

Systematic Review

Between Pro-Environmental Identity and Attitudes: A PRISMA Systematic Review of the Relationship Between Connectedness to Nature and Pro-Environmental Attitudes for Sustainability

Martina Bellotti, Mirko Duradoni * , Maria Fiorenza  and Andrea Guazzini 

Department of Education, Literatures, Intercultural Studies, Languages and Psychology, University of Florence, 50121 Florence, Italy; martina.bellotti@edu.unifi.it (M.B.); maria.fiorenza1@unifi.it (M.F.); andrea.guazzini@unifi.it (A.G.)

* Correspondence: mirko.duradoni@unifi.it

Abstract: In recent decades, the scientific literature has increasingly linked specific human activities to various environmental issues, with climate change being a prominent concern. Environmental Psychology has thus placed its focus on comprehending the dynamics driving Pro-environmental Behaviors (PEBs). Research spotlights two crucial constructs fueling PEBs: Connectedness to Nature (CTN) and Environmental Attitudes (EAs). In the absence of a well-established model, this systematic review strives to advance the understanding of their compound relationship. Following PRISMA guidelines, a comprehensive literature search across Google Scholar, PsycInfo, PsycArticles, PubMed, Science Direct, Sociological Abstracts, and Academic Search Complete databases produced 2658 records. Of these records, only 19 studies met the eligibility criteria after passing the abstract selection phase and were consequently included in this systematic review. Our analysis revealed that CTN and EAs are distinct constructs but showed moderate-to-high correlations. This review posits two hypotheses: (i) CTN may function as a dimension of identity and serve as an EA antecedent and (ii) CTN could be a combination of both implicit and explicit EAs. Subsequently, an interaction model is devised to comprehensively elucidate PEB dynamics and guide effective interventions for their promotion in the context of sustainability.

Keywords: connectedness to nature; environmental attitudes; environmental psychology; pro-environmental behaviors; sustainability



Academic Editor: Tai-Yi Yu

Received: 29 January 2025

Revised: 24 February 2025

Accepted: 25 February 2025

Published: 1 March 2025

Citation: Bellotti, M.; Duradoni, M.; Fiorenza, M.; Guazzini, A. Between Pro-Environmental Identity and Attitudes: A PRISMA Systematic Review of the Relationship Between Connectedness to Nature and Pro-Environmental Attitudes for Sustainability. *Sustainability* **2025**, *17*, 2140. <https://doi.org/10.3390/su17052140>

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1. Introduction

Since the late Sixties, sustainability and environmental concerns have garnered significant attention in Environmental Psychology, driven by the growing awareness of environmental challenges [1,2]. During the last few decades, research has centered on exploring the dynamics shaping Pro-environmental Behaviors (PEBs), which are frequently defined as actions that aim to minimize harm to the environment or even contribute positively to its well-being [3]. This approach was undertaken to delve into the intricacies of the phenomenon, facilitating the development and assessment of targeted interventions to encourage this type of behavior. While psychological research over the past five decades extensively has explored the influence of various psychological and psychosocial factors on PEBs [4]—including Pro-Environmental Knowledge [5,6], Awareness [7], Attitudes [6,8], Beliefs [9], and Identity [10,11]—the effectiveness of interventions aimed at promoting them still remains uncertain, as indicated by a questionable track record of success [12].

Moreover, in accordance with the theory of planned behavior [13] and within the theoretical framework of Environmental Psychology, the adoption of PEBs has been frequently described as being influenced by the interplay of identity factors with attitudes [6,14–20]. Researchers have found two interesting constructs that act as promoters of PEBs: Connectedness to Nature (CTN) [21] and Environmental Attitudes (EAs) [16].

In the literature, numerous definitions of EAs can be found, encompassing perspectives such as “the collection of beliefs, affect, and behavioral intentions a person holds regarding environmentally related activities or issues” [22]; “perceptions of or beliefs regarding the physical environment, including factors affecting its quality (e.g., overpopulation, pollution)” [23]; and “a psychological tendency to evaluate the natural and built environments, and factors affecting their quality, with some degree of favor or disfavor” [24]. Nevertheless, EAs remain a pivotal variable in comprehending the drivers of PEBs [6,14,16,19,20,25].

Concerning CTN, its conceptual roots can be traced back to the ecological insights of Leopold, who posited that environmental issues stem from how individuals perceive the relationship between humanity and the natural world [26]. He asserted that a transformation occurs when we regard the Earth as a community to which we belong; this shift leads to treating it with love and respect. Environmental Psychology has embraced the idea of the interconnection between people and nature as an important requirement for environmental preservation. This perspective claims that actions that hurt the environment are viewed as self-destructive when people broaden their self-concept to encompass nature [27]. Considering these dynamics, the concept of Inclusion of Nature in Self was formulated to represent the extent to which an individual incorporates nature into their cognitive self-representation [28]. Later, Mayer, and Frantz introduced instead the construct of Connectedness to Nature (CTN) defined as the individual’s emotional connection with the world of nature, recapturing the affective and emotional dimension of the relationship between people and nature described by Leopold [21,26]. A recent and advanced conceptualization emerging from CTN was Nisbet, Zelenski, and Murphy’s Nature Relatedness, which encompasses not only the emotional and cognitive dimensions of the human–nature relationship but also the experiential aspect [29].

Research Gap

Within the existing literature, different conceptualizations have elucidated the relationship between CTN and EAs. They can be clustered into two different types of models: Model A and Model B (Figure 1). Specifically, some scholars considered CTN as a subdimension of EAs, assuming subjective identity related to the environment as a component of explicit attitudes toward the environment (Model A) [30–32]. Conversely, other researchers have treated CTN and EAs as partially independent constructs that influence PEBs (Model B) [21,33,34]. In particular, CTN is mainly related to the Self, representing the personal relationship with Nature from an affective and experiential perspective [21]. Meanwhile, EAs are sometimes considered a cognitive aspect of beliefs concerning the environment [21,34–37].

The investigation into the relationship between CTN and EAs has spanned three decades and has employed diverse methodologies across various populations. However, despite these efforts, the precise dynamics of their interaction remain enigmatic. This lack of clarity presents a significant gap in the literature, as a deeper understanding of how these constructs influence each other is crucial for both theoretical and practical advancements. Clarifying this relationship could enhance the development of more effective environmental education programs, interventions, and policies aimed at fostering sustainable behaviors. Addressing this issue is therefore essential to refining existing theoretical models and ensuring that strategies aimed at promoting pro-environmental engagement are based on a solid

empirical foundation. To bridge this gap, the present systematic review seeks to answer the following research questions: (i) To what extent do CTN and EAs correlate across different populations and methodologies? (ii) What are the possible underlying mechanisms that explain the relationship between CTN and EAs? (iii) Can CTN be considered a subdimension of explicit EAs, or does it function as an independent construct with its own role in shaping Pro-environmental Behaviors? According to the research, three hypotheses were formulated within the framework of this systematic review: (i) CTN is a subdimension of explicit EAs; (ii) CTN is a dimension of identity and could be an antecedent of EAs through processes such as cognitive dissonance; and (iii) CTN is a combination of implicit and explicit attitudes toward the environment whose relationship with PEBs is mediated by behavioral intentions and also by the possible inconsistency between implicit and explicit attitudes. Thus, this systematic review aims to comprehensively investigate the intricate relationship between CTN and EAs, seeking a thorough understanding of their interplay in determining PEBs, and to devise effective interventions for their promotion in the context of sustainability. By clarifying these psychological mechanisms, this review contributes to the development of targeted strategies that foster long-term environmental responsibility at individual and collective levels. These insights can inform policies, educational programs, and community initiatives aimed at strengthening people's connection to nature, ultimately promoting more sustainable lifestyles and decision-making.

