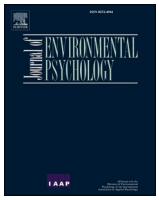
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Nature connectedness and well-being: Evidence from a multi-national investigation across 75 countries

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ABSTRACT

Nature connectedness, a widely used psychological construct which encompasses affective and cognitive aspects of the relationship a person has with nature, has become a central variable of interest in environmental psychology literature. This interest is motivated partially by its enhancing effects on well-being outcomes. However, comprehensive international evaluations of the link between nature connectedness and well-being remain sparse. In this registered report, we propose a secondary analysis of previously collected data to examine how individual differences in nature connectedness relate to multiple aspects of well-being (i.e., purpose in life, hope, mindfulness, life satisfaction, and optimism) across 75 countries ($N = 36{,}803$). Within-country and between-country analyses (linear and mixed regressions) suggested that nature connectedness is a robust positive predictor of well-being. Our findings highlight the importance of nature connected for well-being globally, especially for communities with low access to nature and social resources.

The relationship between humans and nature is slowly moving into the focus of global environmental policies as an important factor in human and planetary health (Brymer et al., 2019; Lengieza et al., 2023). This development builds on a wide range of evidence for the role of the human-nature relationship for human well-being and pro-environmental behaviour (Barragan-Jason et al., 2023). However, while policies, such as the Kunming-Montreal Global Biodiversity Framework (Convention on Biological Diversity, 2022), already show a global concept, research has mostly focused on the role of human-nature relationships in industrialized and mostly Western countries (e.g., de Boer & Aiking, 2023; Olumekor & Oke, 2024). Like other subfields of psychology, in environmental psychology as well, there is an urgent need to expand the understanding of psychological processes beyond WEIRD (Western, Educated, Industrialized, Rich, and Democratic; Henrich et al., 2010) countries to enhance a global understanding of the environmental crises we are facing as a planet (Tam & Milfont, 2020). This is especially important regarding the relationship between nature and well-being, due to global differences in psychological well-being, with (specifically central and northern) European countries, making up the majority of the highest scoring countries in the World Happiness Report, while the lowest scoring countries are almost exclusively in Africa and Asia (Helliwell et al., 2024). This preregistered report proposes an investigation of the association between *nature connectedness*, the psychological concept that captures the human-nature relationship, and various markers of well-being across 75 countries, accounting for relevant differences between countries.

Nature connectedness is a widely used psychological construct, which encompasses affective and cognitive aspects of the relationship a person has with nature. Thus, different operationalizations of nature connectedness focus, at varying levels, on the inclusion of nature into the personal concept of self, a love and appreciation for nature, and the feeling of an emotional connection to the natural world (Nisbet & Zelenski, 2013; Schultz, 2002). An additional important characteristic of this construct is that this connectedness goes beyond mere contact with nature. It describes a meaningful bond, which is expressed through the combination of one's own identity with nature and a sense of oneness with the natural world (Mayer & Frantz, 2004; Schultz, 2002; Unsworth et al., 2016).

Meta-analyses have placed nature connectedness as a key variable in human and planetary well-being (e.g. Barragan-Jason et al., 2023; Capaldi et al., 2014; Pritchard et al., 2020; Wu & Jones, 2022). Nature connectedness is consistently linked to various forms of well-being,

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including improved self-reports of health, both in adults and children (Arola et al., 2023; Pritchard et al., 2020). Significant positive relationships between nature connectedness and both eudaimonic, related to 'functioning well', and hedonistic, related to 'feeling good', measures of well-being can be found across various contexts and research designs (Capaldi et al., 2014; Pritchard et al., 2020). The positive relationship between nature connectedness and well-being remains significant even when controlling for various types of nature exposure and relevant socio-demographic factors (Martin et al., 2020). This suggests that emotional nature connectedness indeed plays a relevant role in psychological well-being and that this role is not simply a side-effect of nature experiences. Most of the evidence relies on correlational research but assumes a causal relationship, where higher nature connectedness causes better psychological well-being (Barragan-Jason et al., 2022). There is some evidence for this causal pathway. Various interventions have been shown to be successful in improving nature connectedness (Sheffield et al., 2022). These successful interventions also consistently show an improvement across various indicators of well-being when such measures are included (e.g. Choe et al., 2020; McEwan et al., 2021).

This causal pathway might, in some cases, be related to mindful engagement with nature. Intervention studies that utilize a mindfulness manipulation to improve nature connectedness tend to also increase well-being (e.g. Nisbet et al., 2019). Mindfulness is a popular concept in well-being interventions and has been shown to be successful across various studies (for a meta-analysis see Galante et al., 2021). These findings have also emerged across cultures (Ivtzan et al., 2018). Mindfulness, when measured as a trait, has been shown to be significantly and positively related to nature connectedness across various studies (for a meta-analysis see Schutte & Malouff, 2018). And mindfulness-based interventions are particularly successful at improving nature connectedness (Barragan-Jason et al., 2022). Thus, a comprehensive investigation of the relationship between nature connectedness and well-being may profit from the inclusion of mindfulness. Further, nature connectedness may have a causal link to well-being through protection from negative impacts, for example, by acting as a resilience factor in crises: This assumption is supported by the positive correlation between nature connectedness and psychological resilience as well as emotional regulation (e.g., Bakir-Demir et al., 2021; Ingulli & Lindbloom, 2013; Richardson et al., 2016). This study will include a measure of resilience to further investigate this link.

Findings on the relationship between nature connectedness and various well-being-related concepts and pro-environmental variables suggest that a reconnection of humans with nature could benefit well-being and health in the short term and could also be an essential driver of a sustainable and livable future. Thus, nature connectedness can be regarded as a leverage point at various levels in societal systems (Riechers et al., 2021), necessitating that global environmental policies start to incorporate efforts to strengthen the relationship between humans and nature (e.g. Convention on Biological Diversity, 2022; EEA, 2022).

However, many assumptions of a failing human-nature relationship are based on industrialized societies with Western values of modernity. For example, affluence, technology, and consumption have been investigated as possible drivers of a weakening bond between humans and nature in Europe (Richardson et al., 2022). Research on nature connectedness has primarily focused on WEIRD societies. Throughout various meta-analyses on nature connectedness, at least 60 % of the included studies were conducted in North America, with the majority of the remaining studies being from Europe (e.g. Capaldi et al., 2014; Mackay & Schmitt, 2019; Pritchard et al., 2020). One of these meta-analyses included the demographic distribution of the samples in the studies additionally to where they were conducted. Here, 60 % of the studies that reported ethnicity had a sample consisting of more than 70 % White participants (Mackay & Schmitt, 2019). As of yet, there is no global investigation of the relationship between nature connectedness and well-being accounting for differences between countries.

Recommendations for cross-cultural research in environmental psychology highlight the need to go beyond simple cross-cultural replication of results to address social structures and cultural factors outside of individual-level differences (Schmitt et al., 2019; Tam & Milfont, 2020). Key factors that have been proposed in relation to pro-environmental variables are urban population, collectivism vs. individualism, Gross Domestic Product (GDP) per capita, and democracy (Tam & Milfont, 2020). Our proposed investigation will evaluate the association between nature connectedness and well-being. Therefore, country-level factors that may affect the relationship between these two variables might differ and have been chosen based on extant literature on well-being, using the expert suggestions named above as a guiding compass (Tam & Milfont, 2020). We opted to not include any indicators of how urban/-suburban/rural the residential environment of each participant was. Our samples in each country were not representative of the population and were limited to specific sites of data collection, leading to a potential lack of variation in the type of their residential environment (e.g., urban vs. suburban vs. rural). This would not allow us to reflect the complex and in many cases not yet understood role of residential environments (Helliwell et al., 2020).

Another suggested key factor, which will be included in this study, is the role of a country's cultural orientation (Tam & Milfont, 2020). The cultural orientation of a nation, often examined via the lens of the collectivism-individualism continuum, has proven useful in explaining cultural differences in well-being (Tov & Diener, 2009). Specifically, these cultural differences are related to varying concepts of well-being or desirable affect (Oishi, 2010; Tsai, 2007). Thus, applying this variable may help to understand variations between different well-being scales on a country-level. Further, the cultural orientation of a nation appears to influence, or at least be related to acceptance of climate change (Nartova-Bochaver et al., 2022) and concern for the environment (Eom et al., 2016). Thus, it is possible that individualism-collectivism could influence the degree to which nature connectedness could ultimately lead to well-being benefits, with individualistic nations potentially having a weaker link.

In addition to this cultural variable, GDP has been suggested as a relevant variable in environmental psychology (Tam & Milfont, 2020). GDP is an indicator of a nation's financial ability based on the gross product of all its financial goods. For the relationship between nature connectedness and well-being it could prove relevant as a moderator. Recent research shows that the link between nature contact, and well-being is consistently stronger for people with low-income, with frequent nature visits leading to a reduction of well-being differences between income groups in Austria (Fian et al., 2024). Evidence suggests that nature connectedness mediates this relationship between nature contact and well-being (Pensini et al., 2016; Webber et al., 2015). Therefore, investigation of the role of nature connectedness, which is both a driver of and formed by meaningful nature contact, across countries with varying levels of wealth among the population can further assess this phenomenon while recognising structural global differences.

