Are nature lovers happy? On various indicators of well-being and connectedness with nature

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Abstract

Connectedness with nature (CN) is seen as a personal disposition relevant for environmental as well as human health. In five questionnaire studies (N = 547) we systematically investigated the relationship between various operationalizations of well-being and CN. CN was assessed with two different tools in parallel. All significant correlations were controlled for the effects of age and gender. Psychological well-being, meaningfulness and vitality were found to be robustly correlated with CN. We highlight the relevance of CN with respect to human health and further discuss conceptual differences unraveled by the concurrent application of two CN-tools.

Keywords

connectedness with nature, environmental health, human health, public health, well-being

Introduction

Connectedness with nature (CN) was repeatedly reported to play a decisive role in the human-nature relationship. It was found to predict pro-environmental behaviour (Karlegger, 2010; Nisbet et al., 2009; Schultz and Tabanico, 2007), was associated with sustainable lifestyles (Mayer and Frantz, 2004) and considered in environmental education (Bogner et al., 2008). Additionally, different studies reported associations between CN and well-being (WB) (eg, Hinds and Sparks, 2008; Mayer and Frantz, 2004; Mayer et al., 2009; Nisbet et al., 2009). These associations imply a relevance of CN for the field of human health, too. Whereas there is sufficient evidence for the importance of CN in the field of environmental health, systematic research on CN in the field of well-being and subjective health is sparse. This is noteworthy, since the beneficial effects of nature on social, psychological and physical WB were frequently reported (eg, Abraham et al., 2007; Frumkin, 2001; Groenewegen et al., 2006; Lafortezza et al., 2009; Priest, 2007). Due to these beneficial effects, nature was, thus, supposed to be used in therapy (eg, Hartig and Cooper Marcus, 2006; Sempik et al., 2005).

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This article aims at contributing to a knowledge base for the use of the CN-concept in health psychology and public health, taking into account the evident beneficial effects of nature on health. For this purpose, the relationship between selected parameters of WB and CN was systematically investigated. Further, the article aims at closing a gap in research, considering the recommendation by Camfield and Skevington (2008) on the necessity of more conceptual and pragmatic research in the field of WB.

Connectedness with nature

Human's relationship with nature was discussed from different angles in the field of public health. For example, CN was highlighted as a crucial factor in therapeutic horticulture (Sempik et al., 2005) and in healing (Büssing et al., 2005). Connection to nature has been described as representing an individual's trait level of feeling emotionally connected to the natural world (Mayer and Frantz, 2004; Kals et al., 1999). Nisbet et al. (2009) discussed aspects of a nature-related personality. They reported links between dimensions of nature relatedness and selected personality variables like agreeableness and openness.

It is the emotional dimension of CN this article focuses on, bearing in mind the important role of emotions for any successful pedagogical or therapeutic relationship. For such purposes, the Connectedness to Nature Scale (CNS), developed by Mayer and Frantz (2004), seemed to be the adequate assessment tool, since it was designed as 'to tap an individual's affective, experiential connection to nature' (Mayer and Frantz, 2004: 504). This scale operationalizes Leopold's (1949) vision of human's relatedness to the natural world. The scale had demonstrated to correlate with life style indices measuring indoor- versus outdoor-preferences and life satisfaction. In experimental studies, Mayer et al. (2009) found CN significantly related with positive affect and the ability to cope with life problems.

Well-being, (mental) health and quality of life

WB can be categorized as an umbrella-term that includes experiences of positive emotional states and processes ranging from short-term to long-term, from current positive feelings (positive affect) to habitual dispositions (personality-factors). It encompasses pleasurable affect as well as general life satisfaction. According to Diener (1984,; 2000) and Diener et al. (2002), subjective WB was defined as a combination of positive affect in the absence of negative affect and general satisfaction with life (SWL). At this, affect is defined as 'a person's immediate, physiological response to a stimulus, and it is typically based on an underlying sense of arousal' (Snyder and Lopez, 2002: 128). In order to distinguish positive and negative affects, their valence has to be included: appraising an event as pleasurable leads to positive affect (enthusiasm, interest, etc); appraising it as painful leads to negative affect (fear, guilt, etc). However, substantial evidence indicated WB to be only moderately linked with other concepts such as income, number of friends and physical health, due to numerous other intervening variables (Diener, 2000).