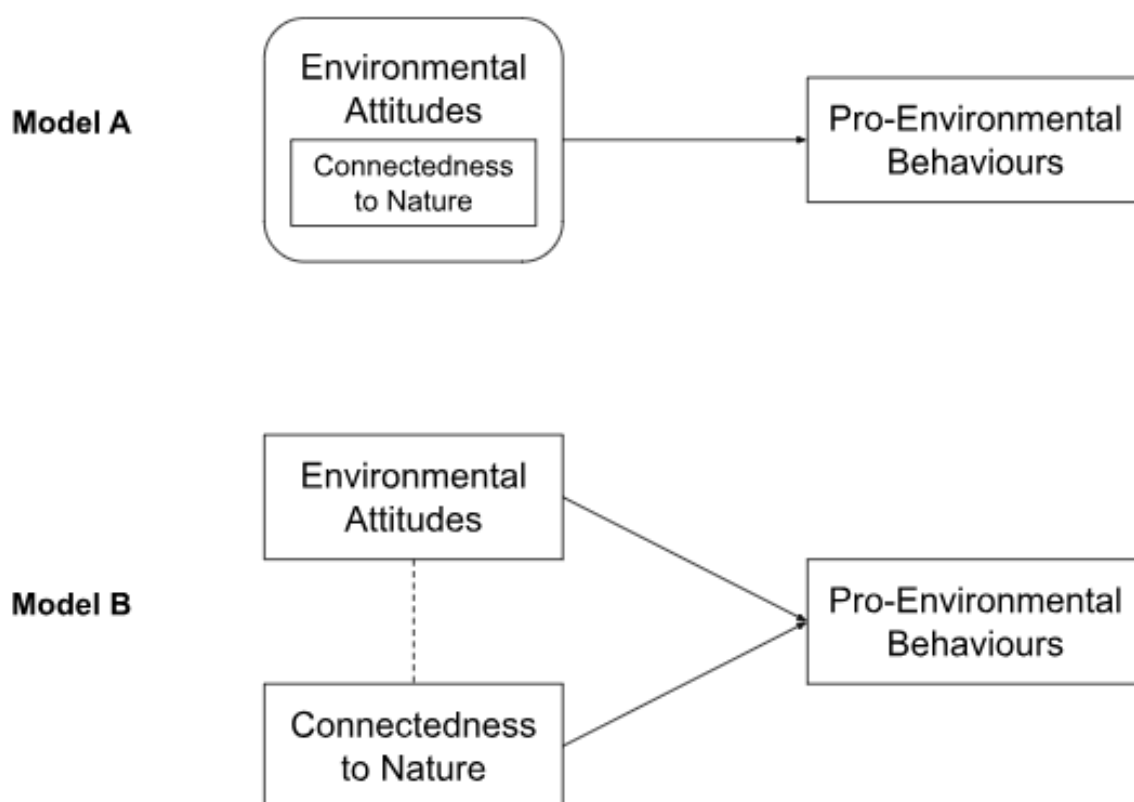


Figure 1. Two distinct conceptualizations of the connection between Connectedness to Nature (CTN) and Environmental Attitudes (EAs): Model A posits CTN as a dimension within EAs, whereas Model B conceptualizes CTN and EAs as two independent constructs influencing Pro-environmental Behaviors (PEBs).

2. Materials and Methods

2.1. Search Strategy

This systematic review was carried out with the Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) guidelines (see the Supplementary Materials

to consult the PRISMA Checklist). The research started in April 2022 and was completed in July of the same year. As for the search engines, the author consulted the databases of Google Scholar, PsycInfo, PsycArticles, PubMed, Science Direct, Sociological Abstracts, and Academic Search Complete, from which a total of 2658 results were found through the input of both the two keywords “Connectedness to Nature” and “Environmental Attitudes”. Subsequently, each result was reviewed and included or excluded in the study according to the eligibility criteria.

2.2. Eligibility Criteria

Each article considered for inclusion had to meet the following inclusion criteria: (i) indexed in Google Scholar, PsycInfo, PsycArticles, PubMed, Science Direct, Sociological Abstracts, and Academic Search Complete; (ii) written in English or Italian, which are the languages known by the authors; (iii) publication date up to July 2022; (iv) reporting the keywords of the search; (v) published in a scholarly peer-reviewed journal or conference proceedings or were Ph.D. or master’s theses; and (vi) reporting a univariate relationship between CTN and EAs.

Records were excluded following these exclusion criteria: (i) not presenting quantitative data; (ii) not reporting any relationship between CTN and EAs; and (iii) concerning an overly specific population.

2.3. Selection Strategy

The review process focused on four stages: identification ($n = 2658$), screening ($n = 2553$), eligibility ($n = 64$), and included articles ($n = 19$) (Figure 2).

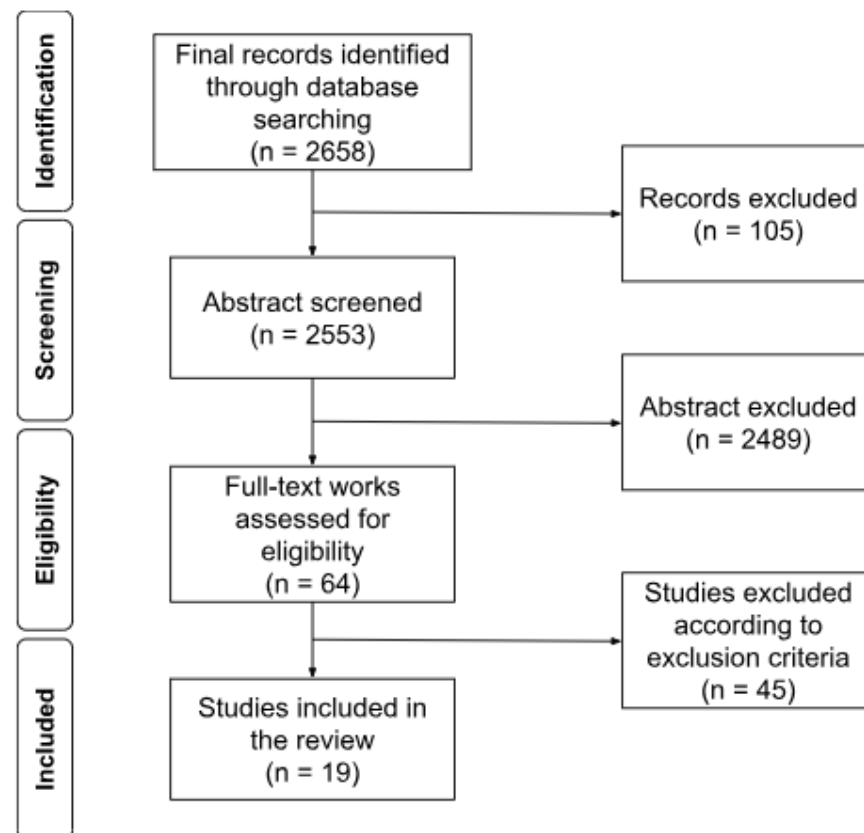


Figure 2. Flow diagram showing the study selection strategy of this systematic review: the number of records identified, included, and excluded.

By entering the keywords “Connectedness to Nature” and “Environmental Attitudes” on Google Scholar, PsycInfo, PsycArticles, PubMed, Science Direct, Sociological Abstracts, and Academic Search Complete, 2658 indexed results were identified. In the pre-exclusion phase, 105 records were excluded due to the fact that they were duplicates, citations, manuals, books, book chapters, or not accessible. Out of the 2553 studies identified, two authors (M.B. and M.F.) independently screened the titles and abstracts to assess their eligibility based on the inclusion and exclusion criteria, specifically selecting correlational and cross-sectional studies examining the association between CTN and EAs. As a result, 2489 studies were excluded. In the subsequent phase, the same authors independently reviewed the full texts of 64 articles, ultimately selecting 19 for inclusion. Key data characteristics—including baseline information, sample size, gender distribution, mean age/age range, country, CTN assessment measures, EA measures, and main findings—were then extracted by two authors (M.B. and M.F.) (Table A1). Throughout all screening and selection phases, a third author (M.D.) acted as a mediator in case of disagreements, ensuring adherence to the study’s internal protocol, which emphasized impartiality and consensus. The two reviewers analyzed the extracted data to identify recurring themes, patterns, and trends in the association between CTN and EAs. Table A2 provides an overview of the key characteristics of the included studies, including their main findings, study limitations, and potential risks of bias. Furthermore, the risk of bias for each study was independently assessed by the same two reviewers using the Joanna Briggs Institute (JBI) critical appraisal tools, ensuring a systematic and rigorous evaluation of study quality. In cases of disagreement, a third reviewer (M.D.) acted as a mediator to reach a consensus. Since nearly all studies reported effects in the same direction, potential sources of heterogeneity among the results were not analyzed further. Traditional sensitivity analysis and certainty assessment methods, commonly used in intervention studies, do not seem applicable to systematic reviews of correlational and cross-sectional studies, as these reviews focus on presenting a distribution rather than estimating a specific value. Instead, the methodological quality and potential biases of the included studies were assessed based on factors such as study design, sample size, data collection methods, statistical analyses, and reporting quality, ensuring a comprehensive evaluation of the available evidence. All of the study characteristics can be found in Appendix A.

