and taking between humans and nature may better cultivate an environment that supports flourishing and thriving for both people and the earth. According to traditional Aboriginal perspective, the concept of health involves the balance and close interconnection of the personal, social, and ecological factors. Reconnecting with nature is described as vital because "if the land sick, [we] are sick" [66].

### Conclusion

This meta-analysis synthesized data from 22 articles to study the relationship between connectedness to nature and well-being across various domains, including psychological, emotional, and overall well-being [67-75]. The results revealed medium-to-large effect sizes, indicating medium to strong correlations and relationships between connectedness to nature and well-being. These results elaborated on prior research on this domain and cultivated a foundation for further promising research and clinical implications regarding ecopsychology and ecotherapy [76-84]. Finally, the implications are discussed, highlighting the importance of further exploration of the potential impacts of connectedness to nature on embodiment, social justice advocacy for a more inclusive and equitable world, and the cultivation of collective and holistic health and healing [85-90]. "To be alive in this beautiful, self-organizing universe - to participate in the dance of life with a sense to perceive it, lungs that breathe it, organs that draw nourishment from it - is a wonder beyond words." -Joanna Macy

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