The use of GDP, however, has been criticized for being too one-dimensional when addressing well-being, ignoring highly important factors such as education, health care, and equality (Llena-Nozal et al., 2019). In addition to the socio-economic standing of a country, one major factor in well-being is inequality. A systematic review showed that countries with encompassing and gender-inclusive welfare had better overall well-being outcomes and less gender-based well-being differences (McAllister et al., 2018). However, those welfare measures did not alleviate socio-economic well-being differences. Nature on the other hand, as demonstrated in Austria, might be able to eradicate socio-economic well-being differences (Fian et al., 2024). To follow guidelines recommending the use of more complex indicators than a country's GDP, and to also consider research linking inequality and well-being, we used the Inequality-adjusted Human Development Index (IHDI) published by the United Nations Development Programme

(UNDP, 2024) instead. This measure combines a country's standard of living, life expectancy, education, and inequality and thus offers a more comprehensive explanatory tool of between-country variability in financial and human development capacity.

Ultimately, and considering that the proposed investigation will examine the relationship between nature connectedness and well-being, variables that are directly related to the quality of the natural environment of a particular country could be important moderators of the hypothesized association. If the quality of a natural environment is in a better state, then it is possible that connectedness to this environment could confer greater benefits to our well-being. This assumption is based on the importance of coming into contact with nature and perceiving beauty in nature, which is a primary building block of nature connectedness (Lumber et al., 2017). Successful interventions that seek to improve well-being through nature connectedness all work through direct or indirect contact to nature (Sheffield et al., 2022). One variable that captures a nation's capacity to protect its natural environment is the Environmental Performance Index (EPI), an indicator of a country's commitment to protecting the environment including a description of how well a country is performing on various environmental aspects, such as ecosystem vitality (Block et al., 2024).

1. Proposed study

We proposed to assess the relationship between nature connectedness and various well-being measures across 75[2] countries. Acknowledging that what is missing from extant literature is whether associations between nature connectedness and indicators of well-being are (a) consistently emerging and thus generalizable across countries and (b) differing based on country characteristics, we investigated this association in a large sample spanning countries from the Global North and South.

We hypothesized that nature connectedness would relate to greater well-being (H1), assessed via several measures. Specifically, we hypothesized that nature connectedness will relate to greater purpose in life (H1a), hope (H1b), satisfaction with life (H1c), coping (H1d), optimism (H1e) and mindfulness (H1f). We examined these associations within each country, to determine how frequently positive associations are noted, and across countries to determine the overall association, and allow for exploration of national level moderators as well as test these associations while controlling for established demographic predictors of well-being.

There are two reasons why we focused on these variables. The first reason is that each of one of these outcomes, are established predictors of subjective well-being (e.g., Bronk et al., 2009; Daukantaitė & Zukauskiene, 2012; Fischer et al., 2021; Klussman et al., 2022). However, each one is a unique and independent construct from each other. Thus, by examining how nature connectedness correlates with these constructs provides us with a more holistic understanding of its associations with well-being. The second reason is, that practically, we are constrained to the testing measures that were used to collect the data in the large cross-national dataset, which is the focus of our proposed analyses. For instance, purpose-in-life is an aspect of eudaimonic well-being that has been consistently related to nature connectedness (Pritchard et al., 2020). Resilience (a construct serving as a protective factor of well-being as discussed in the Introduction), hope and optimism are each captured, measured with extant literature, linking each of these to decreased mental health issues (Laranjeira & Querido, 2022). Mindfulness, although not an indicator of well-being per se, is a construct that robustly predicts well-being, and one that reflects a disposition towards reflection and contemplation, which is a factor that could be positively influenced by nature connectedness.

Importantly, we also investigated how associations between nature connectedness and well-being vary as a function of national-level differences. We hypothesized that the Environmental Performance Index (Block et al., 2024) would act as a moderator of the relationship between nature connectedness and well-being, strengthening the positive effects of nature connectedness. We posit this based on the assumption, that in countries with a higher EPI score, nature is better preserved, respected, and protected, and thus experiences in nature could be richer and more rewarding, and ultimately more beneficial for one's well-being.

We also tested whether human development, measured through the Inequality-Adjusted Human Development Index and the cultural orientation of a country, measured via the individualism-collectivism continuum, moderate associations between nature connectedness and well-being. Although we had no a priori hypothesis about the directionality of the potential moderation, we speculated that it's possible that in countries with higher human development, the association between nature connectedness and well-being could be stronger, as individuals could, due to higher human development levels, be in a position, where one's relationship to nature becomes a more central factor in well-being. With regards to individualism-collectivism, we speculated that in more individualistic countries, well-being and its predictors, such as nature connectedness, could be a more person-specific process, such that actions and variables that focus on personal experiences, could be a stronger predictor of well-being.

2. Proposed methods

Analyses were conducted on a dataset that has been collected across multiple countries. The primary research team has published several papers utilizing this dataset (e.g., Jovanović et al., 2024; Karakulak et al., 2023). The proposed investigation offers a preregistered analysis of data collected via a multinational effort of the C19 Consortium. Data acquisition took place over a duration of three years (2020–2022). The original project focused on evaluating the impact, perceptions, and experiences of COVID-19 among young people. Data gathered by the network of researchers includes variables that can address multiple different research questions, including the one proposed in this investigation. Crucially, the analyses proposed here had not been conducted prior to the in-principal acceptance of the pre-registered report.

2.1. Participants

A total of 38,366 participants across 76 countries, with 75 countries yielding data suitable for our planned analysis, were recruited by a large collaborative effort. This sample size was not determined a priori, and instead reflects a large, multinational collaboration. Recruitment was conducted via convenience and online crowdsourced sampling methods and varied by country. The study was approved by the ethics committee at the Chicago School of Professional Psychology. Across all countries, the median sample size is N = 322.

Sensitivity analyses conducted using G*Power 3.1.9.7 (Faul et al., 2007) suggested that, for this sample size, for a two-tailed test and power of .80, we were able to meaningfully observe correlation coefficients as small as r = 0.15. Additional sensitivity analyses set for a two-tailed correlation test, with power of .80, we meaningful correlation coefficients of .39, .16 and .07 respectively could be identified for the smallest (N = 47), median (N ~ 300) and largest (N = 1778) sample size. We are confident that our large sample size and cluster size (i.e., number of countries, k = 75) are sufficient for the estimation of multilevel associations.

Demographic characteristics for each country for gender and age are given in Table 1. Notably, gender was not equally distributed in each country. We intend to rectify this pattern by controlling for the effects of

[2] The initial stage of the registered report proposed investigation of 76 countries. After acceptance of the methods by the journal, a first examination of the data revealed, that in one country, South Africa, data on nature connectedness was missing. Data from South Africa was thus not suitable for the analysis and was subsequently excluded.

Table 1
Demographic breakdown by country.

Country	N_{Total}	N_{Male}	N_{Female}	N_{Other}	M_{age}	SD_{age}
Afghanistan	369	320	49	0	26.49	5.48
Albania	249	25	224	0	20.31	4.80
Argentina	120	12	104	4	29.79	10.94
Armenia	206	19	187	0	21.54	4.7
Australia	338	77	257	4	22.58	8.38
Bangladesh	1533	691	842	0	22.5	3.46
Bhutan	248	109	139	0	16.63	1.31
Bosnia	75	17	58	0	26.99	11.6
Brazil	932	226	693	13	32.1	12.08
Bulgaria	447	174	273	0	33.64	14.7
Chile	804	211	593	0	23.04	6.58
China	499	136	363	0	22.23	4.58
Colombia	432	167	265	0	23.52	4.88
Costa Rica	86	20	66	0	38.09	8.71
Croatia	1730	623	1105	2	24.96	9.9
Cuba	317	149	167	0	23.68	8.99
Cyprus	328	133	195	0	36.49	11.06
Czech Republic	217	51	166	0	39.35	10.44
Dominican Republic	444	59	385	0	30.13	8.07
Ecuador	335	111	224	0	28.72	10.61
El Salvador	459	183	276	0	26.66	8.59
Georgia	325	54	271	0	24.44	8.44
Germany	1023	229	786	8	30.89	9.75
Ghana	140	81	59	0	26.08	7.23
Greece	105	21	84	0	28.42	12.23
Guatemala	147	27	118	2	37.96	12.83
Honduras	727	275	452	0	25.86	9.09
Hungary	247	43	204	0	25.26	8.19
India	286	177	109	0	21.88	7.51
Indonesia	310	72	238	0	23.99	8.45
Iran	942	348	594	0	30.83	11.1
Ireland	47	8	36	3	23.38	4.29
Israel	301	147	154	0	25.68	9.17
Italy	887	338	549	0	25.1	12.39
Japan	931	440	491	0	35.38	8.09
Kazakhstan	404	101	303	0	25.51	14.94
Kenya	173	67	106	0	24.39	8.15
Kosovo	360	66	294	0	24.09	7.69
Lebanon	453	138	315	0	24.70	8.40
Lithuania	502	97	405	0	31.8	9.24
North Macedonia	267	44	223	0	31.89	11.51
Malaysia	583	143	440	0	30.99	11.05
Mexico	248	28	219	1	23.52	7.4
Moldova	530	249	281	0	26.34	9.55
Mongolia	327	60	267	0	21.55	2.78
Montenegro	68	2	66	0	25.69	9.31
Mozambique	80	34	45	1	31.43	9.58
Nepal	260	92	168	0	22.89	5.3
New Zealand	200	35	162	3	19.6	3.23
Nigeria	121	64	57	0	29.44	9.56
Oman	281	149	132	0	25.97	7.9
Pakistan	386	24	362	0	21.18	2.19
Paraguay	52	17	35	0	38.56	9.54
Peru	705	201	504	0	24.18	4.01
Philippines	534	185	349	0	21.52	6.5
Poland	1091	439	652	0	27.22	8.12
Portugal	319	91	226	2	37.91	15.86
Qatar	97	32	65	0	23.38	8.32
Romania	1505	533	972	0	23.38	6.9
Serbia	789	122	667	0	22.98	5.93
Singapore	366	109	257	0	25.43	4.89
Slovakia	332	118	214	0	17.33	1.17
Slovenia	111	24	87	0	28.43	11.43
Syria	200	110	90	0	23.08	2.85
Taiwan	218	58	160	0	26.04	9.33
Thailand	1121	265	782	74	37.6	20.25
Turkey	432	84	348	0	21.99	5.68
Uganda	119	47	72	0	25.65	5.66
UK	238	46	192	0	22.65	3.67
Ukraine	1778	496	1282	0	30.33	12.76
Uruguay	267	223	43	1	25.9	8.2
USA	148	21	117	10	35.79	9.63
Vietnam	302	100	202	0	22.85	8.31
Zambia	283	133	150	0	22.41	4.42
Zimbabwe	174	43	131	0	27.44	8.96