3. Results

3.1. Sample

The sample consisted of 19 studies that collectively included a total of 6115 participants. The studies were mostly North American ($n = 10$) and European ($n = 5$), followed by South Korean ($n = 1$), Brazilian ($n = 1$), Philippine ($n = 1$), and New Zealander ($n = 1$) (Table A1). Most of the studies included in this systematic review used adult or young adult populations ($n = 17$), except for two studies that used primary school students [34,38] and one study that used secondary school students [39]. The 43% of the sample was represented by females. Three studies used three different and specific samples: (iii) adults attending a family nature event [40]; (ii) members of ambientalist organizations [41]; and (iii) local New Zealand residents who had or had not actively participated in a tree-planting scheme [20].

3.2. Methodologies

All of the studies used a quantitative methodological approach. Most of the studies used a cross-sectional design ($n = 16$). Other studies used a longitudinal design ($n = 3$) [38,39,42]. Most of them were correlational studies ($n = 11$), followed by scale validation studies ($n = 5$) [29,35,43–45]. There were also three pre–post-intervention stud-

ies [38,39,42]. One of the included studies [46] also used the ANCOVA method to measure the effect of State and Trait CTN on EAs. In another study [42], linear regression was used to measure the effect of CTN on EAs.

3.3. Theoretical Frameworks and Operationalization

Within the 19 studies, 4 theoretical frameworks were identified and the Theory of Planned Behavior was the most referred to ($n = 3$); however, 12 studies did not provide a theoretical framework (Table 1).

Table 1. A list of theories used to guide the research included in this systematic review regarding the relationship between CTN and EAs, the number of studies in which they are stated (No. Studies), and the references to the studies in which they are stated (Research).

Theory	No. Studies	Research
Theory of planned behavior	3	[37,41,42]
Biophilia hypothesis	2	[29,45]
PEB theory	1	[20]
Objective self-awareness theory	1	[46]
Theory not stated	14	[21,33,34,36,38–40,43,44,47–49]

Both CTN and EAs were conceptualized and operationalized in different ways. As regards CTN, different instruments were used to measure it. In 2001, Schultz created the very first scale to measure this construct (Table 2) [50].

In around 2010, the interest in this construct increased and various scales were developed. They can be divided into two clusters, namely: (i) internalized connection scales that define Connectedness to Nature as the intimate, personal relationship between Humans and Nature, like the Inclusion of Nature in the Self Scale and the Connectedness to Nature Scale [21,50], and (ii) externalized connection scales that intend the construct as a personal disposition of the Human to connect to Nature and a set of attitudes or intentions toward Nature, like the Disposition to Connect with Nature Scale [15], the Feeling of Connection to Nature Scale [41], and the Nature Relatedness Scale [29]. We can also divide these scales by lengths in two clusters: (i) short scales composed of six items or less, like the Inclusion of Nature in the Self Scale [50], the Connectedness to Nature Scale [40], and the Feeling of Connection to Nature Scale [41], and (ii) medium–long scales with more than six items, like the Connectedness to Nature Scale [21], the Nature Relatedness Scale [29], and the Connection to Nature Index [51]. However, the Connectedness to Nature Scale by Mayer and Frantz was the most used scale in the articles included and it can be considered to be the standard instrument to measure Connectedness to Nature [21].

Table 2. The table provides a complete list of the different scales adopted to measure CTN in the literature included in this systematic review. For each scale, the authors of the scale, the number of items, the state of validation of the scale, the number, and the percentage of the studies included in this systematic review that adopted the scale.

	Authors	Items	Validation	Number of Studies
Inclusion of Nature in the Self Scale	[50]	1	Yes	1 (5.3%)
Connectedness to Nature Scale	[21]	14	Yes	10 (52.6%)
Nature Relatedness Scale	[29]	21	Yes	2 (10.5%)
Connection to Nature Index	[51]	17	Yes	1 (5.3%)
Disposition to Connect with Nature Scale	[15]	12	Yes	1 (5.3%)
Nature Relatedness Scale—Short Form	[45]	6	Yes	2 (10.5%)
Connectedness to Nature Scale	[40]	4	No	1 (5.3%)
Feeling of Connection to Nature Scale	[41]	4	No	1 (5.3%)

As for CTN, different instruments were used to measure EAs at an explicit level (Table 3). The New Ecological Paradigm Scale is one of the first scales created to measure this construct and it is considered to be the standard instrument [16]. Since the beginning of the current millennium, interest in this construct has increased and various scales have been developed. They can be divided into two clusters: (i) unidimensional scales, i.e., the Children Attitudes Toward Environment Scale [52], the New Ecological Paradigm Scale [16], the Environmental Attitudes Short Scale [46], the New Ecological Paradigm Scale for Children [53], the Environmental Attitudes Scale [40], the Environmental Attitudes Scale [42], and the Attitudes toward Consumption-related Environmental Issues Scale [41], and (ii) multidimensional scales, i.e., the Two Major Environmental Values Scale [54] and the Environmental Attitudes Scale [55]. We can also divide these scales by length into two clusters: (i) short scales composed of ten items or less, like the Environmental Attitudes Scale [40] and the Environmental Attitudes Short Scale [46], and (ii) medium-long scales with more than ten items, like the Environmental Attitudes Scale [55] and the Environmental Attitudes Scale [42]. Finally, they were also different from each other in terms of contents: some scales included items related to intentions, like the Environmental Attitudes Scale [55] and the Environmental Attitudes Scale [42], whereas some others included a few items related to CTN, like the Two Major Environmental Values Scale [54].

Table 3. The table provides the complete list of the different scales used to measure EAs adopted in the research included in this systematic review, the authors of the scale, the number of items, the state of validation of the scale, and the number and the percentage of the studies included in this systematic review that adopted the scale.

	Authors	Items	Validation	Number of Studies
Children's Attitudes Toward Environment Scale	[52]	25	Yes	1 (5.3%)
New Ecological Paradigm Scale	[16]	15	Yes	11 (57.9%)
Environmental Attitudes Short Scale	[46]	2	No	1 (5.3%)
Two Major Environmental Values	[54]	16	Yes	1 (5.3%)
Environmental Attitudes Scale	[55]	20	Yes	1 (5.3%)
New Ecological Paradigm Scale for Children	[53]	10	Yes	1 (5.3%)
Environmental Attitudes Scale	[40]	7	No	1 (5.3%)
Attitudes Toward Consumption-related Environmental Issues Scale	[41]	4	No	1 (5.3%)
Environmental Attitudes Scale	[42]	15	Yes	1 (5.3%)

3.4. Main Findings

In all 19 studies included in this systematic review, a moderate-to-high positive and significant correlation between CTN and EAs was found (Table A2). Most of the studies included ($n = 10$, 52%) found a Pearson correlation between $r = 0.40$ and $r = 0.55$ (Figure 3), ranging between $r = 0.25$ and $r = 0.76$. Two of the studies included in this systematic review studied the relationship between CTN and EAs in a sample of children. In the first one, the correlation between these two constructs was moderately low ($r = 0.247$) [34], while in the second one, it was moderately high ($r = 0.543$) [38].

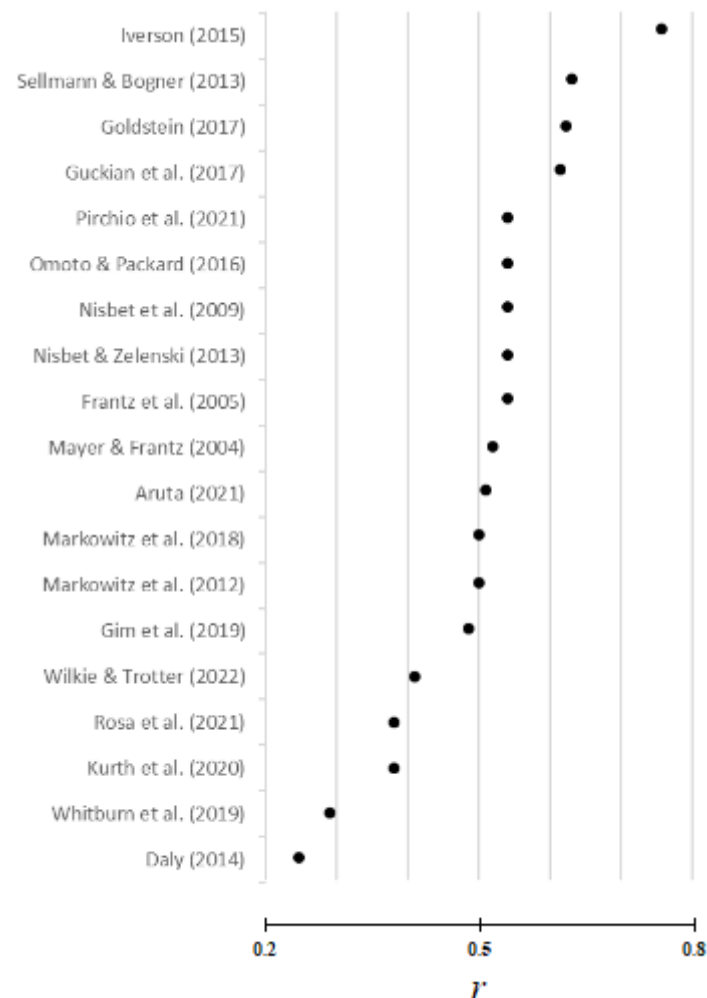


Figure 3. Pearson correlation index (r) between CTN and EAs for each of the studies included in this systematic review. [17,20,21,29,33,34,36–49].

