Happiness and Feeling Connected: The Distinct Role of Nature Relatedness

John M. Zelenski[1] and Elizabeth K. Nisbet[1]

Abstract

Subjective connection with nature, or nature relatedness, is similar to other environmental worldview measures in predicting sustainable attitudes and behaviors, yet is unique in predicting happiness. In two studies, the authors assessed the overlap between nature relatedness and other subjective connections (e.g., with friends or country) and examined these connections as a possible confound in explaining the link between nature relatedness and happiness. Study 1 adapted a measure of general connectedness and administered it to student ($n = 331$) and community ($n = 415$) samples along with multiple nature relatedness and happiness indicators. Study 2 examined more established measures of subjective connections in another community sample ($n = 204$). General connectedness predicted happiness well, yet nature relatedness remained a significant distinct predictor of many happiness indicators, even after controlling for other connections. Results support the notion that nature relatedness could be a path to human happiness and environmental sustainability, though confirming this causal direction requires additional research.

Keywords

nature relatedness, happiness, self, biophilia, environmental attitudes

[1]Carleton University, Ottawa, Ontario, Canada

Corresponding Author:
John M. Zelenski, Carleton University, 1125 Colonel By Drive, Ottawa, Ontario K1S5B6, Canada.
Email: john_zelenski@carleton.ca

Contact with nature appears to have many benefits, even when that contact is limited. For example, exposure to urban nature promotes pleasant moods (Nisbet & Zelenski, 2011b), and natural images promote prosocial aspirations and generosity (Weinstein, Przybylski, & Ryan, 2009). Nature may also restore self-control resources broadly (S. Kaplan & Berman, 2010); data suggest attention restoration (Berman, Jonides, & S. Kaplan, 2008) and reduced crime and aggression (Kuo & Sullivan 2001a, 2001b) with nature contact. Moreover, nature appears beneficial to human health (see reviews by Frumkin, 2001, and Van den Berg, 2005), potentially even reducing the mortality risk associated with income inequalities (Mitchell & Popham, 2008). These salubrious effects are often explained by drawing on Wilson's (1984) biophilia hypothesis, the idea that because humans lived (and evolved) in natural settings until recently, we have an innate need to affiliate with other forms of life. Spending time in nature fulfills this need and promotes well-being, whereas nature deprivation may contribute to maladaptive functioning (Kellert, 1997).

In addition to actual contact with nature, the personality construct of subjective connection with nature, or nature relatedness, has become increasingly useful in understanding environmentally sustainable behavior. Nature relatedness, defined as individual differences in cognitive, affective, and experiential connections with the natural environment, strongly predicts sustainable attitudes and behaviors, and this relationship holds across many assessment tools (Dutcher, Finley, Luloff, & Buttolph Johnson, 2007; Leary, Tipsord, & Tate, 2008; Markowitz, Goldberg, Ashton, & Lee, 2012; Mayer & Frantz, 2004; Nisbet, Zelenski, & Murphy, 2009; Schultz, 2002). People who feel connected to nature want to protect it. Moreover, this subjective sense of connection adds distinct predictive power; nature relatedness appears to predict environmental concern and sustainable behavior even after controlling for other attitude measures that do not include a sense of connectedness (Nisbet et al., 2009).

Nature relatedness is also unique, compared with measures of environmental attitudes, in that it predicts a variety of well-being indicators at the trait level (Cervinka, Röderer, & Hefler, 2012; Howell, Dopko, Passmore, & Buro, 2011; Mayer & Frantz, 2004; Nisbet, Zelenski, & Murphy, 2011), as well as pleasant moods when connectedness is increased via exposure to nature at the state level (Mayer, Frantz, Bruehlman-Senecal, & Dolliver, 2009; Nisbet & Zelenski, 2011b). Being an environmentalist probably does little to promote happiness on its own, but a strong sense of trait connection with nature, and perhaps the moments of nature contact that it facilitates, may promote well-being. Although it is relatively clear that nature relatedness is

positively associated with happiness, its distinct role has only been assessed with regard to (i.e., controlling for) other environmental attitude measures. Nature relatedness includes another component that overlaps with other constructs, the element of subjective connectedness. Moreover, other subjective connections (e.g., with friends, intimate partners, and even strangers) typically predict well-being and other positive outcomes (Aron, Aron, & Smollan, 1992; Leary et al., 2008; Malone, Pillow, & Osman, 2011; Waugh & Fredrickson, 2006). On one hand, these links corroborate the nature-relatedness findings; it appears that subjective connections can facilitate well-being. On the other hand, the other happiness links raise a troubling question: Does nature relatedness predict happiness because of the *nature* connectedness per se or are general feelings of connectedness simply more common among happy people? In other words, nature-relatedness measures may predict happiness solely because they confound (are associated with) other connectedness measures that are strongly related to happiness. Although there are good theoretical reasons to think that nature relatedness would have a distinct benefit (e.g., biophilia), this hypothesis has not been tested.

In addressing this research question, it is important to recognize the multifaceted nature of "happiness"; the answer may also depend on the particular operationalization of well-being. Rather than arguing for a single best definition of happiness, we view and assess it broadly. Happiness is often described with at least two components, affective and cognitive evaluations of life (Diener, 2000). That is, happy people feel good more than they feel bad and also make the judgment that things are going well. Accordingly, happiness can be assessed as average emotional experience and life satisfaction. This hedonic approach to happiness is sometimes contrasted with a eudaimonic approach. In the eudaimonic research tradition, well-being is construed more broadly than feeling good and captures adaptive personal characteristics. (The term *well-being* is also somewhat broader than happiness.) For example, Ryff (1989) created a multidimensional assessment tool that measures autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, and self-acceptance. In addition, subjective vitality, feeling alive and alert, indicates optimal functioning in the eudaimonic tradition (Ryan & Frederick, 1997). Despite some differences in what, exactly, constitutes well-being in the hedonic and eudaimonic traditions, the vast majority of measures rely on participants' subjective experiences of well-being and thus the self-report method.