Note. South Africa (N = 1563) was excluded from the sample as the measure of nature connectedness was not included there.

gender in our multilevel models.

2.2. Materials and procedure

A comprehensive list of instruments was administered to all participants in a randomized order. Important for the context of the current study were the following measures, presented in order as predictor, outcomes, covariates, and country-level indices. The composite reliability estimate across all countries (i.e., Cronbach's α) is reported below.

2.2.1. Predictor

The Nature Relatedness Scale (NR-6; 6 items, 5-point Likert scale; Nisbet & Zelenski, 2013, e.g., "My relationship to nature is an important part of who I am"; $\alpha = 0.87$) was used to capture the degree to which an individual feels connected to nature.

2.2.2. Outcomes

The following indicators of well-being were included in the study: (a) the *Purpose in Life Scale* (4 items, 5-point Likert Scale; Hill et al., 2016, e.g., "There is a direction in my life"; $\alpha = 0.86$); (b) the *Herth Hope Index* (13 items, 5-point Likert scale; Herth, 1992; e.g., "I feel my life has value and worth"; $\alpha = 0.92$); (c) the *Langer Mindfulness Scale* (14 items, 5-point Likert scale; Pirson & Langer, 2015; "I am often aware of changes"; $\alpha = 0.92$); (d) the *Abbreviated 3-Item Satisfaction with Life Scale* (3 items, 5-point Likert Scale; Kjell & Diener, 2021; e.g., "I am satisfied with my life"; $\alpha = 0.84$); (e) the *Brief Resilient Coping Scale* (4 items, 5-point Likert scale; Sinclair & Wallston, 2004; "I believe I can grow in positive ways by dealing with difficult situations"; $\alpha = 0.78$); and (f) the *Life--Orientation Scale, Optimism subscale* (6 items, 5-point Likert scale; Schou-Bredal et al., 2017; "Overall, I expect more good things to happen to me than bad"; $\alpha = 0.72$).

2.2.3. Covariates

Aside from testing these associations within each country to determine how frequently they reveal as significant and positive; we also ran multilevel regression models to determine the overall association. In a second model, we also controlled for demographic covariates to increase robustness of our results. Specifically, we controlled for gender (which is captured as male, female, nonbinary/other) and age (in years). Due to the low number of participants identifying as nonbinary/other, in our analyses controlling for gender, we will exclude these respondents in analyses and treat gender as binary. Thus 174 participants were removed from analyses that included gender as a covariate specifically.

2.2.4. Country-level indicators (moderators)

In a third series of multilevel regressions, we explored how the association between nature connectedness and mental well-being potentially varies because of national differences in three domains.

The first is in the degree to which a country is invested in protecting the environment. To measure national environmental performance, we will use the most recent version of the Environmental Performance Index (Block et al., 2024). To generate EPI scores, a total of 58 indicators are organized into 11 issue categories, such as Water Resources and Air Quality, and three policy objectives. Weights are then estimated (by the EPI team) to reflect the percentage of the total score that each indicator captures. Broadly, 45 % of the score reflect ecosystem vitality, 25 % reflect environmental health, and 30 % reflect climate change performance. Scores are available for 180 countries and range from 0 to 100, with higher scores reflecting better environmental performance. A total of 74 out of 75 countries in our data have a score for this index.

The second domain is the degree to which a country is characterized by inequality and a lack of development. To measure inequality and

human development, we will use the most recent version of the Inequality-Adjusted Human Development Index (United Nations Development Program, 2024; for further details on its measurement properties see Foster et al., 2007). The IHDI is an extension of the Human Development Index (HDI). While the HDI itself synthesizes a score for the level of development of a country through indicators such as standard of living, life expectancy, and education, it is missing to take inequality into account. On the UNDP website, the IHDI is described as follows: "IHDI is computed as a geometric mean of inequality-adjusted dimensional indices. The IHDI accounts for inequalities in HDI dimensions by "discounting" each dimension's average value according to its level of inequality. The IHDI value equals the HDI value when there is no inequality across people but falls below the HDI value as inequality rises. In this sense, the IHDI measures the level of human development when inequality is accounted for." Scores range from 0 to 1, with higher scores indicating higher levels of human development. A total of 71 out of 75 countries in our data have a score for this index.

The third and final potential moderator is a country's cultural orientation. Specifically, we will focus on the best-known and best-validated dimension of national culture, individualism-collectivism, as first proposed by Hofstede (1980) and as measured by the Minkov-Hofstede model of culture. Specifically, three items from the World Values Survey are used to generate this estimate, capturing female emancipation, importance and stability of in-groups, and conformity (Minkov & Kaasa, 2022). We used this measure as it provides scores for 102 countries, the highest possible number of countries to the best of our knowledge. Scores for 61 countries included in this study are available and used. Scores range from negative (collectivism) to positive (individualism), with the lowest possible score being −291 for Nigeria and the highest score being 182 for the Netherlands.[3]

3. Proposed analytical plan

3.1. Measurement invariance

All measures utilized in this investigation will be first evaluated for measurement invariance across all countries. Specifically, we will test for configural (fitting the single-factor Confirmatory Factor Analysis models and obtaining good fit), metric, and scalar invariance. We will test for metric invariance by specifying a partially constrained model, namely a model in which factor loadings are fixed to be equal but intercepts are freely estimated. Notably, researchers often rely on changes in the Chi-Square statistic to evaluate tests of measurement invariance; however, given its sensitivity to sample size (Chen, 2007; Kang et al., 2016) and due to the considerable variability across sample sizes in our study, we will not rely on this method in our investigation. Instead, when evaluating our tests of measurement invariance, we adhered to the recommended thresholds which suggest that for unequal sample sizes between groups, a change of $\leq .025$ in Standardized Root Mean Square (SRMR) and a change of $\leq .010$ in Comparative Fit Index (CFI) indicate invariance (Chen, 2007). These results are reported in Table 2.

We used Weighted Least Squares (WLSMV) for our estimator. We tested for full and partial invariance. Deviating from our analytical plan, rather than utilizing the item effect size index (Nye & Drasgow, 2011) we inspected item loadings to determine potential removal of underperforming items. Ultimately, if invariance was not met even after making adjustments, we ran analyses with the existing form of each measure and highlight this as a key limitation of our study.

Table 2
Measurement invariance tests for original and modified scales.

Model	CFI	ΔCFI	SRMR	ΔSRMR
Nature Connectedness				
Configural	1.00	–	0.03	–
Metric	0.99	**0.010**	0.06	0.027
Scalar	0.93	0.059	0.10	0.039
Purpose				
Configural	1.00	–	0.02	–
Metric	0.98	0.024	0.06	0.039
Scalar	0.95	0.030	0.08	0.023
Purpose (dropping 1 item)				
Configural	1.00		0.00	
Metric	0.99	**0.010**	0.03	0.031
Scalar	0.96	0.034	0.06	0.031
Hope				
Configural	1.00	–	0.05	–
Metric	0.98	0.023	0.08	0.028
Scalar	0.95	0.025	0.10	0.016
Hope (dropping 1 item)				
Configural	1.00	–	0.05	–
Metric	0.98	0.019	0.08	0.026
Scalar	0.96	0.025	0.09	0.016
Mindfulness				
Configural	0.99	–	0.06	–
Metric	0.93	0.067	0.11	0.053
Scalar	0.89	0.041	0.13	0.017
Mindfulness (dropping 1 item)				
Configural	0.99	–	0.06	–
Metric	0.98	0.018	**0.08**	0.021
Scalar	0.95	0.031	0.10	0.018
Life Satisfaction				
Configural	1.00	–	0.00	–
Metric	1.00	**0.000**	0.04	0.037
Scalar	0.97	0.026	0.07	0.031
Resilient Coping				
Configural	1.00	–	0.02	–
Metric	1.00	**0.000**	**0.04**	0.017
Scalar	0.93	0.071	0.07	0.036
Optimism				
Configural	0.99	–	0.05	–
Metric	0.83	0.158	0.12	0.072
Scalar	0.68	0.151	0.15	0.035
Optimism (dropping 1 item)				
Configural	1.00	–	0.03	–
Metric	0.93	0.067	0.08	0.041
Scalar	0.84	0.089	0.11	0.035