Even if in the literature, some studies consider CTN as a dimension of EAs [30–32], in the studies included in this systematic review, they were considered to be two different constructs. In fact, the EAs predicted Green Consumerism, while CTN predicted Green Citizenship [41]. Green Consumerism refers to individual consumption behaviors that are less harmful to the environment, while Green Citizenship refers to the breadth of environmental behaviors individuals navigate and can engage in during common, everyday life patterns that span both the private and public sphere [41]. Moreover, one of the studies observed a high correlation between the change in CTN and EAs pre and post intervention ($r = 0.623$), but no evidence of causality was found [42].

In order to understand the role of CTN in determining PEBs and its relationship with EAs, in one of the articles included in this systematic review [33], two models of mediation were examined: (i) the main factor model in which EAs partially mediate the effect of CTN on PEB and (ii) the second order factors model (Figure 4), in which two of the dimensions of EAs, i.e., conservation (the extent to which one's attitude toward the environment is derived from altruistic versus egoistic interests) and intention (one's willingness to act in a pro-environmental way), partially mediate the effect of CTN on PEBs. Due to the evidence in the literature, the second model can be considered as a starting point in thinking about the conceptualization and role of CTN [33].

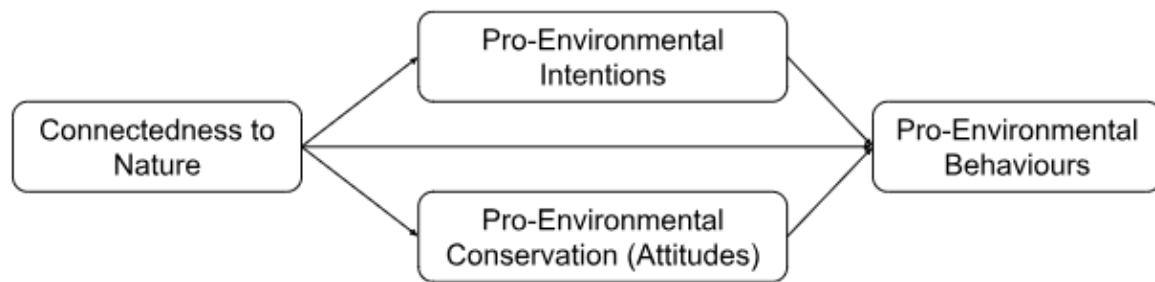


Figure 4. Mediation model between CTN, EAs, and PEBs proposed by Aruta [33].

4. Discussion and Conclusions

Since the late 1960s, Environmental Psychology has witnessed an increase in interest in sustainability and environmental challenges. Understanding the dynamics of PEBs, or acts to reduce harm or improve the environment, has been the focus of recent research. The purpose of this research approach is to create focused treatments that will encourage such actions.

In line with the theory of planned behavior [13], the adoption of PEBs is frequently reported as being mediated by the intertwining of identity factors (e.g., CTN) and attitudes (e.g., EAs) [6,14–20]. While some scholars consider CTN as a subdimension of EAs [30–32], assuming subjective identity related to the environment as a component of explicit attitudes toward the environment, on the other hand, other scholars consider CTN and EAs as two partially independent constructs [21,33,34]. In particular, EAs are sometimes considered as a cognitive aspect of beliefs concerning the environment [21,34,36,37,48], while CTN is mainly related to identity, representing the personal relationship with Nature from an affective and experiential perspective [21].

Despite the variety of scales to measure both CTN and EAs validated and available in the scientific literature, and despite the different types of operationalization of the constructs that prevented us from considering them equivalent, we were able to reduce possible measurement biases by identifying two standard tools in the literature.

In particular, the Connectedness to Nature Scale [21] and New Ecological Paradigm [16] can be considered as the standard respectively for CTN (52.6%) and EA (57.9%) because they are the most adopted instruments in the literature (Tables 2 and 3).

The results of this systematic review appeared to be consistent with the hypothesis of a positive correlation between CTN and EAs, as well as their partial independence. The range of the correlations reported in the literature appeared quite wide, ranging between $r. = 0.24$ and $r. = 0.76$, but while two tails of “small” and “large” correlation can be noted (Figure 3), the majority of the studies (57.9%) found a correlation between 0.40 and 0.60.

The tails could represent extreme cases due to differences in operationalization or due to particular samples, while the correlation between 0.40 and 0.60 can be considered the standard. Some studies may have reported weaker correlations due to these factors. For instance, Whitburn and colleagues found a lower correlation, possibly due to the use of a measurement scale not commonly adopted in other studies and a sample composed of individuals residing in urban areas, which may have influenced the results [20]. Similarly, Daly examined a specific population—children—and highlighted that age appears to play a role, particularly in CTN but not in EAs [34]. Younger children exhibited significantly higher CTN scores, suggesting that this study represents a particular case. Conversely, Iverson reported a stronger correlation, which could be attributed to the nature of the sample, as participants had attended a “family nature event” designed to educate families through hands-on environmental activities [40]. This prior exposure to environmental

education may have strengthened the relationship between CTN and EAs compared to other study populations.

These findings suggest that CTN is not merely a subdimension of explicit EAs. While the two constructs are highly correlated, their definitions and operationalizations indicate that they remain distinct. The correlation, though strong, is not perfect (i.e., not equal to 1), implying that CTN and EAs are related yet not interchangeable. This supports the notion that they should be treated as separate constructs (Figure 3). However, additional research is needed to further substantiate this distinction and explore potential underlying mechanisms that shape their relationship.

In order to classify CTN and establish its role in determining PEBs, the following two hypotheses can be proposed: (i) CTN is a dimension of identity and could be an antecedent of EAs through processes such as cognitive dissonance and (ii) CTN is a combination of implicit and explicit attitudes toward the environment whose relationship with PEBs is mediated by behavioral intentions and also by the possible inconsistency between implicit and explicit attitudes.

Unfortunately, none of the studies included in this review reported a correlation between CTN and EAs at the implicit level, which limited our ability to explore the second hypothesis. It would therefore be valuable for future research to investigate the relationship between CTN and EAs, taking into account the distinction and potential inconsistency between their explicit and implicit dimensions.

Related to the first hypothesis, one of the studies included in this systematic review proposed a mediation model in which the relationship between CTN and PEBs is partially mediated by conservation and intention, two of the EAs' second-order factors [33] (Figure 4).

Aruta's model may be considered a valid starting point in understanding the relationship between CTN, EAs, and PEBs. Yet, in this model, intentions have been conceptualized as a subdimension of EAs. According to the theory of planned behavior and the previous literature, intentions should instead be regarded as a separate variable mediating the relationship between EAs and PEBs [13,56]. In fact, EAs not only had a direct relationship with PEBs but also had a significant influence on pro-environmental intentions (PEIs), which can be considered as a mediator between EAs and PEBs [33,37,40,56]. Another study also explored the mediating role of PEIs in the relationship between CTN and PEBs, concluding that CTN is strongly associated with PEIs. This suggests that the mediation pathway through PEIs may play a crucial role in fostering PEBs, potentially even more so than other variables, such as the appreciation and perceived beauty of nature, which have also been found to be mediated by PEIs [57].