Determining whether nature relatedness contributes to happiness distinctly has some potentially important implications. Noting the pleasure and other benefits of nature contact and connection, scholars have suggested

nature as a potentially powerful motivating force for environmental protection (Bragg, 1996; Conn, 1998; Feral, 1998; Kals, Schumacher, & Montada, 1999; R. Kaplan & Kaplan, 1989; Kellert, 1997; Saunders, 2003). Happiness and environmental behavior appear to be complementary goals (Brown & Kasser, 2005; Corral-Verdugo, Mireles-Acosta, Tapia-Fonllem, & Fraijo-Sing, 2011). For example, O'Brien (2008) describes "sustainable happiness" pursuits as those contributing to human well-being as well as environmental sustainability (e.g., walking and cycling are healthy for people and the planet). The nature-relatedness construct brings many of these ideas together, linking subjective connectedness with sustainable behavior and happiness. Rather than experiencing guilt or sacrifice when contemplating sustainable behaviors, people might instead develop a sense of connection with nature that promotes environmental sustainability and individual happiness (Frantz & Mayer, 2009), a "happy path to sustainability" (Nisbet & Zelenski, 2011b). Further determining that nature relatedness predicts happiness independently would add strength to the viability of this approach.

Study 1

In this study, we sought to measure differences in "general connectedness" (i.e., a subjective sense of connectedness across many domains) and then determine whether nature relatedness could be distinguished from it in predicting well-being. To this end, we assessed a variety of subjective connections (compare Leary et al., 2008) and happiness indicators in student and community samples and tested whether nature relatedness predicted happiness when controlling for other types of subjective connectedness.

Method

Participants and Procedure. Two samples were recruited for an online study on "mindful awareness and happiness." The student sample (*n* = 331) was recruited through the Psychology Department's online system, and students received course credit for participating. Community participants (*n* = 415) were recruited using advertisements on Facebook, Google, Craigslist, and websites that list web-based experiments. Community participants received a chance at a draw for US$500 for their participation. Both samples were directed to a stand-alone website where they read a consent document and then completed questionnaires.

The student sample completed the questionnaires during mid- to late November and was typical of Canadian university samples (i.e., *M* = 20.5

years; 73.1% female, 70.3% Caucasian). The community sample participated over a longer period, from February through September, and was unsurprisingly older than the student sample (*M* = 32.2 years). The community sample was similar in terms of sex ratio (79.7% female) and ethnicity (79.9% Caucasian), but 27.7% had not attended university. Finally, the community sample was located in New Zealand (36.6%), United States (27.7%), Canada (20.2%), United Kingdom (9.2%), Australia (4.8%), and elsewhere (1.4%).

Materials

Subjective connections. Nature relatedness was assessed in two ways. First was a 6-item short version of the Nature Relatedness (NR) scale (Nisbet et al., 2009). Participants rate their agreement with statements on a 1- to 5-point Likert-type scale (students α = .89, community α = .85). The short form NR-6 scale displays a similar pattern of correlations with subjective well-being and environmental variables as the full 21-item scale (Nisbet & Zelenski, 2011a). Four items assess self-identification with nature, a sense of connectedness that may be reflected in spirituality, awareness, or subjective knowledge about the environment, and feelings of oneness with nature, for example, *My relationship to nature is an important part of who I am*. Two additional items capture individual differences in the need for nature and comfort with wilderness, as well as awareness of local wildlife or nearby nature, for example, *I take notice of wildlife wherever I am*. The 6 NR items were embedded in a broader personality questionnaire (Big 5 traits) to avoid highlighting NR as a construct of particular interest. Second, Schultz's (2002) single-item Inclusion of Nature in Self (INS) asks participants to rate their connectedness with nature by choosing one of seven pairs of circles (each was labeled *me* or *nature*) that differ in their degree of overlap (compare Aron et al.'s, 1992, Inclusion of Other in Self [IOS] measure). More overlap indicates greater connectedness, and choices are assigned scores from 1 to 7.

We further adapted the logic of the inclusion measure to assess other subjective connections. That is, pairs of circles labeled with *me*,[1] and then *my country, culture, family, music, home*, and *friends* assessed these other domains. Although we may be the first to use these particular items or combination of items, Aron et al.'s (1992) IOS measure has been widely adapted and validated in similar domains. For example, Tropp and Wright (2001) validated this approach in assessing in-group identifications (e.g., with gender or ethnicity), Ersner-Hershfield, Wimmer, and Knutson (2009) have used it to study the self over time, and Leary et al. (2008) explicitly recommend adapting the IOS approach as a versatile tool that is easily modified to address to new research questions. In most analyses, we used a composite average

score across all connections (except nature) to assess general connectedness. Item intercorrelations across both samples ranged from .15 to .56 (all *p*s < .05), a combined-sample exploratory factor analysis (principle axis extraction) suggested a single-factor solution that explained 30% of variance, and the six-item connectedness composite had acceptable internal consistency (students α = .65, community α = .72).

Happiness indicators. The four-item Subjective Happiness Scale (SHS; Lyubomirsky & Lepper, 1999; students α = .86, community α = .88) and the five-item Satisfaction With Life Scale (SWLS; Diener, Emmons, Larsen, & Griffin, 1985; students α = .86, community α = .90) asked participants to indicate their happiness and satisfaction on Likert-type scales.