3.2. Proposed main analyses

All code and survey materials are available on the Open Science Framework (OSF), https://osf.io/rxtg2/?view_only=8136aab070f7489eb83db0269f5613c9. The data, however, are subject to data sharing restrictions at some of the institutes responsible for data collection, and are available upon request. All analyses were conducted in RStudio.[4] To evaluate all hypothesized associations within each country, we estimated bivariate correlations between our predictor (nature connectedness) and each of the six mental well-being indicators. In Table 3, we report the correlation coefficient, and the number of countries where results support our hypothesis.[5]

To estimate the hypothesized associations across all countries, we run a total of 18 multilevel regression models. These models are presented in Table 4. For each model, participants (level 1) are nested in countries (level 2). Random intercepts will be estimated. Rather than grand-mean-centering our predictor, we deviated from our analytical plan and standardized our measure. Since data were only included in a single-timepoint, we could not use full-information maximum likelihood

[3] We also acknowledge that although individualism-collectivism is often (including in the present investigation) conceptualized as a continuum, this construct is considerably more complex as recent research also reiterates (Lomas et al., 2023).

[4] Measurement invariance tests will be estimated with the lavaan package, and multilevel regression models with the lme4 package.

[5] We opted to present a standardized regression coefficient, which is corresponding to a correlation coefficient in a model with a single predictor.

Table 3
Standardized Linear Regression Models with Nature Connectedness as the Predictor. Bolded coefficients highlight significant results in the hypothesized direction.

Country	Purpose in Life		Hope		Life Satisfaction		Resilient Coping		Optimism		Mindfulness	
	b	95 % CI	b	95 % CI	b	95 % CI	b	95 % CI	b	95 % CI	b	95 % CI
Afghanistan	**0.55*****	**[0.41, 0.68]**	–	–	0.23	[-0.03, 0.50]	**0.53*****	**[0.43, 0.63]**	**0.25*****	**[0.15, 0.34]**	**0.42*****	**[0.34, 0.51]**
Albania	**0.34*****	**[0.22, 0.46]**	**0.45*****	**[0.33, 0.57]**	0.19	[-0.02, 0.41]	**0.47*****	**[0.37, 0.58]**	**0.39*****	**[0.29, 0.49]**	**0.39*****	**[0.28, 0.50]**
Argentina	**0.30*****	**[0.15, 0.45]**	**0.29*****	**[0.16, 0.42]**	**0.36****	**[0.13, 0.59]**	**0.26*****	**[0.11, 0.41]**	**0.17****	**[0.04, 0.29]**	**0.14***	**[0.04, 0.25]**
Armenia	0.04	[-0.07, 0.16]	**0.16*****	**[0.08, 0.25]**	0.01	[-0.24, 0.25]	**0.17****	**[0.06, 0.28]**	0.11	[-0.01, 0.23]	**0.20*****	**[0.10, 0.30]**
Australia	**0.09***	**[0.00, 0.18]**	**0.17*****	**[0.10, 0.23]**	0.06	[-0.08, 0.21]	**0.20*****	**[0.13, 0.27]**	**0.14*****	**[0.07, 0.20]**	**0.20*****	**[0.15, 0.26]**
Bangladesh	**0.37*****	**[0.32, 0.43]**	**0.35*****	**[0.31, 0.39]**	**0.22*****	**[0.12, 0.31]**	**0.49*****	**[0.45, 0.53]**	**0.27*****	**[0.22, 0.31]**	**0.36*****	**[0.32, 0.40]**
Bhutan	**0.38*****	**[0.27, 0.49]**	–	–	**0.21****	**[0.06, 0.36]**	**0.40*****	**[0.32, 0.49]**	**0.26*****	**[0.16, 0.36]**	**0.35*****	**[0.27, 0.43]**
Bosnia	0.04	[-0.14, 0.23]	**0.21***	**[0.05, 0.37]**	0.02	[-0.23, 0.27]	**0.37*****	**[0.19, 0.54]**	0.08	[-0.09, 0.24]	**0.24****	**[0.08, 0.40]**
Brazil	**0.12*****	**[0.07, 0.18]**	**0.16*****	**[0.11, 0.20]**	**0.14****	**[0.04, 0.24]**	**0.13*****	**[0.09, 0.17]**	**0.07*****	**[0.03, 0.10]**	**0.19*****	**[0.15, 0.22]**
Bulgaria	**0.33*****	**[0.25, 0.41]**	**0.23*****	**[0.17, 0.30]**	0.08	[-0.03, 0.19]	**0.38*****	**[0.32, 0.45]**	**0.22*****	**[0.15, 0.28]**	**0.27*****	**[0.22, 0.33]**
Chile	0.06	[-0.01, 0.14]	**0.09****	**[0.03, 0.15]**	0.05	[-0.06, 0.17]	**0.17*****	**[0.11, 0.23]**	**0.12*****	**[0.07, 0.17]**	**0.22*****	**[0.17, 0.28]**
China	**0.18*****	**[0.09, 0.27]**	**0.18*****	**[0.12, 0.23]**	**0.22****	**[0.07, 0.36]**	**0.27*****	**[0.20, 0.34]**	**0.14*****	**[0.07, 0.20]**	**0.28*****	**[0.22, 0.35]**
Colombia	**0.25*****	**[0.16, 0.33]**	–	–	**0.28*****	**[0.18, 0.37]**	**0.34*****	**[0.27, 0.41]**	**0.29*****	**[0.22, 0.36]**	**0.31*****	**[0.24, 0.37]**
Costa Rica	0.04	[-0.16, 0.24]	0.06	[-0.09, 0.22]	0.02	[-0.20, 0.24]	0.06	[-0.10, 0.21]	−0.01	[-0.15, 0.13]	0.03	[-0.09, 0.15]
Croatia	**0.14*****	**[0.11, 0.18]**	**0.18*****	**[0.15, 0.21]**	**0.10*****	**[0.04, 0.16]**	**0.25*****	**[0.21, 0.28]**	**0.11*****	**[0.08, 0.15]**	**0.25*****	**[0.22, 0.28]**
Cuba	**0.52*****	**[0.43, 0.61]**	**0.52*****	**[0.44, 0.59]**	**0.31*****	**[0.18, 0.44]**	**0.53*****	**[0.45, 0.60]**	**0.40*****	**[0.33, 0.47]**	**0.53*****	**[0.46, 0.61]**
Cyprus	**0.15*****	**[0.06, 0.24]**	**0.18*****	**[0.11, 0.25]**	−0.18*	[-0.34, −0.02]	**0.16*****	**[0.09, 0.23]**	**0.07***	**[0.00, 0.15]**	**0.17*****	**[0.10, 0.24]**
Czech Republic	0.12	[-0.01, 0.25]	**0.14****	**[0.06, 0.22]**	0.12	[-0.06, 0.30]	**0.15****	**[0.06, 0.24]**	0.08	[-0.01, 0.17]	**0.19*****	**[0.10, 0.27]**
Dominican Republic	**0.28*****	**[0.17, 0.39]**	**0.25*****	**[0.17, 0.33]**	0.10	[-0.06, 0.26]	**0.28*****	**[0.19, 0.36]**	**0.16*****	**[0.09, 0.23]**	**0.29*****	**[0.22, 0.36]**
Ecuador	**0.22*****	**[0.11, 0.33]**	**0.24*****	**[0.17, 0.32]**	0.01	[-0.12, 0.13]	**0.33*****	**[0.25, 0.40]**	**0.19*****	**[0.13, 0.26]**	**0.32*****	**[0.24, 0.39]**
El Salvador	**0.22*****	**[0.12, 0.32]**	**0.22*****	**[0.14, 0.30]**	0.05	[-0.08, 0.18]	**0.21*****	**[0.14, 0.29]**	**0.12*****	**[0.06, 0.19]**	**0.20*****	**[0.13, 0.27]**
Georgia	**0.13***	**[0.03, 0.24]**	**0.13****	**[0.05, 0.20]**	−0.13	[-0.32, 0.05]	**0.23*****	**[0.16, 0.31]**	**0.13****	**[0.04, 0.22]**	**0.21*****	**[0.15, 0.28]**
Germany	0.03	[-0.02, 0.07]	**0.19*****	**[0.16, 0.23]**	**0.16*****	**[0.08, 0.23]**	**0.20*****	**[0.16, 0.23]**	**0.06*****	**[0.03, 0.09]**	**0.22*****	**[0.19, 0.25]**
Ghana	0.09	[-0.14, 0.33]	0.17	[-0.03, 0.36]	−0.45	[-1.03, 0.14]	**0.37*****	**[0.19, 0.55]**	**0.31****	**[0.10, 0.52]**	**0.24***	**[0.02, 0.47]**
Greece	0.05	[-0.16, 0.26]	0.1	[-0.05, 0.24]	−0.12	[-0.43, 0.20]	0.11	[-0.04, 0.27]	0.05	[-0.07, 0.17]	0.11	[-0.01, 0.23]
Guatemala	**0.21****	**[0.05, 0.36]**	**0.18****	**[0.07, 0.30]**	0.17	[-0.06, 0.40]	0.09	[-0.02, 0.19]	0.00	[-0.09, 0.09]	0.09	[-0.02, 0.19]
Honduras	**0.32*****	**[0.25, 0.39]**	**0.34*****	**[0.29, 0.40]**	**0.31*****	**[0.23, 0.38]**	**0.39*****	**[0.34, 0.45]**	**0.30*****	**[0.25, 0.35]**	**0.38*****	**[0.33, 0.43]**
Hungary	**0.34*****	**[0.22, 0.45]**	**0.33*****	**[0.25, 0.42]**	**0.17***	**[0.00, 0.33]**	**0.34*****	**[0.24, 0.44]**	**0.22*****	**[0.12, 0.32]**	**0.30*****	**[0.22, 0.38]**
India	**0.23*****	**[0.12, 0.34]**	–	–	**0.36*****	**[0.18, 0.54]**	**0.31*****	**[0.21, 0.41]**	**0.31*****	**[0.22, 0.40]**	**0.31*****	**[0.24, 0.38]**
Indonesia	**0.32*****	**[0.21, 0.43]**	**0.23*****	**[0.15, 0.31]**	**0.35*****	**[0.19, 0.51]**	**0.28*****	**[0.19, 0.36]**	**0.16*****	**[0.09, 0.23]**	**0.30*****	**[0.22, 0.38]**
Iran	**0.23*****	**[0.16, 0.30]**	**0.32*****	**[0.26, 0.38]**	0.02	[-0.13, 0.16]	**0.36*****	**[0.30, 0.41]**	**0.19*****	**[0.13, 0.25]**	**0.35*****	**[0.29, 0.41]**
Ireland	0.24	[-0.10, 0.57]	–	–	0.25	[-0.29, 0.80]	**0.23***	**[0.01, 0.45]**	**0.27***	**[0.02, 0.52]**	**0.30***	**[0.02, 0.57]**
Israel	**0.17*****	**[0.08, 0.26]**	**0.11****	**[0.05, 0.18]**	−0.03	[-0.16, 0.10]	**0.25*****	**[0.18, 0.32]**	**0.16*****	**[0.09, 0.22]**	**0.19*****	**[0.12, 0.25]**
Italy	**0.19*****	**[0.13, 0.25]**	**0.19*****	**[0.15, 0.23]**	0.05	[-0.04, 0.13]	**0.24*****	**[0.19, 0.28]**	**0.10*****	**[0.06, 0.15]**	**0.20*****	**[0.17, 0.24]**
Japan	**0.20*****	**[0.16, 0.25]**	**0.23*****	**[0.18, 0.28]**	**0.32*****	**[0.23, 0.41]**	**0.28*****	**[0.23, 0.33]**	**0.07*****	**[0.04, 0.10]**	**0.29*****	**[0.24, 0.34]**
Kazakhstan	**0.30*****	**[0.19, 0.41]**	**0.31*****	**[0.22, 0.40]**	**0.37*****	**[0.19, 0.55]**	**0.46*****	**[0.36, 0.55]**	**0.27*****	**[0.18, 0.37]**	**0.36*****	**[0.26, 0.46]**