Becker, the most recognized researcher on WB in German speaking countries, presented three factors crucial for mental-physical WB: meaningfulness versus depression, self-obliviousness versus self-centeredness and freedom of distress versus nervousness (Becker, 1994). The Trier Personality Inventory (TPI: Becker, 1989), measuring these factors was developed based on Becker's theory.

The conception of physical, mental and social WB as integral constituents of the state of health in general has also been highlighted by the World Health Organization (WHO). There is an array of aspects of WB that play an important role when it comes to an individual's appraisal of quality of life. However, Camfield and Skevington (2008) suggested that subjective WB and subjective quality of life are virtually synonymous. Indeed, most definitions of

both quality of life and satisfaction in life intend WB (eg, Rapley, 2003). Thus, health-related quality of life is closely linked with subjective health (cf. Bullinger and Kirchberger, 1989). Positive personal orientations and evaluations are also important in subjective health (eg, Bullinger, 1998) and should be taken into account for healing processes and therapy (eg, Frank, 2007), since such attitudes and dispositions help to cope with stressful life events (eg, Schwarzer and Schulz, 2002; Snyder and Lopez, 2002; 2007).

Nature, well-being and health

Directly and indirectly, nature positively influences WB and health through; (1) recovery from stress and attention fatigue; (2) encouragement to exercise; (3) facilitation of social contact and; (4) provision of opportunities for personal development and a sense of purpose (Health Council of the Netherlands, 2004). Such benefits can be experienced by spending time in natural outdoor environments, ranging from urban nature to wild nature. These findings are corroborated by numerous authors, highlighting the positive effects of natural environments on human health and well-being (eg, Abraham et al., 2007; Frumkin, 2001; Groenewegen et al., 2006, Lafortezza et al., 2009). For instance, De Vries, Verheij et al. (2003) showed a positive relationship between the amount of green space in a living environment and a person's mental health. Accordingly, Mitchell and Popham (2007) found a higher proportion of green space to be associated with better health. Restorative effects of nature have extensively been investigated in accordance with the Attention Restoration Theory by Kaplan and Kaplan (1989; Kaplan, 1995).

The qualities of natural settings compared to urban settings were widely demonstrated (eg, Hartig et al., 2003; Staats et al., 2003; Ulrich, 1984). Subsequent to walking in a nature reserve, participants showed improved psychophysiological stress recovery and attention restoration, whereas those walking in urban settings showed no improvement (Hartig et al., 2003). Benefits of nature on the psychophysiological aspects of stress reduction were examined by Ulrich (1981) and Ulrich et al. (1991).

Priest (2007) revealed seven categories describing the healing properties of walking experiences in nature: being closer to what is more natural, feeling safe, being part, striving, getting away, being me and finding meaning. Schultz and Tabanico (2007) reported that participants in their study were in a better mood while being in nature, compared to indoor-locations.

The present article

In the present study, we aimed at comprehensively investigating associations between WB and CN. Mayer and Frantz (2004) first reported CN to be related to life satisfaction and proposed a possible relation to subjective well-being and health. However, no systematic research was conducted since then. Additionally, Camfield and Skevington (2008) noted a need for conceptual and pragmatic research in the field of WB. By investigating the relation between the two concepts WB and CN in detail, we wanted to close this gap, gain theoretical insights and set the basis for applied projects in the future. We operationalized WB from different angles, including tools measuring current mood, life satisfaction and WB as a personal disposition or trait. Being aware of Diener's (2000) findings on the moderate relationship between WB and other concepts, such as income, number of friends and physical health, we hypothesized WB to be at the most moderately, yet significantly correlated with CN.