An adapted version of the Positive and Negative Affect Schedule (PANAS) (Watson, Clark, & Tellegen, 1988) contained the standard 10-item Positive Affect (students α = .87, community α = .91) and Negative Affect (students α = .86, community α = .88) scales where trait affect terms were rated on a 5-point Likert-type scale. In addition, we added three items as an ad hoc scale to capture additional pleasant affects distilled from previous theory and research on nature and emotions (*in awe, fascinated, curious*; students α = .64, community α = .79).

To assess well-being from a more eudaimonic perspective, we administered the six-item Vitality Scale (individual difference level version, Ryan & Frederick, 1997; students α = .88, community α = .93) and nine-item versions of the Autonomy (students α = .78, community α = .81), Personal Growth (students α = .77, community α = .81), and Purpose (students α = .80, community α = .83) scales from Ryff's (1989) Psychological Well-Being Inventory (PWBI). Both used 7-point Likert-type response scales. These three (of six) PWBI scales were selected because they correlated with nature relatedness in past research (Nisbet et al., 2011).

Finally, the 20-item Centre for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977) assessed ill-being with 4-point Likert-type rating scales of depression symptoms. Unlike the trait instructions used for all other measures, the CES-D asked participants to consider only the last week (students α = .71, community α = .78).

Results

As expected, the two nature-relatedness indicators correlated strongly with one another (*r* = .66 student sample, *r* = .64 community sample). The INS was also moderately associated with the similarly formatted connectedness composite (*r* = .38 students, *r* = .51 community), whereas the NR scale was considerably less so (*r* = .07 students, *r* = .23 community).

Table 1. Happiness and Connectedness Correlations in the Student Sample—Study 1 (*n* = 331).

Scale	α	Connection composite	INS	Partial *r* INS	NR	Partial *r* NR
SHS	.86	.36***	.26***	.14*	.12*	.13*
SWLS	.86	.31***	.24***	.13*	.15**	.15**
PA	.87	.38***	.26***	.13*	.16**	.16**
NA	.86	−.20***	−.11*	−.03	−.02	−.01
Nature PA	.64	.17**	.24***	.19***	.24***	.23***
Vitality	.88	.42***	.28***	.14*	.11*	.09
PWB Autonomy	.78	.13*	.17**	.13*	.11*	.10
PWB Growth	.77	.18***	.31***	.26***	.30***	.29***
PWB Purpose	.80	.25***	.18***	.09	.12*	.10
CES-D	.71	−.19***	−.05	.03	.02	.02

Note: SHS = Subjective Happiness Scale; SWLS = Satisfaction With Life Scale; PA = Positive Affect; NA = Negative Affect; Nature PA = Nature Positive Affects; PWB = Psychological Well-Being; CES-D = Center for Epidemiological Studies Depression Scale; INS = Inclusion of Nature in Self; NR = Nature Relatedness Scale.
*p < .05. **p < .01. ***p < .001.

Tables 1 and 2 contain the correlations between happiness indicators, our general-connectedness composite, and nature-relatedness measures for student and community samples, respectively. Consistent with expectations, the connectedness composite correlated significantly with all happiness indicators in both samples (*r*s from .13 to .46). (Individual connectedness items often correlated with happiness indicators too.) The nature-relatedness measures (NR and INS) were also significantly correlated with most happiness indicators, though often not quite as strongly as the connectedness composite (significant *r*s from .11 to .42), particularly in the student sample. To test our primary research question—whether the link between nature relatedness and happiness is independent of a generally connected personality—we computed partial correlations between the nature relatedness and happiness indicators, controlling for the general-connectedness composite (see Tables 1 and 2). Although correlations were clearly attenuated with the control, most of the relationships between nature relatedness and happiness remained significant. Across the various happiness scales, personal growth and pleasant emotions were most strongly correlated with nature relatedness, whereas the negative indicators (depression and negative affect) were less consistently related to nature relatedness, especially after controlling for general connectedness.[2]

Table 2. Happiness and Connectedness Correlations in the Community Sample—Study 1 (*n* = 415).

Scale	α	Connection composite	INS	Partial *r* INS	NR	Partial *r* NR
SHS	.88	.46***	.34***	.14**	.19***	.11*
SWLS	.90	.44***	.34***	.15**	.16**	.07
PA	.91	.43***	.42***	.26***	.29***	.22***
NA	.88	−.25***	−.16***	−.05	−.07	−.02
Nature PA	.79	.28***	.37***	.28***	.33***	.28***
Vitality	.93	.44***	.38***	.20***	.27***	.20***
PWB Autonomy	.81	.25***	.27***	.17***	.25***	.19***
PWB Growth	.81	.30***	.36***	.26***	.34***	.29***
PWB Purpose	.83	.36***	.26***	.11*	.21***	.14**
CES-D	.78	−.29***	−.16***	−.02	−.03	.03

Note: SHS = Subjective Happiness Scale; SWLS = Satisfaction With Life Scale; PA = Positive Affect; NA = Negative Affect; Nature PA = Nature Positive Affects; PWB = Psychological Well-Being; CES-D = Center for Epidemiological Studies Depression Scale; INS = Inclusion of Nature in Self; NR = Nature Relatedness Scale.
*p < .05. **p < .01. ***p < .001.