(*continued on next page*)

Table 3 (*continued*)

Country	Purpose in Life		Hope		Life Satisfaction		Resilient Coping		Optimism		Mindfulness	
	b	95 % CI	b	95 % CI	b	95 % CI	b	95 % CI	b	95 % CI	b	95 % CI
Kenya	**0.39*****	**[0.24, 0.54]**	–	–	**0.33***	[0.08, 0.58]	**0.31*****	**[0.19, 0.44]**	**0.21****	**[0.08, 0.34]**	**0.39*****	**[0.28, 0.51]**
Kosovo	**0.10***	**[0.01, 0.19]**	**0.10***	**[0.02, 0.18]**	0.01	[-0.15, 0.17]	**0.19*****	**[0.09, 0.28]**	**0.17*****	**[0.09, 0.26]**	**0.12*****	**[0.06, 0.19]**
Lebanon	**0.11***	**[0.02, 0.20]**	**0.11****	**[0.03, 0.18]**	**−0.21***	[-0.37, −0.05]	**0.17*****	**[0.09, 0.25]**	0.08	[-0.01, 0.16]	**0.16*****	**[0.10, 0.22]**
Lithuania	**0.11****	**[0.03, 0.19]**	**0.17*****	**[0.11, 0.23]**	0.05	[-0.07, 0.18]	**0.33*****	**[0.27, 0.39]**	**0.08****	**[0.03, 0.14]**	**0.24*****	**[0.18, 0.29]**
Macedonia	**0.19****	**[0.07, 0.31]**	–	–	0.02	[-0.21, 0.25]	**0.23*****	**[0.12, 0.34]**	**0.19*****	**[0.09, 0.29]**	**0.26*****	**[0.16, 0.35]**
Malaysia	**0.20*****	**[0.13, 0.28]**	**0.20*****	**[0.14, 0.25]**	0.01	[-0.09, 0.11]	**0.38*****	**[0.33, 0.43]**	**0.18*****	**[0.13, 0.23]**	**0.30*****	**[0.26, 0.35]**
Mexico	**0.32*****	**[0.22, 0.43]**	**0.20*****	**[0.11, 0.29]**	**0.17****	**[0.06, 0.29]**	**0.31*****	**[0.22, 0.40]**	**0.19*****	**[0.12, 0.27]**	**0.25*****	**[0.17, 0.32]**
Moldova	**0.26*****	**[0.15, 0.36]**	**0.26*****	**[0.17, 0.35]**	**0.27***	**[0.04, 0.50]**	**0.32*****	**[0.25, 0.40]**	**0.19*****	**[0.12, 0.27]**	**0.32*****	**[0.23, 0.40]**
Mongolia	**0.22*****	**[0.13, 0.30]**	–	–	0.15	[-0.02, 0.32]	**0.33*****	**[0.25, 0.41]**	**0.18*****	**[0.09, 0.27]**	**0.29*****	**[0.22, 0.36]**
Montenegro	−0.16	[-0.47, 0.15]	−0.08	[-0.27, 0.10]	−0.04	[-0.53, 0.45]	**0.17***	**[0.02, 0.33]**	0.05	[-0.15, 0.24]	0.03	[-0.12, 0.18]
Mozambique	−0.13	[-0.42, 0.15]	0.04	[-0.14, 0.22]	0.15	[-0.64, 0.93]	0.18	[0.00, 0.35]	0.10	[-0.15, 0.34]	**0.22****	**[0.07, 0.36]**
Nepal	**0.62*****	**[0.50, 0.75]**	**0.50*****	**[0.40, 0.59]**	**0.45*****	**[0.22, 0.69]**	**0.43*****	**[0.33, 0.53]**	**0.33*****	**[0.23, 0.43]**	**0.30*****	**[0.22, 0.38]**
New Zealand	0.11	[-0.02, 0.24]	**0.16*****	**[0.07, 0.25]**	0.08	[-0.13, 0.29]	**0.28*****	**[0.20, 0.37]**	**0.18*****	**[0.10, 0.27]**	**0.20*****	**[0.13, 0.27]**
Nigeria	**0.28*****	**[0.14, 0.42]**	**0.16****	**[0.07, 0.26]**	0.14	[-0.24, 0.52]	**0.26*****	**[0.14, 0.39]**	**0.15***	**[0.03, 0.26]**	**0.31*****	**[0.20, 0.41]**
Oman	**0.24*****	**[0.12, 0.37]**	–	–	0.12	[-0.11, 0.35]	**0.34*****	**[0.23, 0.45]**	**0.12***	**[0.03, 0.22]**	**0.24*****	**[0.15, 0.34]**
Pakistan	**0.44*****	**[0.36, 0.53]**	**0.42*****	**[0.35, 0.49]**	**0.34*****	**[0.20, 0.49]**	**0.54*****	**[0.47, 0.61]**	**0.36*****	**[0.28, 0.44]**	**0.41*****	**[0.34, 0.47]**
Paraguay	0.32	[-0.07, 0.72]	**0.35***	**[0.04, 0.66]**	−0.05	[-0.63, 0.52]	**0.39****	**[0.15, 0.62]**	**0.43****	**[0.15, 0.70]**	**0.56*****	**[0.30, 0.83]**
Peru	**0.26*****	**[0.16, 0.35]**	**0.36*****	**[0.28, 0.43]**	−0.03	[-0.14, 0.08]	**0.46*****	**[0.40, 0.52]**	**0.31*****	**[0.23, 0.38]**	**0.44*****	**[0.38, 0.50]**
Philippines	**0.26*****	**[0.18, 0.34]**	**0.26*****	**[0.20, 0.31]**	**0.17****	**[0.06, 0.29]**	**0.28*****	**[0.22, 0.34]**	**0.20*****	**[0.13, 0.27]**	**0.24*****	**[0.19, 0.29]**
Poland	**0.09*****	**[0.04, 0.14]**	**0.14*****	**[0.11, 0.17]**	**0.10****	**[0.04, 0.17]**	**0.20*****	**[0.16, 0.24]**	**0.06*****	**[0.03, 0.10]**	**0.22*****	**[0.19, 0.26]**
Portugal	**0.21*****	**[0.12, 0.31]**	**0.18*****	**[0.10, 0.25]**	0.09	[-0.09, 0.26]	**0.21*****	**[0.14, 0.28]**	**0.14*****	**[0.06, 0.21]**	**0.11****	**[0.04, 0.17]**
Qatar	0.13	[-0.06, 0.32]	–	–	0.05	[-0.27, 0.37]	**0.21****	**[0.08, 0.34]**	0.05	[-0.10, 0.19]	**0.23****	**[0.09, 0.38]**
Romania	**0.15*****	**[0.09, 0.21]**	**0.18*****	**[0.14, 0.22]**	0	[-0.13, 0.12]	**0.20*****	**[0.16, 0.24]**	**0.08*****	**[0.04, 0.12]**	**0.23*****	**[0.20, 0.27]**
Serbia	**0.10*****	**[0.04, 0.16]**	**0.15*****	**[0.10, 0.19]**	0.08	[-0.01, 0.17]	**0.17*****	**[0.12, 0.22]**	**0.11*****	**[0.06, 0.16]**	**0.19*****	**[0.16, 0.23]**
Singapore	**0.15****	**[0.06, 0.25]**	**0.19*****	**[0.13, 0.26]**	**0.21****	**[0.09, 0.34]**	**0.22*****	**[0.15, 0.28]**	**0.11*****	**[0.05, 0.18]**	**0.20*****	**[0.14, 0.26]**
Slovakia	**0.19*****	**[0.09, 0.30]**	**0.19*****	**[0.11, 0.27]**	**0.17****	**[0.05, 0.30]**	**0.21*****	**[0.13, 0.29]**	**0.15*****	**[0.08, 0.23]**	**0.18*****	**[0.11, 0.24]**
Slovenia	0	[-0.16, 0.16]	0.11	[-0.01, 0.22]	0.13	[-0.11, 0.37]	**0.19****	**[0.07, 0.32]**	0.11	[-0.01, 0.23]	**0.20*****	**[0.08, 0.31]**
Syria	**0.29*****	**[0.19, 0.38]**	**0.30*****	**[0.21, 0.38]**	**0.30*****	**[0.14, 0.45]**	**0.34*****	**[0.25, 0.43]**	**0.29*****	**[0.19, 0.39]**	**0.36*****	**[0.28, 0.43]**
Taiwan	**0.38*****	**[0.24, 0.52]**	**0.29*****	**[0.18, 0.40]**	**0.45*****	**[0.26, 0.65]**	**0.24*****	**[0.16, 0.33]**	**0.12****	**[0.04, 0.21]**	**0.25*****	**[0.15, 0.34]**
Thailand	**0.32*****	**[0.27, 0.37]**	**0.30*****	**[0.26, 0.35]**	0.03	[-0.04, 0.10]	**0.33*****	**[0.29, 0.37]**	**0.19*****	**[0.15, 0.24]**	**0.34*****	**[0.31, 0.38]**
Türkiye	**0.12****	**[0.04, 0.21]**	**0.15*****	**[0.09, 0.21]**	−0.08	[-0.20, 0.04]	**0.19*****	**[0.12, 0.25]**	**0.13*****	**[0.05, 0.20]**	**0.18*****	**[0.12, 0.24]**
Uganda	0.18	[-0.08, 0.43]	**0.17***	**[0.03, 0.31]**	0.35	[-0.05, 0.75]	**0.31*****	**[0.15, 0.47]**	**0.29****	**[0.12, 0.46]**	**0.27*****	**[0.14, 0.39]**
Ukraine	**0.27*****	**[0.23, 0.31]**	**0.25*****	**[0.22, 0.28]**	**0.16*****	**[0.12, 0.20]**	**0.45*****	**[0.42, 0.48]**	**0.22*****	**[0.19, 0.26]**	**0.31*****	**[0.28, 0.34]**
United Kingdom	0.04	[-0.09, 0.16]	−0.01	[-0.08, 0.07]	0.05	[-0.11, 0.22]	**0.14*****	**[0.06, 0.22]**	0.01	[-0.07, 0.09]	**0.15*****	**[0.08, 0.22]**
United States	0.04	[-0.08, 0.16]	**0.14****	**[0.04, 0.24]**	0.13	[-0.15, 0.40]	**0.19*****	**[0.09, 0.29]**	0.11	[-0.00, 0.22]	**0.21*****	**[0.13, 0.29]**
Uruguay	0.07	[-0.05, 0.19]	**0.13****	**[0.04, 0.22]**	0.27**	[0.11, 0.43]	0.08	[-0.00, 0.17]	0.04	[-0.04, 0.12]	**0.20*****	**[0.11, 0.29]**
Vietnam	**0.34*****	**[0.26, 0.42]**	**0.22*****	**[0.15, 0.28]**	**0.18*****	**[0.08, 0.28]**	**0.30*****	**[0.24, 0.36]**	**0.22*****	**[0.15, 0.29]**	**0.35*****	**[0.28, 0.42]**