Furthermore, according to the systematic review by Guazzini and colleagues, CTN can be characterized by a direct effect on PEBs, but it may be mediated by Intention, as proven by Aruta, or both [33,58]. Additionally, the relationship between the variables may not be strictly unidirectional, as the studies included in this systematic review are correlational in nature, which precludes the determination of the directionality of this relationship. It is reasonable to consider that not only can engaging in Pro-environmental Behaviors strengthen one's connection to nature but also that environmental attitudes themselves may reinforce CTN over time. This reciprocal relationship between CTN and EAs highlights a dynamic interaction where stronger environmental attitudes could lead to a greater sense of connection to nature, which in turn may further reinforce pro-environmental engagement. However, this hypothesis warrants further exploration through future research to better understand the mechanisms underlying this interaction. Also, there is evidence suggesting that engagement in Pro-environmental Behaviors can, in turn, strengthen one's connection to nature, creating a reciprocal dynamic between these two variables [57]. Thus,

in constructing a comprehensive model of interaction between CTN, EAs, and PEBs, it is essential to account for both mediating pathways and potential bidirectional influences (Figure 5).

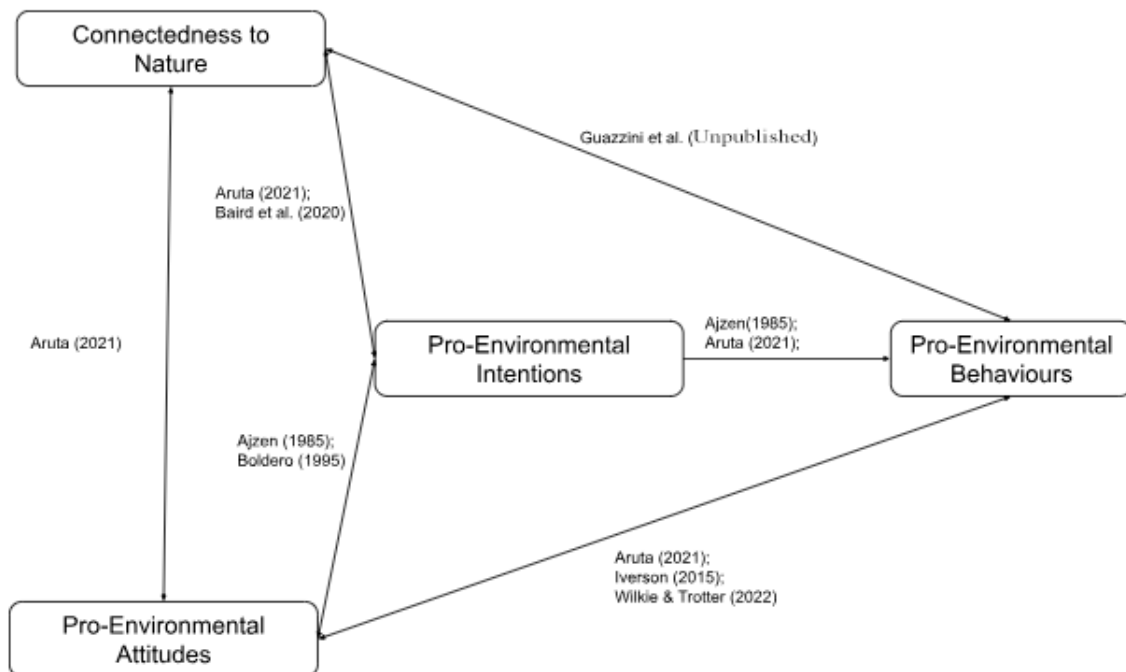


Figure 5. A proposal for an interaction model between CTN, EAs, intention, and PEBs [13,33,37,40,56–58].

The mediation model discussed in this review suggests that pro-environmental intentions (PEIs) play a crucial role in the relationship between Connectedness to Nature (CTN), Environmental Attitudes (EAs), and Pro-environmental Behaviors (PEBs). Both CTN and EAs not only directly influence PEBs but may also do so indirectly through the enhancement of PEIs, which mediates the relationship between CTN, EAs, and sustainable behaviors. This mediation process is key to understanding the psychological mechanisms underlying pro-environmental engagement and provides insights for interventions targeting the strengthening of PEIs as a pathway to more sustainable actions.

Understanding how connection to nature (CTN) relates to pro-environmental attitudes and other psychological variables associated with Pro-environmental Behaviors (PEBs) has important implications for both policy design and practical interventions. By modeling these relationships, policymakers can develop more targeted and evidence-based strategies to promote sustainable behaviors. Given the urgent need to address global environmental challenges, understanding the psychological mechanisms that drive sustainability-oriented behaviors is crucial for designing effective interventions that foster long-term ecological responsibility. For instance, environmental education programs and urban planning initiatives could integrate nature-based interventions to enhance individuals' emotional and cognitive bonds with nature, thereby fostering greater environmental responsibility. Additionally, this knowledge can inform campaigns aimed at shifting social norms and motivating behavioral change by emphasizing the psychological drivers of sustainability. In practice, organizations and institutions can leverage these insights to design workplace policies, community initiatives, and educational curricula that effectively encourage long-term pro-environmental engagement.

Limitations

Most of the studies included in this systematic review ($n = 17$) used non-probabilistic sampling techniques. Some of the studies presented sampling bias due to the low representativeness of the sample. In fact, three studies used three different samples: (i) adults attending a family nature event [40]; (ii) members of ambientalist organizations [41]; and (iii) New Zealand local residents who had or had not actively participated in a tree-planting scheme [20]. Other studies used a sample made up of females for more than 65% of the sample [29,37,39,40,45]. Some other studies used a sample of elementary students [34,38], high school students [39], or university students [21,29,35,42,45–47,49]. Moreover, four studies used small sample sizes [40,42,46,47]; thus, low representativeness can not be excluded. Finally, some of the studies did not report all of the characteristics of the sample [21,40,46,47].

Another limitation is the language bias, as only studies published in English and Italian were included. This decision was based on the language proficiency of the researchers involved in the review, which could limit the generalizability of the findings. This issue has been acknowledged, and future research could benefit from including studies in other languages to mitigate this bias.

Also, while the findings of this systematic review highlight clear distinctions between CTN and EAs, the variability in correlation strengths across studies suggests that their relationship may be influenced by contextual and methodological factors. Given the correlational nature of the included studies, definitive conclusions about the directionality and underlying mechanisms of this relationship remain uncertain. Future research employing longitudinal and experimental designs is necessary to establish causal links and further clarify the interplay between these constructs. A more nuanced understanding of their interaction will contribute to refining theoretical models and improving interventions aimed at fostering pro-environmental engagement.

A limitation of the studies included in this review is the lack of consideration of potential confounding variables, such as demographics, education, and political beliefs, which could influence the relationship between CTN and EAs. None of the studies explicitly accounted for these factors, leaving their impact unexplored. We acknowledge this gap in the literature and suggest that future research should examine how these variables may affect or mediate the CTN-EA relationship, as this would provide a more comprehensive understanding of the factors influencing the connection between these constructs.

Moreover, while we selected a set of databases deemed appropriate for our research scope, other databases such as Web of Science, Scopus, or ProQuest Dissertations could also be explored in future research to ensure broader coverage. Additionally, this review focused specifically on the constructs of Connectedness to Nature and Environmental Attitudes, using these as primary keywords combined with the Boolean operator “AND” when necessary. As a result, related terms such as nature relatedness, environmental concern, ecological identity, and pro-environmental attitudes were not included in the search strategy, which may have led to the exclusion of some relevant studies.

We must also consider that both CTN and EAs were conceptualized and operationalized in different ways in the studies included in this systematic review. Various scales were used to assess these two constructs and they were very different from each other. Due to this heterogeneity, we must be cautious in the interpretation of the results. Especially for EAs, in the literature, many instruments exist to measure this construct, numbering around 700 that either consider the construct unidimensional or multidimensional, causing a phenomenon of “measurement anarchy” of this construct [19,59]. However, in the studies included in this systematic review, the most used instrument for measuring EAs was the

New Ecological Paradigm Scale [16]. But criticisms have been made about the validity of this instrument as a method of measuring EAs, especially in developing countries [48].

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/su17052140/s1>, Table S1: PRISMA 2020 Main Checklist, Table S2: PRISMA Abstract Checklist.

Author Contributions: Conceptualization: M.B., M.F. and A.G.; methodology, M.B. and A.G.; formal analysis, M.B., M.D., M.F. and A.G.; investigation, M.B., M.D., M.F. and A.G.; data curation, M.D. and A.G.; writing—original draft preparation, M.B., M.D., M.F. and A.G.; supervision, A.G. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Key Characteristics of the Included Studies: Sample Size, Gender Distribution, Age Mean, and Age Distribution, Country, Connectedness to Nature Measurement of CTN, Measurement of EAs, and Results (N.A. = Not Available).