Although not reported in detail here, we also took a regression approach to these data by simultaneously entering individual connectedness items in equations predicting happiness indicators (R^2s ranged from .06 to .29).[3] Across these equations, the nature connectedness item (INS) was one of the better predictors (though not for the negative indicators, similar to the correlations). Friend, family, and home connectedness also independently predicted happiness in most equations, whereas country, culture, and music were only rarely significant. Finally, a virtually identical pattern emerged when the NR scale was entered in place of the single nature connectedness item.

Discussion

The primary goal of this study was to determine whether the association between nature relatedness and happiness is due to a general sense of connectedness or a more specific link with nature. We replicated previous research showing that subjective connectedness (with nature, as well as family, friends, country, etc.) predicts happiness. Importantly, however, nature relatedness remained a significant predictor of most happiness indicators

even when controlling for a variety of other connections. Despite some variation, this pattern generally held across two assessment tools (NR and INS), two samples (students and community), and a variety of happiness indicators. These results suggest that nature relatedness has a distinct happiness benefit; that is, it becomes difficult to dismiss the link as spurious due to content overlap with more established or intuitive subjective connections (e.g., social or cultural ties).

Although the relationship between nature relatedness and happiness was fairly robust, variation across samples and indicators deserves some comment. First, the happiness correlations tended to be stronger in the community sample for general connectedness and nature relatedness. It is not clear which specific difference(s) between the samples accounts for this. The most obvious, age, seems unlikely given that very little changes when it is controlled in analyses. The smaller correlations between nature relatedness and happiness could be due to the fact that students were sampled on the cusp of Canadian winter where opportunities to actually connect with nature are more restricted, or perhaps less pleasant, than during milder weather; highly nature-related people might be less happy than usual because they are more nature deprived (e.g., outdoor life is less abundant; see the biophilia hypothesis). However, this does not easily account for why the general-connectedness correlations with happiness were also stronger in the community sample.

Both nature relatedness measures correlated with most well-being indicators, but not with the ill-being indicators, suggesting that nature relatedness may play a more beneficial, rather than buffering, role in happiness. In addition, the two nature-relatedness measures had slightly different patterns when comparing the zero-order correlations to the partial correlations. That is, the INS had somewhat larger zero-order correlations, but the correlations were also more attenuated when controlling for general connectedness. This is probably due to the fact that the INS is assessed more similarly to the connectedness composite (both use the "circles" format), compared with the NR scale, yet there are a few ways to interpret the finding. Perhaps the assessment method inflates the INS zero-order correlations with happiness indicators because it taps variance due to other connections, and thus, the NR scale better approximates the actual correlation. Alternatively, the connectedness composite control could be viewed as overly conservative in that any validly overlapping variance is removed. This is also important to keep in mind when interpreting the magnitude of the partial correlations. Although the size is relatively small, it is nonetheless impressive that nature connectedness remained an independent predictor when controlling for so many other powerful connections (e.g., social bonds are among the best predictors of

happiness; Diener & Seligman, 2002; Ryff, 1989). Regression analyses further supported this idea as nature relatedness predicted many well-being indicators simultaneously with, or even better than, other connections.

Study 2

To extend the findings of Study 1, we took a slightly different approach to assessing subjective connectedness in a second study. That is, we sought other widely used and well-validated measures that assess various connections. Many of these were interpersonal in nature (e.g., attachment, loneliness, belongingness), but others assessed slightly broader connections to cultural groups (e.g., collective identity, interdependent-self). We were minimally interested in these particular connectedness constructs per se but rather in determining their overlap with nature relatedness, especially in terms of predicting happiness. In addition, we assessed nature relatedness more comprehensively in Study 2, using the full 21-item questionnaire. This allows examination of three subscales that capture slightly different aspects of nature relatedness (see Nisbet et al., 2009). Thus, the primary goals of Study 2 were to provide a conceptual replication of Study 1 and to develop a more nuanced view of the relationship between nature relatedness (subscales) and well-being.

Method

Participants and Procedure. Participants were recruited via Amazon Mechanical Turk, a web portal that matches "workers" with small online tasks completed for monetary compensation (see mturk.com). Mturk samples are slightly more representative of the U.S. population than other Internet or convenience samples, and they produce data that are similarly reliable (Buhrmester, Kwang, & Gosling, 2011). This study was advertised as a study on personality and well-being that would involve completing online questionnaires for approximately 20 min and compensation of US$0.65. Participants were directed to surveymonkey.com (the site used to administer the survey) and saw an informed consent document describing the study. After indicating consent, they completed questionnaires in a counterbalanced order (i.e., with well-being and connectedness questionnaires blocked and then presented first or second;[4] the order of measures within blocks corresponds to the order of materials listed below).

Seemingly complete data from 226 participants were scrutinized for careless, string, or noncontent responding, and we retained a sample of 204 for

analyses. The excluded data were mainly from participants who failed to leave a questionnaire item blank, despite being explicitly instructed to do so. This simple criterion identified people who completed the survey in impossibly short periods of time, and the excluded group showed other evidence of careless responding (e.g., very low internal consistencies and significant mean differences from the rest of the sample—particularly on scales with means further from the midpoint or that had many reversed items).