(*continued on next page*)

Table 3 (*continued*)

Country	Purpose in Life		Hope		Life Satisfaction		Resilient Coping		Optimism		Mindfulness	
	b	95 % CI	b	95 % CI	b	95 % CI	b	95 % CI	b	95 % CI	b	95 % CI
Zambia	**0.26****	**[0.10, 0.42]**	**0.30*****	**[0.17, 0.42]**	**0.44***	**[0.10, 0.77]**	**0.40*****	**[0.27, 0.53]**	**0.23****	**[0.07, 0.40]**	**0.37*****	**[0.24, 0.50]**
Zimbabwe	0.12	[-0.04, 0.28]	**0.20*****	**[0.11, 0.29]**	0.18	[-0.07, 0.43]	**0.25*****	**[0.12, 0.38]**	**0.16***	**[0.04, 0.29]**	**0.35*****	**[0.25, 0.45]**
Countries with significant results	55		58		32		70		61		71	

Note. *p < .05, **p < .01, ***p < .001.

Table 4
Pre-registered mixed linear regression models.

Models 1a-f	Outcome	n	τ_{00}	ICC	95 % CI
1a	Purpose in Life	27361	0.10	0.13	[0.09, 0.17]
1b	Hope	23782	0.04	0.07	[0.05, 0.10]
1c	Life Satisfaction	20284	0.06	0.05	[0.04, 0.07]
1d	Resilient Coping	27178	0.03	0.06	[0.04, 0.08]
1e	Optimism	28642	0.07	0.14	[0.10, 0.18]
1f	Mindfulness	26355	0.03	0.07	[0.05, 0.09]

Models 2a-f	Outcome	n	b	95 % CI
2a	Purpose in Life	25385	0.21***	[0.18, 0.24]
2b	Hope	23711	0.22***	[0.19, 0.24]
2c	Life Satisfaction	19568	0.13***	[0.10, 0.17]
2d	Resilient Coping	26071	0.28***	[0.26, 0.31]
2e	Optimism	26252	0.17***	[0.15, 0.19]
2f	Mindfulness	25277	0.26***	[0.24, 0.28]

Models 3a-f	Outcome	n	b	95 % CI
3a	Purpose in Life	24328	0.21***	[0.18, 0.24]
3b	Hope	22826	0.21***	[0.19, 0.24]
3c	Life Satisfaction	18879	0.13***	[0.10, 0.16]
3d	Resilient Coping	25028	0.28***	[0.26, 0.31]
3e	Optimism	25192	0.17***	[0.15, 0.19]
3f	Mindfulness	24305	0.26***	[0.24, 0.28]

Note. *p < .05, **p < .01, ***p < .001.

to impute missing data for participants who did not provide a response to a given variable.

First, we run six unconditional intercept-only models to estimate the variability across countries, and the Intraclass Correlation Coefficient will be reported (Models 1a-1f). Then, in a second series of six models, the random slope of each outcome regressed on nature connectedness was estimated (Models 2a-2f; testing our main hypotheses). Subsequently, in a third series of six models (Models 3a-3f), we included person-level covariates (age, gender), thus determining the robustness of our analyses when controlling for demographic covariates.

3.3. Proposed exploratory analyses

A fourth and exploratory set of models allowed us to independently examine each national-level moderator (Environmental Performance Index, Inequality-Adjusted Human Development Index, and the Individualism-Collectivism index) as a predictor of both, the random intercept, and the random slope. A total of 18 models was estimated (3 country-level moderators * 6 outcomes = 18 models). Demographic covariates were included in these models (i.e., the variables specified in the third series of models). Exploratory Models 1a-1f examine our predictions concerning the national-level moderators of our hypothesized association. These results are reported in Table 5.

Table 5
Exploratory mixed linear regression models examining variation across national indexes.