Method

Procedure

In order to investigate the relationship between CN and WB we systematically and comprehensively conducted five questionnaire-studies. In

each study, another WB-scale was administered together with the same two CN-measures.

Participants

Participants were approached in public places or in private homes in Austria, most of them in the city of Vienna and its vicinity. All of the participants were Caucasians, fluent in German. After giving informed consent, subjects were provided with general verbal information about the respective study which was conducted anonymously. In total, 547 questionnaires could be analysed. The number of participants varied slightly within studies. Numbers and basic demographic information is presented in Table 1.

Measurements

To cover different aspects of WB we used several instruments, encompassing different operationalization of WB. WB-tools stretched from the assessment of current mood states to the evaluation of stable features of personality. The used WB scales are summarized in the Appendix. In study 1 we administered the scale Current Mood out of the Multidimensional Comfort Questionnaire (MDBF: Steyer et al., 1997). In study 2, we used the Satisfaction with Life Scale (SWLS: Diener et al., 1985). In study 3 we chose three out of four domains of the WHO Quality of Life Questionnaire (WHOQOL-Bref: Angermayer et al., 2000) for the measurement of physical WB, psychological WB and the evaluation of environmental quality. In order to investigate WB as a trait, in study 4 we administered three scales out of the Trier Personality Inventory (TPI: Becker, 1989). In study 5, we applied Bullinger and Kirchberger's health survey (SF-36: Bullinger and Kirchberger, 1989). For our purposes we selected three scales: Vitality, Emotional Role-Function and Mental WB.

To assess CN we used two tools: the CNS and the CN-SI. The CNS (Mayer and Frantz, 2004) was reported to address people's emotional connection to nature, for example, 'I feel as though I belong to the earth as equally as it belongs to me'; 'I often feel part of the web of life'. According to Mayer and Frantz (2004), the scale was shown to have one factor and to possess high internal consistency and test-retest reliability. We translated the scale and tested the German version for psychometric properties. The single factor solution was replicated. The scale revealed satisfying item and scale characteristics for a 13-item scale (Cronbach's Alpha = .85, Guttman's split half reliability = .84). As in the original study, participants responded in categories from 1 = strongly disagree to 5 = strongly agree.

The CN-SI is a single-item measure with the wording: 'My connectedness with nature is'. It is answered in categories from 1 = 'very low' to 10 = 'very high'. This single-item has been repeatedly used in university courses and seminars discussing the relevance of CN with respect to health behaviour and health education.

Table 1. Participants in five consecutive studies.

Study	*N*	Age			Gender	
		Age range	*M*	SD	Male	Female (%)
Study 1	94	17 – 82	37.3	15.0	40	54 (57.4%)
Study 2	119	18 – 80	36.0	16.6	56	63 (52.1%)
Study 3	118	15 – 87	40.1	19.8	68	50 (42.4%)
Study 4	115	19 – 79	36.3	14.4	53	62 (53.9%)
Study 5	101	18 – 80	34.3	15.0	46	55 (54.5%)
Total	547	15 – 87	36.9	16.5	263	284 (51.9%)

Results

Socio-demographics

The aggregated community sample (N = 547) consisted of 284 women and 263 men. Among the participants, 23.2 percent had primary education, 48.4 percent had secondary education and 24.3 percent had tertiary education; 3.8 percent did not specify their educational level. A one-way ANOVA of educational levels revealed no statistically significant differences, neither for CNS nor CN-SI. It is worth noting that our study sample possessed a higher educational level than the Austrian average. Within the age range of 15 to 87 (M = 36.9, SD = 16.5), we categorized participants into three groups by tertiles. A one-way ANOVA showed significant CNS and CN-SI differences between age groups. Duncan's post hoc tests revealed that respondents older than 45 years of age (M = 3.82, SD = .68) scored higher on the CNS than the other age groups (under 26 years of age: M = 3.37, SD = .71; from 26 to 44 years of age: M = 3.45, SD = .71, F (2, 533) = 20.67, $p < .01$). For the CN-SI the same difference was found: respondents older than 45 years of age (M = 8.01, SD = 1.75) scored significantly higher than those under 26 years of age (M = 6.75, SD = 2.17), and those between 26 and 45 years of age (M = 7.05, SD = 2.19, F (2, 488) = 15.55, $p < .01$).