Participation was limited to U.S. residents at least 18 years of age (via mturk settings). Other demographic information was self-reported with a categorical format and indicated a sample that was 60% female, and an age range of at least 20 to 75 with mean and mode in the 25 to 34 range. Furthermore, 80% were Caucasian; education ranged from 11% having high school only, 73% with some college or university degree (33% completed a bachelor's), and 15% with advanced degrees. Finally, participants varied in employment status with 52% employed, 15% unemployed, 9% students, 16% homemakers, and 5% retired.[5]

Materials

Happiness indicators. Well-being questionnaires were the same as in Study 1, but with the CES-D omitted. Participants completed them in the following order: PANAS (Positive Affect α = .93, Negative Affect α = .88, Nature Positive Affects α = .80), SWLS (α = .93), SHS (α = .94), PWBI (Autonomy α = .84, Personal Growth α = .84, Purpose α = .84, and Vitality α = .95)

Connectedness indicators. A variety of established questionnaires assessing subjective connections were combined to form a composite. These were the following:

The nine-item Attachment Styles Questionnaire (Hazan & Shaver, 1987) contains three statements that correspond to each of the three attachment styles: secure, avoidant, and anxious/ambivalent. Participants rate each (e.g., *I find it easy to get close to others*) as *mostly true* or *mostly false*. Although three scales are typically scored, our interest in general sense of connection (rather than specific varieties of disconnection) led us to create a single scale of healthy attachment with secure items scored positively and others negatively (α = .69). (Scoring scales separately did not improve internal consistency; αs were .46, .62, and .52, respectively.)

The Self Construal Scales (Singelis, 1994) include an interdependent self scale (α = .82) that assesses the extent to which people view themselves as part of a broader social context. It is often contrasted with an independent, more autonomous sense of self (which is assessed on another scale omitted from this study). The scale asks participants to rate agreement with statements

representing interdependence on a 7-point scale, for example, *My happiness depends on the happiness of those around me*.

An eight-item short form of the University of California, Los Angeles (UCLA) Loneliness Scale (see Hays & DiMatteo, 1987) asks participants to rate the frequency of various statements (e.g., *I feel isolated from others*) on a 4-point scale from *never* to *always*. Because loneliness indicates subjective social disconnection, we reverse scored the entire scale before combining with others ($\alpha = .89$).

The 12-item General Belongingness Scale (Malone et al., 2011) assesses people's subjective sense of belonging with other people broadly (friends, strangers, family; $\alpha = .95$). Participants use a 7-point scale of agreement to rate statements such as, *I feel connected with others.*

The Aspects of Identity questionnaire (version IIIx; Cheek, Smith, & Tropp, 2002; see http://www.wellesley.edu/Psychology/Cheek/identity.html) includes an eight-item Collective Identity Scale that assesses subjective connectedness with a variety of social identities, for example, family, ethnicity, religion, community, political activities, language, and so forth ($\alpha = .77$). Participants rate items (paraphrased above) on a 5-point scale to indicate how important each is to *my sense of who I am*. (We administered, but do not consider, other items that deal more with personal identity, for example, possessions, emotions, career, etc.)

To create our general-connectedness composite, we standardized scores on each scale and computed a mean. The composite included the scale scores of healthy attachment, interdependent-self, loneliness (reversed), general belongingness, and collective identity. This five-item composite had acceptable internal consistency ($\alpha = .72$). Exploratory factor analysis (principle axis extraction) revealed a single-factor solution that explained 46% of the variance. (Using an "eigenvalue > 1" decision rule, one might extract two factors [2.59, 1.22, .70], with the second explaining an additional 13% variance. Nonetheless, we view the exploratory factor analysis as largely supporting our more conceptually based decision to create a single composite of general connectedness due to the large first factor.)

Nature relatedness was assessed with the full 21-item scale (Nisbet et al., 2009). As opposed to the 6-item short version used in Study 1, the full version ($\alpha = .90$) contains three subscales that assess slightly different aspects of subjective connectedness with nature. NR-Self (8 items; $\alpha = .89$) reflects an identity intertwined with nature (e.g., *I am not separate from nature, but a part of nature*); NR-Perspective (7 items; $\alpha = .73$) connotes a view that humans have limited rights to interfere with or harm nature (e.g., *I think a lot about the suffering of animals*); and NR-Experience (6 items; $\alpha = .79$) indicates a desire to

Table 3. Correlations Between Nature Relatedness and General Connectedness Scales—Study 2 (*n* = 204).

Scale	NR-Self	NR-Perspective	NR-Experience	NR-6
Attachment	.08	−.05	.03	.07
Interdependence	.02	.06	−.05	.04
Loneliness	−.04	.12	−.12	−.04
Belongingness	.07	−.03	.06	.05
Collective identity	.13	−.11	.04	.17*
Composite	.10	−.07	.06	.11

Note: NR = Nature Relatedness scale.
Correlations of .12 marginally significant at *p*<.10. Composite refers to the average of other (standardized) scales.
*p < .05 (two-tailed).

physically connect with nature (e.g*., I enjoy being outdoors even in unpleasant weather*). For comparison with Study 1, we also scored the short NR-6 scale (α = .85), which includes 4 NR-Self and 2 NR-Experience items.

Results

The main goal of this research was to assess the potential overlap between nature relatedness and other subjective connections, especially with regard to predicting happiness. To this end, we first correlated nature-relatedness subscales with the other connectedness measures and their composite (see Table 3). Although the connectedness measures were strongly intercorrelated (see the factor analysis), the correlations with nature relatedness were all nonsignificant except for one (NR-6 and collective identity, *r* = .17). Somewhat surprisingly, nature relatedness appears largely distinct from these other connections.

Table 4 presents the correlations with happiness. Unsurprising, the connectedness composite was clearly related to happiness indicators (except autonomy), though with some variation in strength, ranging from *r* = .67 for vitality to *r* = .25 for personal growth. Nature relatedness again predicted happiness, but the different subscales revealed some nuances in this relationship. In general, the NR-Self and NR-Experience scales predicted higher happiness (though not ubiquitously), whereas the NR-Perspective scale sometimes predicted *un*happiness (e.g., low subjective happiness, life satisfaction, vitality, and high negative affect). It is also worth noting that some of the predicted relationships

Table 4. Happiness and Connectedness Correlations—Study 2 (*n* = 204).