Outcome	NC		IC		NC*IC	
	b	95 % CI	b	95 % CI	b	95 % CI
Purpose in Life	0.20***	[0.17, 0.22]	−0.10**	[-0.17, −0.03]	−0.05***	[-0.07, −0.03]
Hope	0.21***	[0.18, 0.23]	−0.04*	[-0.08, −0.01]	−0.03**	[-0.05, −0.01]
Life Satisfaction	0.11***	[0.08, 0.15]	0.03	[-0.03, 0.08]	0.00	[-0.04, 0.03]
Resilient Coping	0.27***	[0.25, 0.30]	−0.03	[-0.06, 0.00]	−0.04***	[-0.06, −0.02]
Optimism	0.15***	[0.14, 0.17]	−0.17***	[-0.22, −0.13]	−0.04***	[-0.05, −0.02]
Mindfulness	0.25***	[0.24, 0.27]	0.02	[-0.02, 0.05]	−0.04***	[-0.05, −0.02]
Outcome	NC		EPI		NC*EPI	
	b	95 % CI	b	95 % CI	b	95 % CI
Purpose in Life	0.21***	[0.18, 0.24]	−0.08*	[-0.14, −0.01]	−0.06***	[-0.09, −0.03]
Hope	0.21***	[0.19, 0.24]	−0.02	[-0.06, 0.02]	−0.04**	[-0.06, −0.01]
Life Satisfaction	0.13***	[0.10, 0.16]	0.03	[-0.02, 0.09]	−0.03	[-0.06, 0.00]
Resilient Coping	0.28***	[0.26, 0.31]	−0.02	[-0.05, 0.02]	−0.04***	[-0.07, −0.02]
Optimism	0.16***	[0.14, 0.18]	−0.16***	[-0.21, −0.12]	−0.04***	[-0.06, −0.02]
Mindfulness	0.26***	[0.24, 0.28]	0.03	[0.00, 0.07]	−0.03**	[-0.05, −0.01]
Outcome	NC		IHDI		NC *IHDI	
	b	95 % CI	b	95 % CI	b	95 % CI
Purpose in Life	0.21***	[0.18, 0.23]	−0.08*	[-0.15, −0.01]	−0.06***	[-0.08, −0.04]
Hope	0.21***	[0.19, 0.23]	−0.06**	[-0.09, −0.02]	−0.04***	[-0.06, −0.02]
Life Satisfaction	0.13***	[0.10, 0.16]	0.04	[-0.02, 0.09]	−0.05**	[-0.08, −0.02]
Resilient Coping	0.28***	[0.25, 0.30]	−0.04*	[-0.07, −0.01]	−0.04**	[-0.06, −0.02]
Optimism	0.16***	[0.14, 0.18]	−0.14***	[-0.19, −0.09]	−0.04***	[-0.06, −0.03]
Mindfulness	0.26***	[0.24, 0.27]	0.01	[-0.03, 0.04]	−0.04***	[-0.05, −0.02]

Note. *p < .05, **p < .01, ***p < .001. NC = Nature connectedness. IC = Individualism-Collectivism. IHDI = Inequality Adjusted Human Development Index. EPI = Environmental Performance Index.

4. Results

4.1. Measurement invariance

Data were not normally distributed, so we used Weighted Least Squares (WLSMV) for factor analyses. Some evidence for metric invariance was noted for nature connectedness, life satisfaction, and resilient coping. However, no evidence for metric invariance was observed for 4 outcomes: purpose in life, hope, mindfulness, and optimism. Subsequent removal of items that had a small effect size index and factor loadings was then utilized for these four measures. For two out of four measures this helped us observe some evidence for metric invariance (e.g., removing one item for purpose in life "My life is guided by a set of clear commitments"; and one for mindfulness "I generate few novel ideas"). However, removing problematic items for hope and optimism did not help reach metric invariance. Thus, in these cases we retained the original version of the scale and interpreted the results with caution.

4.2. Associations within each country

Before analyses, South Africa was removed from the data as participants did not respond to the NR-6 here (N = 1563). Table 3 provides detailed results for each country in the form of standardized linear regression weights for nature connectedness as a sole predictor of each outcome. Thus, standardized coefficients here provide an estimate of the correlation between the predictor and the outcome. Overall, a positive association was noted in most countries for all outcomes, except for life satisfaction, supporting our hypotheses. The magnitude ranged from small to large depending on the country, with the most consistency noted for mindfulness and resilient coping, with significant results in 70 and 71 of the 75 countries, respectively.

4.3. Analyses across countries

To examine the hypothesized associations across all countries, we conducted mixed linear regression models, with participants nested in countries (see specification in the previous section). Deviating from our preregistration, we standardized rather than centered our predictor, to ensure all associations are interpreted in a similar manner given differences in measurement. In the unconditional intercept-only models, significant between-country variability was noted, with ICCs ranging from .05 to .14 across outcomes (see Table 4). With and without adjusting for demographic covariates, nature connectedness had a significant positive association with every outcome (see Table 4).

4.4. Exploratory analyses

In the exploratory analyses, we examined the variation in these associations based on a country's culture (individualism-collectivism), environmental performance, and inequality (see Table 5 for results). Overall, the effect of nature connectedness remained statistically significant in each model for every outcome. The country-level indicators, tested each in a separate model, had associations that ranged from not statistically significant to significant and negative. Interaction terms emerged for all outcomes and each country-level moderator except for life satisfaction when the moderator was the EPI and individualism-collectivism. The overarching pattern (see Figs. 1–3) suggested that associations between nature connectedness and each outcome were stronger in more collectivist countries, countries with lower environmental performance, and countries with a lower Human Development Index.

5. Discussion

This preregistered report investigated the link between nature connectedness and multiple indicators of well-being, namely purpose in life, hope, life satisfaction, resilient coping, optimism, and mindfulness, across a multitude of countries. The hypothesis that nature connectedness would positively predict all available well-being indicators was mostly supported. Except for life satisfaction, the relationship between nature connectedness and the well-being indicators was exclusively positive in all countries, and significant in most countries. Further support for the hypothesis that nature connectedness predicts well-being internationally was found in Mixed Linear Regression models, which showed significant effects of nature connectedness on all well-being indicators, even when accounting for country of residence and personal-level variables such as age and gender.

These results are in line with previous findings on the consistent link between nature connectedness and well-being, as shown in meta-analyses of studies conducted predominantly in North America and Northern Europe (Capaldi et al., 2014; Pritchard et al., 2020). Results from this study suggest that this association is indeed a global phenomenon. Thus, policies with a global goal to strengthen the human-nature relationship, such as the Kunming-Montreal Global

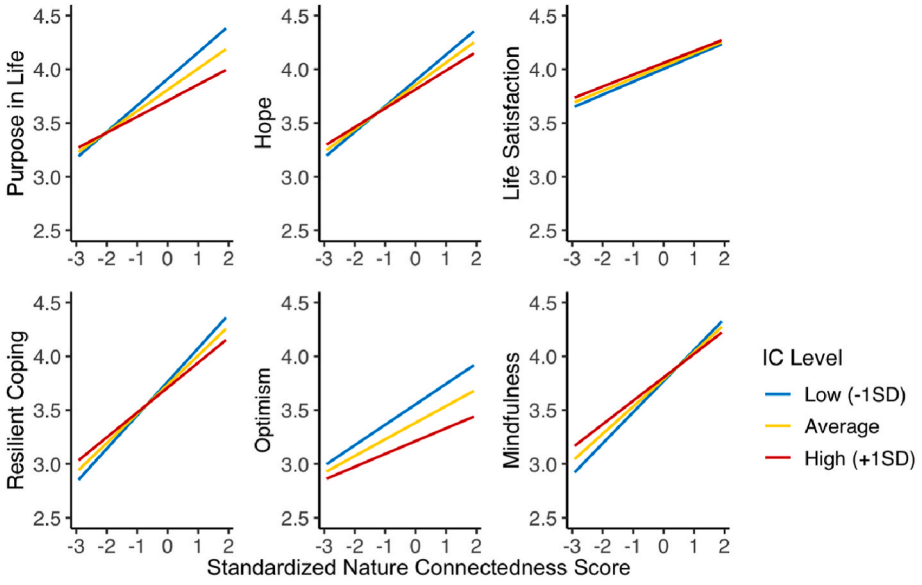


Fig. 1. Interaction Plot for Individualism-Collectivism (Higher Scores indicate Individualism).

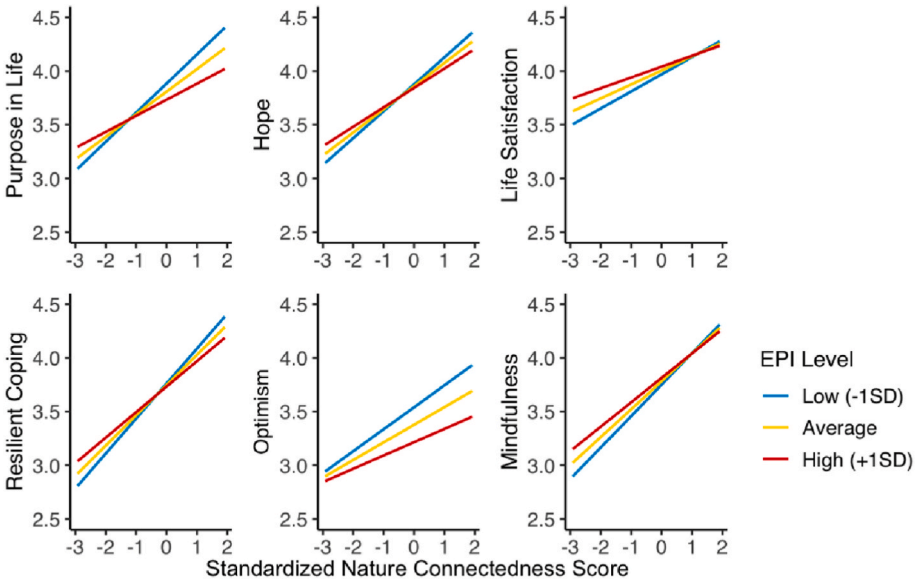


Fig. 2. Interaction plot for environmental performance index.