The gender distribution in our sample equated the distribution within the general Austrian public. A t-test showed a statistically significant difference between women (M = 3.66, SD = .73) and men (M = 3.40, SD = .70, $t(544) = 4.13$, $p < .01$) regarding CNS-values, with women scoring higher on the CNS than men. In the CN-SI we found no significant difference between women and men.

Well-being and connectedness with nature

CN was found to be significantly correlated with WB scores in studies 3, 4 and 5 (Table 2). CN did not correlate with current mood (study 1). In contrast to the results of Mayer and Frantz (2004), in study 2, neither the CNS nor the CN-SI correlated significantly with the SWLS.

Only in study 4, the CNS correlated with meaningfulness (r = .27, $p < .01$). The CN-SI correlated in study 3 with physical WB (r = .24, $p < .01$) and with psychological WB (r = .28, $p < .01$), in study 4 with meaningfulness (r = .26, $p < .01$), in study 5 with vitality (r = .27, $p < .01$) and with emotional role-function (r = .21, p = .05).

To control for age and gender-effects, we calculated partial correlations by using blockwise multiple regression analyses with WB being the dependent variable and CN, age and gender as predictors. CN was entered in block 1, gender and age in block 2. All analyses were computed in parallel for CNS and CN-SI. Table 2 shows all statistically significant correlations between WB indicators and CN, as well as evident differences between the two CN-measures. Whenever a correlation coefficient did not reach statistical significance, the subsequent step was omitted, which is indicated by a bar in the table. CN-SI was related to the respective WB measures to a considerably higher degree compared to CNS.

The correlations between the CN-SI and WB turned out to be quite robust against partialling out the effects of age and gender. Significant correlations between CN-SI and WB indicators were found in study 3 for psychological WB ($r_{part.}$ = .30; $p < .01$), in study 4 for meaningfulness ($r_{part.}$ = .21, p = .04) and in study 5 for vitality ($r_{part.}$ = .23; p = .03). In contrast, statistically significant correlations between CNS and WB were not robust against partialling out these effects. The only retained correlation between CNS and WB was found for the TPI-scale 'meaningfulness' ($r_{part.}$ = .23; p = .02).

To estimate the role of CN in the prediction of WB across different age groups, an ANCOVA-model of homogenous regression was applied. No significant differences between slopes across age-groups were found.

Pearson correlations between CNS and CN-SI in five studies were: r = .62 ($p < .01$) in study 1; r = .43 ($p < .01$) in study 2; r = .39 ($p < .01$) in study 3; r = .54 ($p < .01$) in study 4 and r = .62 ($p < .01$) in study 5.

Table 2. Pearson correlations between well-being and connectedness with nature.

Study	WB measure	Subscales	CNS	CN-SI	Controlled for
Study 1	MDBF	Current mood	.27 (p = .25)	.17 (p = .46)	
			–	–	A, G
Study 2	SWLS	Subjective WB	.09 (p = .32)	.16 (p = .15)	
			–	–	A, G
Study 3	WHOQOL-BREF	Physical WB	.18 (p = .05)	.24 (p = .01)	
			–	.16 (p = .10)	A, G
		Psychological WB	.06 (p = .52)	.28 (p < .01)	
			–	**.30 (p < .01)**	A, G
		Environment. qual.	.14 (p = .13)	.27 (p < .01)	
			–	.10 (p = .30)	A, G
Study 4	TPI	Meaningfulness	.27 (p < .01)	.26 (p < .01)	
			.23 (p = .02)	**.21 (p = .04)**	A, G
		Self-obliviousness	.10 (p = .32)	.10 (p = .30)	
			–	–	A, G
		Freedom f. distress	.02 (p = .84)	.13 (p = .20)	
			–	–	A, G
Study 5	SF 36	Vitality	.18 (p = .08)	.27 (p < .01)	
			–	**.23 (p = .03)**	A, G
		Emot. role-function	.02 (p = .87)	.21 (p = .05)	
			–	.19 (p = .07)	A, G
		Mental WB	.13 (p = .20)	.18 (p = .08)	
			–	–	A, G