Scale	Composite	NR-Self	Partial NR-Self	Partial NR-Perspective	NR-Perspective	NR-Experience	Partial NR-Experience	NR-6	Partial NR-6
SHS	.66***	.09	.03	−.14*	−.13	.12	.11	.11	.05
SWLS	.58***	.04	−.02	−.22**	−.24***	.11	.10	.09	.04
PA	.56***	.19**	.16*	−.01	.04	.19**	.20**	.21**	.18**
NA	−.41***	.07	.12	.24***	.23***	.10	.13	.11	.16*
Nat-PA	.26***	.26***	.24***	.08	.10	.23***	.22**	.25***	.23***
Vitality	.67***	.16*	.14*	−.17*	−.14	.17*	.19**	.17*	.14*
Aut	.10	.12	.11	−.01	.01	.13	.12	.06	.05
Growth	.25***	.32***	.31***	.21**	.24***	.17*	.17*	.20**	.18*
Purp	.44***	.12	.09	−.01	.05	.01	−.01	.03	−.01

Note: SHS = Subjective Happiness Scale; SWLS = Satisfaction With Life Scale; PA = Positive Affect; NA = Negative Affect; Nat-PA = Nature Positive Affects; Aut = Autonomy (PWBI); Growth = Personal Growth (PWBI); Purp = Purpose (PWBI); NR = Nature Relatedness Scale. Correlations of .12 marginally significant at *p* < .10.
*p < .05. ***p* < .01. ****p* < .001 (two-tailed).

between happiness and nature relatedness found in Study 1 (and previous research) did not replicate in this study. NR-Self and NR-Experience predicted positive affects, vitality, and personal growth but were not significant predictors of subjective happiness, life satisfaction, autonomy, or purpose.

Table 4 also presents partial correlations between nature relatedness and happiness controlling for the connectedness composite. Given that the composite was not significantly correlated with nature relatedness, it is unsurprising that controlling for it had little impact on the correlations between nature relatedness and happiness. That is, where nature relatedness predicted happiness, controlling for general connectedness did not alter the relationship.

Discussion

We conducted Study 2 to further explore the link between nature relatedness and other subjective connections and to further test the hypothesis that nature relatedness predicts happiness distinctly, that is, even after accounting for a more general sense of connection. Although not every link between nature relatedness and happiness replicated in Study 2, the general pattern of findings leads to similar conclusions. That is, nature relatedness appeared distinct from other important connections, and nature relatedness predicted happiness independently of other subjective connections.

Despite overall corroborative results, a number of unexpected findings emerged in Study 2. First, it was surprising how distinct nature relatedness was from other subjective connections. In Study 1, with different assessment techniques, we observed modest relationships among connections, including nature. The connectedness measures used in Study 2 shared less method variance (i.e., the "circles" format and specific response scales), potentially explaining the weaker relationships. The various individual non-nature-connectedness measures were strongly interrelated, and predicted happiness very well, suggesting strong validity. Thus, the null relationships with nature relatedness may be informative; it appears this particular form of connectedness may indeed be distinct from others, at least the range of social connections assessed in Study 2 such as belongingness, interdependence, and healthy attachment.

Perhaps most surprising was the null and even negative relationships between facets of nature relatedness and some happiness indicators. The null relationships are most difficult to explain. It may be that this U.S. sample construed at least one of the well-being measures differently than other samples; autonomy was unrelated to all measures of connectedness. (That connection and autonomy would be positive related perhaps sounds odd on the surface but is consistent with theory and previous work, for example, even Study 1.) Previous research has also produced some variation in which particular nature relatedness and well-being constructs are linked (see Howell et al., 2011). For example, life satisfaction was correlated with nature relatedness in Study 1 and Mayer and Frantz (2004) but not in Study 2 or Nisbet et al. (2011). Thus, although there is considerable support for the general idea that nature relatedness is linked with happiness, future research is needed to resolve discrepancies in the data. Such work might consider moderators of the relationship like local nature or climate, season, demographic or other personality characteristics, and so forth. Given that the correlations between nature relatedness and some happiness indicators are relatively small, some of the variation may also be due to random error (i.e., a small true correlation that is statistically significant in only some studies due to unreliability in estimates of the association).

Study 2's results provide some guidance in disentangling how various operationalizations of nature relatedness and happiness are linked. By using the full NR scale and its facets, we discovered some substantial divergences in the relationships with happiness. Most strikingly, NR-Perspective significantly predicted ill-being on some indicators. Although we believe this is the first negative relationship reported in the literature, there are some previous hints that are consistent with this finding. The perspective subscale is most

clearly linked to strong (and sometimes pessimistic) environmental attitudes. Moreover, Nisbet et al. (2011) found that controlling for environmental attitudes actually increased (or made significant) the relationship between nature relatedness (full scale) and some happiness indicators. Thus, although environmental attitudes are not strongly linked with happiness, there may be a subtle negative relationship. A sense of connectedness with nature might facilitate happiness and sustainable attitudes, but an interest in protecting the environment *without* that sense of connection may actually hinder well-being. In other words, the benefits of connectedness may buffer the distress that could accompany awareness of environmental crises. This might also help explain why other connections predicted happiness more strongly and consistently than nature relatedness. By analogy, a strong connection with someone who is very ill might also be distressing.