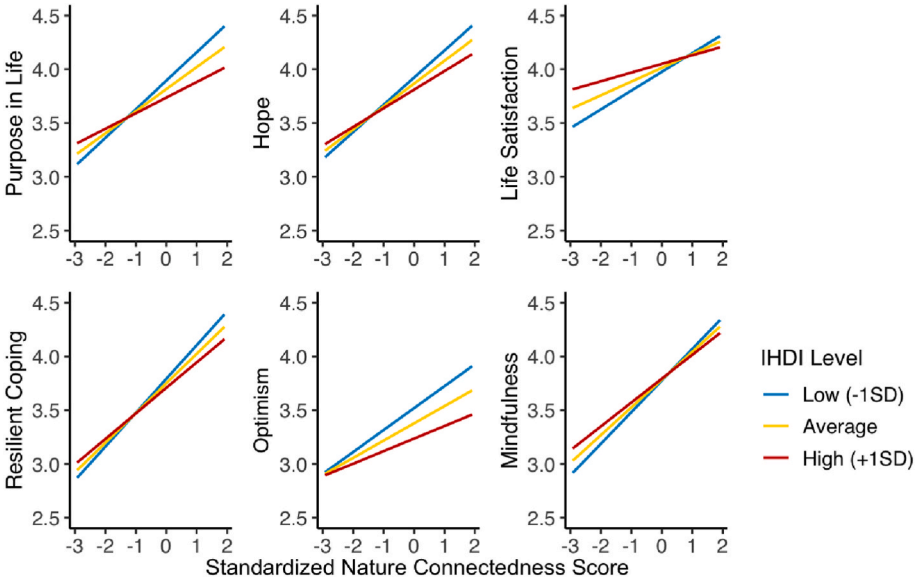


Fig. 3. Interaction plot for inequality adjusted human development index.

Biodiversity Framework (Convention on Biological Diversity, 2022), show potential to benefit people's well-being across countries and cultures.

However, our exploratory analyses highlight that the strength of the relationship between nature connectedness and well-being varies depending on certain country-level factors. Associations were more pronounced in countries with a more collectivist orientation. This finding may be explained by cultural differences in self-construal and motivational processes. According to cultural models of self (Markus & Kitayama, 1991), individuals in collectivist societies tend to define themselves through relationships and interdependence, a perspective that can extend beyond human networks to include the natural world. This relational orientation may enhance the salience and psychological rewards of feeling connected to nature. From a Self-Determination Theory perspective (Ryan & Deci, 2017), collectivist contexts may foster conditions in which nature connectedness satisfies all three basic psychological needs—autonomy, competence, and relatedness—not only through personal experiences of nature, but also through socially reinforced, communal engagement with the environment. Together, these factors may amplify the extent to which nature connectedness supports well-being in collectivist cultures.

Countries with lower human development captured in the IHDI through markers such as life expectancy and equality showed a stronger relationship between nature connectedness and well-being. The Human Development Index is considered such a strong influence on well-being, that it is often, wrongly, conflated with quality of life or well-being itself (Morse, 2023). In contrast to this conflation, in our data, highly nature-connected participants from low IHDI countries scored higher on well-being markers than highly nature connected participants from countries with high IHDI. This positions nature connectedness as an individual-level buffer against macro-level threats to well-being. Similar effects have been found in Austria, where nature visits could level out well-being differences between participants from different socio-economic groups (Fian et al., 2024). Our results regarding environmental performance of a country were similar, further strengthening the assumption that nature connectedness may act as a buffer for

macro-level factors.

The stronger association between nature connectedness and hope, purpose in life, optimism, and coping in countries with lower environmental performance may reflect the motivational and restorative functions of nature bonds under conditions of ecological threat. From an environmental identity perspective (Clayton, 2003), feeling connected to nature can anchor individuals' sense of self to environmental values, fostering a clear purpose and sense of responsibility even when ecosystems are degraded. Moreover, scarcity may intensify the perceived value of natural environments, making each interaction more emotionally salient and reinforcing collective efforts to safeguard them. Hope theory (Snyder, 2002) suggests that such bonds can sustain optimism by providing both a valued goal (environmental protection) and perceived pathways for action, thus enhancing coping. Together, these mechanisms suggest that in lower-performing environmental contexts, nature connectedness may function as a psychological resource that transforms ecological scarcity into agency and resilience.

This role of nature connectedness was further supported in our analyses: resilient coping showed one of the most consistent relationships with nature connectedness across countries. Previous research has focused on this mechanism as well, finding similar relationships (Bakir-Demir et al., 2021; Ingulli & Lindbloom, 2013; Richardson et al., 2016). Nature connectedness should be examined more thoroughly using context-specific approaches, as it may not function as a universal resilience factor. For instance, in the context of climate anxiety, nature connectedness can serve as a vulnerability factor rather than a protective one (Wullenkord et al., 2024). Efforts to strengthen individual nature connectedness may be particularly beneficial for enhancing well-being in marginalized communities that face limited access to natural environments and social resources.

Our analyses also add to the growing body of research on the interaction of mindfulness and nature. Mindfulness showed the most consistent relationship to nature connectedness across countries, with only four countries not showing a significant relationship. This finding aligns with previous investigations in predominantly WEIRD samples on the relationship between mindfulness and nature connectedness (for a meta-analysis see Schutte & Malouff, 2018). This relationship is theorized to be reciprocal, which is supported by research (Schutte & Malouff, 2018): nature-based interventions designed to cultivate nature connectedness have been shown to improve mindfulness, while mindfulness interventions can also enhance nature connectedness (Aspy & Proeve, 2017; Hamann & Ivtzan, 2017).

Mindfulness interventions also have greater effects on well-being outcomes, when combined with natural settings (Choe et al., 2020). Thus, mindfulness might play an important role in the relationship between nature connectedness and well-being. It has been suggested that especially for constrained nature experiences, mindful engagement with nature could maximise well-being outcomes by harnessing various pathways that interlink with nature connectedness and psychological restoration (Macaulay et al., 2022). Future research should focus on the specific pathways in the relationship between nature, mindfulness, and well-being to promote a thorough understanding of how these concepts interact and how interventions can effectively improve well-being. Such interventions can target the above-mentioned communities with low access to nature due to the potential of mindfulness in constrained nature experiences (Macaulay et al., 2022).

5.1. Strengths and limitations

This report has a clear strength in its overall sample size and variety of countries studied, but some limitations need to be considered. Sampling was conducted by local researchers as co-leaders and co-authors of this project, in accordance with recent guidelines on globally diverse and equitable research (Ghai et al., 2025). Deviating from these guidelines, however, opportunity sampling was used, investigating predominantly students.

Given our aim to overcome the limitations of previously WEIRD research, the skew in the sample towards highly educated populations presents a challenge. This skew affects the interpretation of results concerning human development. A country's IHDI score depends on various indicators of the overall population's education, such as average years of schooling (United Nations Development Programme, 2024). Consequently, our sample of university students may not adequately represent the general population of a country, especially in countries with low education-related indicators.

Additionally, the cross-cultural applicability of our measurements must be evaluated. Although most of the scales or their versions have undergone some degree of cross-cultural validation, these validations rarely cover all countries within our sample (e.g., Bosma et al., 2022; Ishimwe et al., 2020; Kövi et al., 2023; Swami et al., 2025; Yaghoobzadeh et al., 2019). While there is a reasonable level of confidence in the cross-cultural applicability of these scales, it is possible that one or more scales may not have been appropriate for one of the countries included in our sample. This may have contributed to issues with measurement invariance in our data. For the majority of scales, measurement invariance was supported to some extent or could be achieved by removing specific items. However, this was not the case for hope and optimism.

Finally, it is worth noting that data were collected during the COVID-19 pandemic. This event led to extraordinary circumstances around the globe which may have impacted on the well-being of our participants in ways that our analysis did not account for.

5.2. Conclusion

This registered report replicates and extends previous findings from WEIRD samples in 75 countries around the globe, demonstrating that the association between nature connectedness and well-being can be found cross-culturally. Stronger relationships between these concepts in countries scoring lower on human development and environmental performance indicate that nature connectedness may act as a resilience factor for these macro-level influences on human well-being. Conversely, stronger associations observed in collectivist countries suggest that shared identity and oneness with nature could further boost the benefits of nature connectedness. Future research should investigate this role in more detail to improve our understanding of how nature connectedness can be harnessed to improve well-being in vulnerable populations.

CRediT authorship contribution statement

Lea Barbett: Writing – review & editing, Writing – original draft, Conceptualization. **Stylianos Syropoulos:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Conceptualization. **Jin Capozzoli:** Visualization, Formal analysis. The C19 Consortium: Data Curation, Investigation, Funding Acquisition, Writing - review & editing, Methodology.

Author note

We have no known conflict of interest to disclose.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jenvp.2025.102895.

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