Ref.	Sample Size	Gender Distribution	Age Mean/Age Distribution	Country	Measurement of CTN	Measurement of EAs	Results
[33]	589	F = 373 M = 216	Mean = 30.06 18–65	The Philippines	Connectedness to Nature Scale (CNS; [21])	EA Scale [55]	$r = 0.51$ $p < 0.01$
[39]	114	F = 75 M = 39	15–19	Germany	Inclusion of Nature in Self (INS; [50])	2MEV Scale [54]	CTN and Preservation $0.44 < r < 0.63$ CTN and Utilization $0.27 < r < 0.35$
[48]	222	F = 140 M = 82	Mean = 23.64	Brazil	CNS [21]	New Environmental Paradigm (NEP; [16])	$r = 0.38$ $p < 0.001$
[38]	407	F = 187 M = 220	9–11	Italy	CNS adapted: 9 items; 4-point Likert scale	CATES [52]	$r = 0.54$ $p < 0.001$
[40]	78	F = 60 M = 8	N.A.	USA	CNS Scale [40]	EA Scale [40]	$r = 0.76$
[20]	423	F = 261 M = 162	18–74	New Zealand	Disposition to Connect with Nature Scale [15]	NEP [16]	$r = 0.29$
[44]	695	F = 376 M = 319	Mean = 35.7 18–75	USA	CNS [21]	NEP [16]	$r = 0.38$ $p < 0.01$
[43]	407	F = 229 M = 178	17–60	South Korea	CNS [21]	NEP [16]	$r = 0.485$ $p < 0.01$
[47]	43	F = 24 M = 19	N.A.	USA	CNS [21]	NEP [16] 7-item version	$r = 0.50$ $p < 0.01$
[46]	60	F = 29 M = 31	N.A.	USA	CNS [21]	EA Short Scale [46]	$r = 0.47$
[21]	60	F = 29 M = 31	N.A.	USA	CNS [21]	NEP [16]	$r = 0.52$ $p < 0.001$

Table A1. Cont.

Ref.	Sample Size	Gender Distribution	Age Mean/Age Distribution	Country	Measurement of CTN	Measurement of EAs	Results
[41]	223	F = 102 M = 121	20–79	UK	Feeling of Connection to Nature Scale [41]	Attitudes Toward Consumption-related Environmental Issues Scale [41]	$r = 0.614$ $p < 0.05$
[42]	46	F = 23 M = 23	Mean = 30 18–50	UK	CNS [21]	Environmental Attitudes Scale [42]	$r = 0.623$ $p < 0.01$
[45]	184	F = 124 M = 60	Mean = 19.48	Canada	Nature Relatedness Short-Form Scale (NR-6; [45]) and Nature Relatedness Scale (NR-21; [29])	NEP [16]	NR-6 and NEP $r = 0.38$ NR-21 and NEP $r = 0.54$
[37]	211	F = 154 M = 57	Mean = 26.57 16–68	UK	NR-6 [45]	NEP [16]	$r = 0.43$ $p < 0.001$
[36]	427	F = 239 M = 188	Mean = 39.5 18–93	USA	CNS [21]	NEP [16] 6-revised-item version	$r = 0.54$ $p < 0.001$
[34]	95	F = 52 M = 43	Class 2 Mean = 8,6 Class 6 Mean = 12.6	Ireland	Connection to Nature Index [51]	NEP for Children [53]	$r = 0.247$ $p < 0.016$
[49]	115	F = 83 M = 32	Mean = 19 18.31	USA	CNS [21]	NEP [16]	$r = 0.50$ $p < 0.001$
[29]	184	F = 124 M = 60	Mean = 29.48	Canada	NR [29]	NEP [16]	$r = 0.54$ $p < 0.01$

Table A2. Main Features of the Studies Reviewed: Main Findings, Limitations, and Biases.

Ref.	Main Findings	Study Limitations	Risk of Biases
[33]	CTN and EAs also have a highly significant positive correlation in the Philippine context, and EAs in both models presented turn out to be a mediator of the effect of CTN on PEBs.	A non-probabilistic type of sampling (avalanche sampling) is used.	Sampling bias due to the low representativeness of the sample.
[39]	CTN has a significantly moderate positive relationship with the “Protection” dimension of EAs and a low negative correlation with the “Utilization” dimension of EAs.	The sample is unrepresentative because it consists of high school classes and is non-probabilistic; sample data are incomplete.	Sampling bias due to the low representativeness of the sample. Measurement bias due to the “Inclusion of Nature in the Self Scale” that has only one item.
[35]	CTN has a significantly high positive correlation with EAs. NEP, although showing low internal consistency in the Brazilian context, has good convergence validity.	The sample is non-probabilistic and unrepresentative because it consists of college students.	Sampling bias due to the low representativeness of the sample.

Table A2. Cont.

Ref.	Main Findings	Study Limitations	Risk of Biases
[38]	CTN and EAs maintain a significantly high positive correlation before and after the implementation of the outdoor environmental education program. The educational intervention has a positive effect on CTN and perceived well-being but not on empathy, life satisfaction, and anxiety (although they are significantly correlated with CTN).	The sample is non-probabilistic and unrepresentative because it consists of elementary school students; a reduced form of the CNS is used.	Sampling bias due to the low representativeness of the sample; measurement bias due to using only a few items from a validated scale.
[40]	CTN and EAs have a high positive correlation.	Incomplete sample data; non-probabilistic and unrepresentative sample because females significantly outnumber males; small sample size; unvalidated scales are used; and the significance of the relationship is not studied.	Sampling bias due to the low representativeness of the sample; measurement bias due to the use of unvalidated scales.
[20]	CTN and EAs have a moderately significant positive correlation. Both constructs mediate the relationship between PEBs and living in neighborhoods with lots of vegetation. In addition, the two variables are two distinct concepts in that they have different relationships with the other variables considered in this study.	A short form of the scale measuring CTN is used.	Measurement bias due to the use of only a few items from a validated scale.
[44]	CTN and EAs have a moderately significant positive correlation. The two constructs correlate positively with Ecological Empathy and Ecological Mindfulness (Indigenous Nature Connection) as measured by the scales presented in the article, which therefore have good convergent validity.	A non-probabilistic sampling method is used.	Sampling bias due to the non-probabilistic sample.
[43]	CTN and EAs have a moderately significant positive correlation. The scale translated into Korean is validated.	The sampling method is not specified.	Sampling bias.
[47]	CTN and EAs have a highly significant positive correlation. Using a different locomotion mode in VR has no effect on the two variables.	Data on the sample are incomplete; the sample is non-probabilistic and unrepresentative in addition to being small in number.	Sampling bias due to the non-probabilistic sample.
[46]	State CTN has a highly significant positive correlation with EAs, while trait CTN has a moderately significant positive correlation with EAs. In addition, EAs predict the CTN of the state. Objective self-awareness (OSA) has a negative effect on CTN but this is mitigated by EA.	Data on the sample are incomplete; the sample is unrepresentative and composed of a low number of individuals.	Sampling bias due to the low representativeness of the sample.

Table A2. Cont.

Ref.	Main Findings	Study Limitations	Risk of Biases
[21]	CTN and EAs have a highly significant positive correlation. EAs are also related to lifestyle, however, this relationship becomes non-significant when controlling for CTN (thus, they measure different constructs).	Data on the sample are incomplete; the sample is non-probabilistic and unrepresentative because it consists of college students and consists of a low number of individuals.	Sampling bias due to the low representativeness of the sample.
[41]	CTN and EA have a highly significant positive correlation. While EAs predict Green Consumerism, CTN predicts Green Citizenship.	The sample is non-probabilistic and unrepresentative because it consists of individuals who are members of environmental organizations; unvalidated scales are used.	Sampling bias due to non-probabilistic sampling; measurement bias due to the use of non-validated scales.
[42]	CTN and EAs have a highly significant positive correlation before the intervention (watching nature movies).	Non-probabilistic sample; unrepresentative as it consists of college students and is small; a scale consisting of two validated scales is used to measure EAs, but the resulting scale has not been validated.	Sampling bias due to non-probabilistic sampling; measurement bias due to the use of non-validated scales.
[45]	The new scale (NR-6) to measure nature relatedness, although not capturing all components of the construct compared to the long version (NR-21), shows convergent reliability and validity. In fact, NR and EAs are found to have a moderately significant positive correlation when measured with NR-6 and a highly moderate positive correlation when measured with NR.	Lack of generalizability due to the small sample and the prevalence of the females in the sample (65%) with an average age of 33 y.o.	Sampling bias due to the low representativeness of the sample.
[37]	NR has a significantly moderate positive association with EAs whether an individual prefers a natural environment or an individual prefers an urban environment.	Non-probability and female-majority sample; use of NR-6, a short form of NR that although validated does not fully capture all dimensions of the construct.	Sampling bias due to the low representativeness of the sample; measurement bias due to the use of a short form of the scale.
[36]	CTN has a highly positive and significant correlation with EAs, their relationship with environmental activism however is limited and surpassed by the psychological sense of community (PSOC).	Non-probability sample with majority feminiõe; use of a reduced version of the NEP.	Sampling bias due to low representativeness of the sample; measurement bias due to the use of a short form of the scale.
[34]	In children in both classes, CTN has a moderately significant positive correlation with EAs. Children in class two have a significantly higher CTN than those in class six, while no differences are found in EAs.	Non-probabilistic and unrepresentative sample because it consists of elementary school students.	Sampling bias due to the low representativeness of the sample.