General Discussion

In sum, despite a few unexpected findings, nature relatedness remained a significant predictor of happiness (particularly positive affects) even after controlling for other subjective connections across two studies. Such findings suggest that nature relatedness is distinct in producing happiness benefits and bolsters previous suggestions that sustainable behavior and happiness might be simultaneously increased if nature relatedness were facilitated. This, of course, assumes that nature relatedness can cause happiness. Although experimental manipulations with actual nature at the state level (Mayer et al., 2009; Nisbet & Zelenski, 2011b) and longitudinal studies of trait nature relatedness changes (Nisbet et al., 2011) support this causal direction, it is also possible that happiness causes feelings of connectedness or nature relatedness. The cross-sectional design of this study clearly limits causal inferences, and a bidirectional relationship seems plausible. Nonetheless, to the extent that nature relatedness can cause happiness, it might be an important tool in promoting environmentally sustainable behavior. That is, some people might be more persuaded to protect the natural environment by understanding how connecting with nature can contribute to their personal well-being. By spending more time enjoying and connecting with nature, their motivation to protect it might again increase, ultimately supporting a cycle with benefits for people and the environment. Because this study suggests that the nature relatedness link with happiness is genuine (i.e., not accounted for by assessment artifacts or general trait connectedness), it helps further distinguish the construct from

other proenvironmental attitudes (that are typically unrelated to happiness). Thus, this research ultimately supports the idea that cultivating nature relatedness could provide a unique route to increasing human happiness and environmentally sustainable behavior, though further research is clearly needed to confirm these suggestions.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interests with respect to the authorship and/or publication of this article.

Funding

Notes

1. The INS and IOS more commonly use "self," but we changed this to "me" (for all measures) because it seemed to capture the original idea while also "sounding better" with our new items.
2. All correlation and partial correlation analyses were also conducted with age as an additional control, but this had virtually no effect on their magnitude.
3. Regression analyses and additional correlations available online at: http://carleton.ca/~jzelensk/connections_supp.pdf
4. Order had no impact on the results and was omitted from analyses reported here.
5. Across demographic categories, percentages may not add to 100 due to rounding, missing data, or small categories not explicitly mentioned.

References

Aron, A., Aron, E. N., & Smollan, D. (1992). Inclusion of other in the self scale and the structure of interpersonal closeness. *Journal of Personality and Social Psychology, 63*, 596-612.

Berman, M. G., Jonides, J., & Kaplan, S. (2008). The cognitive benefits of interacting with nature. *Psychological Science, 19*, 1207-1212.

Bragg, E. A. (1996). Towards ecological self: Deep ecology meets constructionist self-theory. *Journal of Environmental Psychology, 16*, 93-108.

Brown, K. W., & Kasser, T. (2005). Are psychological and ecological well-being compatible? The role of values, mindfulness and lifestyle. *Social Indicators Research, 74*, 349-368.

Buhrmester, M., Kwang, T., & Gosling, S. D. (2011). Amazon's mechanical turk: A new source of inexpensive, yet high-quality data? *Perspectives on Psychological Science, 6*, 3-5.

Cervinka, R., Röderer, K., & Hefler, E. (2012). Are nature lovers happy? On various indicators of well-being and connectedness with nature. *Journal of Health Psychology, 17*, 379-388.

Cheek, J. M., Smith, S. M., & Tropp, L. R. (2002, February). *Relational identity orientation: A fourth scale for the AIQ.* Paper presented at the meeting of the Society for Personality and Social Psychology, Savannah, GA.

Conn, S. (1998). Living in the earth: Ecopsychology, health and psychotherapy. *Humanistic Psychologist, 26*, 179-198.

Corral-Verdugo, V., Mireles-Acosta, J., Tapia-Fonllem, C., & Fraijo-Sing, B. (2011). Happiness as a correlate of sustainable behavior: A study of pro-ecological, frugal, equitable and altruistic actions that promote subjective wellbeing. *Human Ecology Review, 18*, 95-104.

Diener, E. (2000). Subjective well-being: The science of happiness and a proposal for a national indicator. *American Psychologist, 55*, 34-43.

Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The satisfaction with life scale. *Journal of Personality Assessment, 49*, 71-75.

Diener, E., & Seligman, M. E. P. (2002). Very happy people. *Psychological Science, 13*, 81-84.

Dutcher, D. D., Finley, J. C., Luloff, A. E., & Buttolph Johnson, J. (2007). Connectivity with nature as a measure of environmental values. *Environment and Behavior, 39*, 474-493.

Ersner-Hershfield, H., Wimmer, G., & Knutson, B. (2009). Saving for the future self: Neural measures of future self-continuity predict temporal discounting. *Social Cognitive and Affective Neuroscience, 4*, 85-92.

Feral, C. H. (1998). The connectedness model and optimal development: Is ecopsychology the answer to emotional well-being? *Humanistic Psychologist, 26*, 243-274.

Frantz, C. M., & Mayer, F. S. (2009). The emergency of climate change: Why are we failing to take action? *Analyses of Social Issues and Public Policy, 9*, 205-222.

Frumkin, H. (2001). Beyond toxicity: Human health and the natural environment. *American Journal of Preventive Medicine, 20*, 234-240.

Hays, R. D., & DiMatteo, M. R. (1987). A short-form measure of loneliness. *Journal of Personality Assessment, 51*, 69-81.

Hazan, C., & Shaver, P. (1987). Romantic love conceptualized as an attachment process. *Journal of Personality and Social Psychology, 52*, 511-524.

Howell, A. J., Dopko, R. L., Passmore, H., & Buro, K. (2011). Nature connectedness: Associations with well-being and mindfulness. *Personality and Individual Differences, 51*, 166-171.