Note: Partial correlations controlled for age (A) and gender (G), remaining significant correlations in bold

Discussion

In the present studies, distinct indicators of WB were found to be robustly correlated with CN, particularly meaningfulness. People high on CN scored high on vitality and on psychological WB too. Meaningfulness, in contrast to depression, is understood as a developmental motive, referring to a human's need of being in the world and experiencing a sense of purpose in life. People scoring high on meaningfulness conceive their lives as fulfilling and relatively free from feelings of powerlessness, helplessness, fear and depression. They feel accepted by others and experience social connectedness and high satisfaction in their lives. Thus, meaningfulness refers to self-actualization, not to the accumulation of material goods – so it can be distinguished from related constructs like 'welfare'.

Respondents high on vitality experience themselves as full of drive and energy, in contrast to being exhausted or tired. Those high on psychological WB, who enjoy their lives, again evaluate life as meaningful; they accept themselves, and report high satisfaction with life. In general, individuals scoring high on these WB scales evaluate their selves positively, experience social connectedness and coherence with others, as well as high satisfaction in life. Thus, our research revealed that people who are highly affiliated with nature also show certain positive self-evaluation. Nisbet et al. (2009) found nature relatedness, which is quite similar to CN, to be positively correlated with several personality variables like agreeableness, conscientiousness and openness. Based on their results they assumed 'that high (nature-related) people may be more adventurous and easy going … more able to contemplate possible

future outcomes, even if those outcomes are ambiguous' (p. 25). Our findings corroborate and extend these results. To our understanding of psychodynamic processes, CN and a positive personality can be interpreted as linked personal resources, which could be activated separately or in common. This combination of CN and positive traits provides individuals with a broadened range of coping options against stressors and furthermore, increased resilience against disease. Challenges in life, daily hassles, losses or illnesses can be managed in a more effective manner by people high on these combined traits.

Measures of current mood and subjective WB showed very low correlations with CN. Mayer and Frantz's findings (2004) concerning subjective WB and CN could not be replicated. We presume this to be associated with special characteristics of the research design. However, their global estimation of CN being an important predictor of general WB could only be supported to some extent by our results.

In our studies CNS and CN-SI correlated significantly with a considerable amount of shared variance. However, a different pattern of correlations between WB, CNS and CN-SI proved that the respective concepts show remarkable differences. Due to the fact that CNS correlated only with meaningfulness, we believe it to measure a specific aspect of CN which is closely related to the experience of a sense of meaning and purpose in life. The CN-SI, however, was related with a higher number of WB-indicators, implying the underlying concept to cover a broader range of attributes towards nature.

Limitations to our studies

First, limitations to our studies lay in the mode of investigation, which encompassed questionnaire studies, performed in urban or sub-urban settings. Therefore, we did not reveal correlations with positive current mood, which comes along while being in nature or urban green space. However, it is the first scientific approach in order to investigate the complex relations between WB and CN systematically. With this research, the basis is laid for further investigations using other tools measuring WB and CN respectively.

Second, CN was measured by one scale and a single item measure. It could have been helpful to include a broader variety of measurements in order to investigate it in a more systematic matter. Still, these measures were consciously chosen to deliver different operationalizations of the construct CN. The CNS is based on ecologist Leopold's (1949) norm-oriented and value-driven contention of humans' connection with the natural world. It is still our view that Leopold's values and ecological norms build a possible conceptual basis for research on CN. In contrast to the CNS, the CN-SI, with its neutral wording, is less inclined to a specific philosophical foundation, and hence more open for broader personal conceptualizations. We chose the item, since individuals would not necessarily have to share Leopold's vision of a human-nature relationship in order to attribute CN to themselves. As far as quality criteria are concerned, undoubtedly the CNS is more advantageous compared to the CN-SI. However, the CN-SI turned out to be useful in order to assess CN quickly and explore the concept of CN.