Table A2. Cont.

Ref.	Main Findings	Study Limitations	Risk of Biases
[49]	CTN and EAs have high, positive, and significant correlations and have a greater effect on Pro-environmental Behaviors than personality, which are mediators of the relationship between the factor “Openness to experience” and PEBs.	Non-probabilistic and unrepresentative sample as it consists of college students.	Sampling bias due to the low representativeness of the sample.
[29]	NR is considered a valid and reliable tool for measuring CTN. Its convergence validity is due to the fact that it has a highly positive and significant correlation with three measures of EAs, and it is shown that NR measures CTN, which is a different construct from EAs.	Non-probabilistic and unrepresentative sample because it consists of college students.	Sampling bias due to the low representativeness of the sample.

References

- Groot, I.D. Trends in Public Attitudes Toward Air Pollution. *J. Air Pollut. Control. Assoc.* **1967**, *17*, 679–681. [\[CrossRef\]](#) [\[PubMed\]](#)
- Griffiths, I.D.; Langdon, F.J. Subjective Response to Road Traffic Noise. *J. Sound Vib.* **1968**, *8*, 16–32. [\[CrossRef\]](#)
- Steg, L.; Vlek, C. Encouraging Pro-Environmental Behaviour: An Integrative Review and Research Agenda. *J. Environ. Psychol.* **2009**, *29*, 309–317. [\[CrossRef\]](#)
- Blankenberg, A.-K.; Alhusen, H. *On the Determinants of Pro-Environmental Behavior: A Literature Review and Guide for the Empirical Economist*; Center for European, Governance, and Economic Development Research (CEGE): Göttingen, Germany, 2019.
- Fatima, J.K.; Khan, H.Z.; Goh, E. Environmental Knowledge and Behavioural Outcomes of Tourism Students in Australia: Towards Testing a Range of Mediation and Moderated Mediation Effects. *Environ. Educ. Res.* **2016**, *22*, 747–764. [\[CrossRef\]](#)
- Hines, J.M.; Hungerford, H.R.; Tomera, A.N. Analysis and Synthesis of Research on Responsible Environmental Behavior: A Meta-Analysis. *J. Environ. Educ.* **1987**, *18*, 1–8. [\[CrossRef\]](#)
- Zhang, Y.; Zhang, H.-L.; Zhang, J.; Cheng, S. Predicting Residents’ pro-Environmental Behaviors at Tourist Sites: The Role of Awareness of Disaster’s Consequences, Values, and Place Attachment. *J. Environ. Psychol.* **2014**, *40*, 131–146. [\[CrossRef\]](#)
- Tarrant, M.A.; Cordell, H.K. The Effect of Respondent Characteristics on General Environmental Attitude-Behavior Correspondence. *Environ. Behav.* **1997**, *29*, 618–637. [\[CrossRef\]](#)
- Hornsey, M.J.; Harris, E.A.; Bain, P.G.; Fielding, K.S. Meta-Analyses of the Determinants and Outcomes of Belief in Climate Change. *Nat. Clim. Chang.* **2016**, *6*, 622–626. [\[CrossRef\]](#)
- Brick, C.; Sherman, D.K.; Kim, H.S. “Green to Be Seen” and “Brown to Keep down”: Visibility Moderates the Effect of Identity on pro-Environmental Behavior. *J. Environ. Psychol.* **2017**, *51*, 226–238. [\[CrossRef\]](#)
- Owen, A.; Videras, J.; Wu, S. Identity and Environmentalism: The Influence of Community Characteristics. *Rev. Soc. Econ.* **2010**, *68*, 465–486. [\[CrossRef\]](#)
- Van Valkengoed, A.M.; Abrahamse, W.; Steg, L. To Select Effective Interventions for Pro-Environmental Behaviour Change, We Need to Consider Determinants of Behaviour. *Nat. Hum. Behav.* **2022**, *6*, 1482–1492. [\[CrossRef\]](#) [\[PubMed\]](#)
- Ajzen, I. From Intentions to Actions: A Theory of Planned Behavior. In *Action Control: From Cognition to Behavior*; Kuhl, J., Beckmann, J., Eds.; Springer: Berlin/Heidelberg, Germany, 1985; pp. 11–39, ISBN 978-3-642-69746-3.
- Bamberg, S.; Möser, G. Twenty Years after Hines, Hungerford, and Tomera: A New Meta-Analysis of Psycho-Social Determinants of pro-Environmental Behaviour. *J. Environ. Psychol.* **2007**, *27*, 14–25. [\[CrossRef\]](#)
- Brügger, A.; Kaiser, F.G.; Roczen, N. One for All? *Eur. Psychol.* **2011**, *16*, 324–333. [\[CrossRef\]](#)
- Dunlap, R.E.; Van Liere, K.D.; Mertig, A.G.; Jones, R.E. New Trends in Measuring Environmental Attitudes: Measuring Endorsement of the New Ecological Paradigm: A Revised NEP Scale. *J. Soc. Issues* **2000**, *56*, 425–442. [\[CrossRef\]](#)
- Frantz, C.M.; Mayer, F.S. The Importance of Connection to Nature in Assessing Environmental Education Programs. *Stud. Educ. Eval.* **2014**, *41*, 85–89. [\[CrossRef\]](#)
- Hanley, A.W.; Bettmann, J.E.; Kendrick, C.E.; Deringer, A.; Norton, C.L. Dispositional Mindfulness Is Associated with Greater Nature Connectedness and Self-Reported Ecological Behavior. *Ecopsychology* **2020**, *12*, 54–63. [\[CrossRef\]](#)
- Stern, P.C.; Dietz, T.; Guagnano, G.A. The New Ecological Paradigm in Social-Psychological Context. *Environ. Behav.* **1995**, *27*, 723–743. [\[CrossRef\]](#)