Kals, E., Schumacher, D., & Montada, L. (1999). Emotional affinity toward nature as a motivational basis to protect nature. *Environment and Behavior, 31*, 178-202.

Kaplan, R., & Kaplan, S. (1989). *The experience of nature: A psychological perspective*. Cambridge, MA: Cambridge University Press.

Kaplan, S., & Berman, M. G. (2010). Directed attention as a common resource for executive functioning and self-regulation. *Perspectives on Psychological Science, 5*, 43-57.

Kellert, S. R. (1997). *Kinship to mastery: Biophilia in human evolution and development*. Washington, DC: Island Press.

Kuo, F. E., & Sullivan, W. C. (2001a). Aggression and violence in the inner city: Effects of environment via mental fatigue. *Environment and Behavior, 33*, 543-571.

Kuo, F. E., & Sullivan, W. C. (2001b). Environment and crime in the inner city: Does vegetation reduce crime? *Environment and Behavior, 33*, 343-367.

Leary, M. R., Tipsord, J. M., & Tate, E. B. (2008). Allo-inclusive identity: Incorporating the social and natural worlds into one's sense of self. In H. Wayment & J. Bauer (Eds.), *Transcending self-interest: Psychological explorations of the quiet ego* (pp. 137-147). Washington, DC: American Psychological Association.

Lyubomirsky, S., & Lepper, H. S. (1999). A measure of subjective happiness: Preliminary reliability and construct validation. *Social Indicators Research, 46*, 137-155.

Malone, G. P., Pillow, D. R., & Osman, A. (2011). The General Belongingness Scale (GBS): Assessing achieved belongingness. *Personality and Individual Differences, 52*, 311-316.

Markowitz, E. M., Goldberg, L. R., Ashton, M. C., & Lee, K. (2012). Profiling the "pro-environmental individual": A personality perspective. *Journal of Personality, 80*, 81-111.

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

Mayer, S. F., Frantz, C. M., Bruehlman-Senecal, E., & Dolliver, K. (2009). Why is nature beneficial? The role of connectedness to nature. *Environment and Behavior, 41*, 607-643.

Mitchell, R., & Popham, F. (2008). Effect of exposure to natural environment on health inequalities: An observational population study. *Lancet, 372*, 1655-1660.

Nisbet, E. K., & Zelenski, J. M. (2011a, June). *Bridging sustainability and well-being with the NR-6, a brief new measure of nature relatedness*. Paper presented

at the 72nd Annual Convention of Canadian Psychological Association, Toronto, Ontario, Canada.

Nisbet, E. K., & Zelenski, J. M. (2011b). Underestimating nearby nature: Affective forecasting errors obscure the happy path to sustainability. *Psychological Science, 22*, 1101-1106.

Nisbet, E. K., Zelenski, J. M., & Murphy, S. A. (2009). The nature relatedness scale: Linking individuals' connection with nature to environmental concern and behavior. *Environment and Behavior, 41*, 715-740.

Nisbet, E. K., Zelenski, J. M., & Murphy, S. A. (2011). Happiness is in our nature: Exploring nature relatedness as a contributor to subjective well-being. *Journal of Happiness Studies, 13*, 303-322.

O'Brien, C. (2008). Sustainable happiness: How happiness studies can contribute to a more sustainable future. *Canadian Psychology, 49*, 289-295.

Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement, 1*, 385-401.

Ryan, R. M., & Frederick, C. (1997). On energy, personality, and health: Subjective vitality as a dynamic reflection of well-being. *Journal of Personality, 65*, 528-565.

Ryff, C. D. (1989). Happiness is everything, or is it? Explorations on the meaning of psychological well-being. *Journal of Personality and Social Psychology, 57*, 1069-1081.

Saunders, C. D. (2003). The emerging field of conservation psychology. *Human Ecology Review, 10*, 137-149.

Schultz, P. W. (2002). Inclusion with nature: The psychology of human-nature relations. In P. Schmuck & W. P. Schultz (Eds.), *Psychology of sustainable development* (pp. 62-78). Norwell, MA: Kluwer.

Singelis, T. M. (1994). The measurement of independent and interdependent self-construals. *Personality and Social Psychology Bulletin, 20*, 580-591.

Tropp, L. R., & Wright, S. C. (2001). Ingroup identification as inclusion of ingroup in the self. *Personality and Social Psychology Bulletin, 27*, 585-600.

Van den Berg, A. E. (2005). *Health impacts of healing environments: A review of evidence for benefits of nature, daylight, fresh air, and quiet in healthcare settings*. Groningen, Netherlands: Foundation 200 years University Hospital Groningen.

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS Scales. *Journal of Personality and Social Psychology, 54*, 1063-1070.

Waugh, C. E., & Fredrickson, B. L. (2006). Nice to know you: Positive emotions, self-other overlap, and complex understanding in the formation of new relationships. *Journal of Positive Psychology, 1*, 93-106.

Weinstein, N., Przybylski, A. K., & Ryan, R. M. (2009). Can nature make us more caring? Effects of immersion in nature on intrinsic aspirations and generosity. *Personality and Social Psychology Bulletin, 35*, 1315-1329.

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

Author Biographies

John M. Zelenski is an associate professor of psychology at Carleton University in Ottawa, Canada. He studies individual differences in happiness and the causes and consequences of social and environmentally sustainable behaviors.

Elizabeth K. Nisbet is an assistant professor in the Psychology Department at Trent University in Peterborough, Canada. Her research encompasses personality, social, health, and environmental psychology, exploring individual differences in "nature relatedness" and the links between human–nature relationships, happiness, and sustainable behavior.