Third, we used a questionnaire study as methodological approach. It could be argued, however, that an experimental approach could have delivered additional insight (as used in a study recently published by Mayer et al., 2009).

In sum, we found some robust links between WB and CN. The correlation between meaningfulness and CN was the most significant one. Due to its obvious association with integral constituents of subjective health, CN should likewise be promoted in health education and health promotion, analogous to its use in the environmental domain. For example, in schools the mobilization of CN could foster healthy forms of commuting, such as cycling or walking – both beneficial for environmental and personal health. Further, CN could be used

in the rehabilitation of (mental) disorders. The connectedness with the natural world could be utilized to enhance mindfulness, and at this, improve healing and the prevention of relapse: Green Care and therapeutic gardening, for instance, make use of patients' positive connection with animals and nature. This also applies to care for the elderly, where nature-related activities, fostered by the person's closeness to nature could counteract the progression of deficits in physical and social life. We are convinced pursuing the reported links between CN and WB in theory and practice would contribute decisively to health and well-being of humans in manifold ways.

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Appendix 1. Well-being scales (study 1 – study 5).

Scale:	**Multidimensional Comfort Questionnaire (MDBF)**
Authors:	Steyer et al. (1997)
Construct:	Current well-being (alertness/fatigue, current mood state, agitation)
Categories:	1 = not at all to 5 = very
Reliability:	Cronbach's alpha = .91 (Steyer et al., 1997) Cronbach's alpha = .86 (present study)
Items:	8 items, example: 'Currently, I feel good.'
Scale:	**Satisfaction with Life Scale (SWLS)**
Authors:	Diener et al. (1985)
Construct:	Subjective well-being is seen as positive affect, absence of negative affect and general satisfaction with life
Categories:	1 = strongly disagree to 7 = strongly agree
Reliability:	Cronbach's alpha = .88 (Diener et al., 1985) Cronbach's alpha = .87 (present study)
Items:	5 items, example: 'In most ways my life is close to my ideal'.
Scale:	**Quality of Life Scale (WHO QOL-BREF)**
Authors:	Angermayer et al. (2000)
Construct:	Quality of life covers physical well-being (pain, energy, sexual activity, sleep), psychological well-being (positive feelings, negative feelings, thinking, learning, memory, bodily image) and evaluation of environmental quality (physical safety, health care)
Categories:	1 = never to 5 = always, or, 1 = very unsatisfied to 5 = very satisfied
Reliability:	Cronbach's alpha = .77 - .87 (Angermayer et al., 2000) Cronbach's alpha = .74 - .85 (present study)
Items:	25 items, example: 'To what extent do you feel your life to be meaningful?'
Scale:	**Trier Personality Inventory (TPI)**
Authors:	Becker (1989)
Construct:	Mental-physical WB is seen as a personal trait consisting of meaningfulness vs. depression, self-obliviousness versus self-centeredness and freedom from distress vs. nervousness
Categories:	1 = always to 4 = never
Reliability:	Cronbach's alpha = .78 - .81 (Becker, 1989) Cronbach's alpha = .72 - .83 (present study)
Items:	31 items, example: 'My life is meaningful and fulfilled'.
Scale:	**Health Survey (SF 36)**
Authors:	Bullinger and Kirchberger (1989)
Construct:	Subjective health covers vitality (being 'full of energy'), emotional role-function (degree in which emotional problems affect one's daily activities) and mental well-being (anxiety, depression, general positive state, emotional control, behavior control)
Categories:	yes/no, or 1 = always to 6 = never
Reliability:	Cronbach's alpha = .80 – .85 (Bulinger and Kirchberger, 1989) Cronbach's alpha = .76 – .81 (present study)
Items:	12 items, example: 'How often have you felt full of energy during the last four weeks?'