20. Whitburn, J.; Linklater, W.L.; Milfont, T.L. Exposure to Urban Nature and Tree Planting Are Related to Pro-Environmental Behavior via Connection to Nature, the Use of Nature for Psychological Restoration, and Environmental Attitudes. *Environ. Behav.* **2019**, *51*, 787–810. [\[CrossRef\]](#)
21. Mayer, F.S.; Frantz, C.M. The Connectedness to Nature Scale: A Measure of Individuals' Feeling in Community with Nature. *J. Environ. Psychol.* **2004**, *24*, 503–515. [\[CrossRef\]](#)
22. Schultz, P.W.; Shriver, C.; Tabanico, J.J.; Khazian, A.M. Implicit Connections with Nature. *J. Environ. Psychol.* **2004**, *24*, 31–42. [\[CrossRef\]](#)
23. Pérez-Acosta, A.M. *Thesaurus of Psychological Index Terms*, 10th ed.; Gallagher, L.A., Ed.; Revista Latinoamericana de Psicología: Bogotá, Colombia, 2006; Volume 38, pp. 608–611.
24. Milfont, T.L.; Milfont, T.L. Psychology of Environmental Attitudes: A Cross-Cultural Study of Their Content and Structure. Unpublished. Ph.D. Thesis, University of Auckland, Auckland, New Zealand, 2007.
25. Milfont, T.L.; Duckitt, J.; Wagner, C. A Cross-Cultural Test of the Value–Attitude–Behavior Hierarchy. *J. Appl. Soc. Psychol.* **2010**, *40*, 2791–2813. [\[CrossRef\]](#)
26. Leopold, A. *A Sand County Almanac: With Essays on Conservation from Round River*; Oxford University Press: Oxford, UK, 1949.
27. Roszak, T.; Gomex, M.E.; Kanner, A.D. (Eds). *Ecopsychology: Restoring the Earth, Healing the Mind*; Sierra Club Books: San Francisco, CA, USA, 1995; p. xxiii, 338, ISBN 978-0-87156-499-3.
28. Schultz, P.W. Inclusion with Nature: The Psychology Of Human-Nature Relations. In *Psychology of Sustainable Development*; Schmuck, P., Schultz, W.P., Eds.; Springer: Boston, MA, USA, 2002; pp. 61–78, ISBN 978-1-4615-0995-0.
29. Nisbet, E.K.; Zelenski, J.M.; Murphy, S.A. The Nature Relatedness Scale: Linking Individuals' Connection With Nature to Environmental Concern and Behavior. *Environ. Behav.* **2009**, *41*, 715–740. [\[CrossRef\]](#)
30. Gkargkavouzi, A.; Paraskevopoulos, S.; Matsiori, S. Connectedness to Nature and Environmental Identity Scales Reveal Environmental Awareness in Greek Teachers. *Nat. Sci. Educ.* **2018**, *47*, 1–10. [\[CrossRef\]](#)
31. Hedlund-de Witt, A.; de Boer, J.; Boersema, J.J. Exploring Inner and Outer Worlds: A Quantitative Study of Worldviews, Environmental Attitudes, and Sustainable Lifestyles. *J. Environ. Psychol.* **2014**, *37*, 40–54. [\[CrossRef\]](#)
32. Kroufek, R.; Janovec, J.; Chytrý, V.; Simonová, V. Environmental attitudes of preschool children and their parents. In Proceedings of the INTED2016 10th International Technology, Education and Development Conference, Valencia, Spain, 7–9 March 2016; pp. 5469–5473. [\[CrossRef\]](#)
33. Aruta, J.J.B.R. Connectedness to Nature Encourages, but Materialism Hinders, Ecological Behavior in the Philippines: The Higher Order and Second-Order Factors of Environmental Attitudes as Viable Mediating Pathways. *Ecopsychology* **2021**, *13*, 114–122. [\[CrossRef\]](#)
34. Daly, M. *Environmental Attitudes, Connection to Nature, and Conscientiousness of Primary School Participants in a Green-School Programme*; Dublin Business School: Dublin, Ireland, 2014.
35. Rosa, C.D.; Profice, C.C.; Collado, S. Nature Experiences and Adults' Self-Reported pro-Environmental Behaviors: The Role of Connectedness to Nature and Childhood Nature Experiences. *Front. Psychol.* **2018**, *9*, 1055. [\[CrossRef\]](#)
36. Omoto, A.M.; Packard, C.D. The Power of Connections: Psychological Sense of Community as a Predictor of Volunteerism. *J. Soc. Psychol.* **2016**, *156*, 272–290. [\[CrossRef\]](#)
37. Wilkie, S.; Trotter, H. Pro-Environmental Attitudes, pro-Environmental Behaviours and Nature-Relatedness: Differences Based on Place Preference. *Eur. Rev. Appl. Psychol.* **2022**, *72*, 100705. [\[CrossRef\]](#)
38. Pirchio, S.; Passiatore, Y.; Panno, A.; Cipparone, M.; Carrus, G. The Effects of Contact With Nature During Outdoor Environmental Education on Students' Wellbeing, Connectedness to Nature and Pro-Sociality. *Front. Psychol.* **2021**, *12*, 648458. [\[CrossRef\]](#)
39. Sellmann, D.; Bogner, F.X. Effects of a 1-Day Environmental Education Intervention on Environmental Attitudes and Connectedness with Nature. *Eur. J. Psychol. Educ.* **2013**, *28*, 1077–1086. [\[CrossRef\]](#)
40. Iverson, A. Do Adults Who Attend a Family Nature Event Have Correlations Between Environmental Responsible Behaviors, Connection to Nature, and Environmental Attitudes? Undergraduate Thesis, Department of Environmental Studies, University of Nebraska–Lincoln, Lincoln, NE, USA, 2015.
41. Guckian, M.; De Young, R.; Harbo, S. Beyond Green Consumerism: Uncovering the Motivations of Green Citizenship. *Mich. J. Sustain.* **2017**, *5*, 73–94. [\[CrossRef\]](#)
42. Goldstein, T. A Study to Investigate the Use of Perspective, in a Short Computer-Based Intervention, to Influence Self-Reported Nature Connection, and Environmental Attitude. Master's Thesis, University of Chester, Chester, UK, 2017.
43. Gim, W.-S.; Lee, M.-H.; Kim, K.-H. A Validation Study of the Korean Version of the Connectedness to Nature Scale. *J. People Plants Environ.* **2019**, *22*, 621–628. [\[CrossRef\]](#)
44. Kurth, A.M.; Narvaez, D.; Kohn, R.; Bae, A. Indigenous Nature Connection: A 3-Week Intervention Increased Ecological Attachment. *Ecopsychology* **2020**, *12*, 101–117. [\[CrossRef\]](#)
45. Nisbet, E.K.; Zelenski, J.M. The NR-6: A New Brief Measure of Nature Relatedness. *Front. Psychol.* **2013**, *4*, 813. [\[CrossRef\]](#)

46. Frantz, C.; Mayer, F.S.; Norton, C.; Rock, M. There Is No “I” in Nature: The Influence of Self-Awareness on Connectedness to Nature. *J. Environ. Psychol.* **2005**, *25*, 427–436. [\[CrossRef\]](#)
47. Markowitz, D.M.; Laha, R.; Perone, B.P.; Pea, R.D.; Bailenson, J.N. Immersive Virtual Reality Field Trips Facilitate Learning About Climate Change. *Front. Psychol.* **2018**, *9*, 2364. [\[CrossRef\]](#)
48. Rosa, C.D.; Collado, S.; Profice, C.C. Measuring Brazilians’ Environmental Attitudes: A Systematic Review and Empirical Analysis of the NEP Scale. *Curr. Psychol.* **2021**, *40*, 1298–1309. [\[CrossRef\]](#)
49. Markowitz, E.M.; Goldberg, L.R.; Ashton, M.C.; Lee, K. Profiling the “Pro-Environmental Individual”: A Personality Perspective. *J. Pers.* **2012**, *80*, 81–111. [\[CrossRef\]](#)
50. Schultz, P.W. The structure of environmental concern: Concern for self, other people, and the biosphere. *J. Environ. Psychol.* **2001**, *21*, 327–339. [\[CrossRef\]](#)
51. Cheng, J.C.-H.; Monroe, M.C. Connection to Nature: Children’s Affective Attitude Toward Nature. *Environ. Behav.* **2012**, *44*, 31–49. [\[CrossRef\]](#)
52. Musser, L.M.; Malkus, A.J. The Children’s Attitudes toward the Environment Scale. *J. Environ. Educ.* **1994**, *25*, 22–26. [\[CrossRef\]](#)
53. Manoli, C.C.; Johnson, B.; Dunlap, R.E. Assessing Children’s Environmental Worldviews: Modifying and Validating the New Ecological Paradigm Scale for Use With Children. *J. Environ. Educ.* **2007**, *38*, 3–13. [\[CrossRef\]](#)
54. Bogner, F.X.; Wiseman, M. Adolescents’ Attitudes towards Nature and Environment: Quantifying the 2-MEV Model. *Environmental* **2006**, *26*, 247–254. [\[CrossRef\]](#)
55. Fernández-Manzanal, R.; Rodríguez-Barreiro, L.; Carrasquer, J. Evaluation of Environmental Attitudes: Analysis and Results of a Scale Applied to University Students. *Sci. Educ.* **2007**, *91*, 988–1009. [\[CrossRef\]](#)
56. Boldero, J. The Prediction of Household Recycling of Newspapers: The Role of Attitudes, Intentions, and Situational Factors. *J. Appl. Soc. Psychol.* **1995**, *25*, 440–462. [\[CrossRef\]](#)
57. Baird, J.; Hutson, G.; Plummer, R. Examining Links between Connections to Nature and Intentions for Pro-Environmental Behavior as Outcomes of NOLS. *J. Outdoor Recreat. Educ. Leadersh.* **2020**, *12*, 367–379. [\[CrossRef\]](#)
58. Guazzini, A.; Valdrighi, G.; Fiorenza, M.M.; Duradoni, M. The Relationship between Connectedness to Nature and Pro-Environmental Behaviors: A PRISMA Systematic Review. [Unpublished Manuscript].
59. Dunlap, R.; Jones, R.E. Environmental Concern: Conceptual and Measurement Issues. In *Handbook of Environmental Sociology*; Greenwood Press: Westport, CN, USA, 2002.

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