



Flourishing in nature: A review of the benefits of connecting with nature and its application as a wellbeing intervention

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Abstract: From the increasing number of people living in urban areas to the continued degradation of the natural environment, many of us appear to be physically and psychologically disconnected from nature. We consider the theoretical explanations and present evidence for why this state of affairs might result in suboptimal levels of hedonic and eudaimonic wellbeing by reviewing the large body of research on the mental health benefits of connecting with nature. The advantages of contact with nature as a potential wellbeing intervention are discussed, and examples of how this research is being applied to reconnect individuals to nature and improve wellbeing are given. We conclude by considering the limitations of, and proposing future directions for, research in this area. Overall, evidence suggests that connecting with nature is one path to flourishing in life.

Keywords: nature, nature connectedness, flourishing, subjective wellbeing, hedonic wellbeing, eudaimonic wellbeing, human-nature

1. Introduction

From ancient Chinese healers to Western writers such as Henry David Thoreau, the belief that connecting with the natural world improves wellbeing repeatedly appears throughout recorded human history (Selhub & Logan, 2012). Despite the durability of this belief over time and across cultures, numerous trends suggest that many are ignoring this time-tested wisdom, and are disconnected, both physically and psychologically, from nature.¹ Since 1950, the percentage of the world's population living in a relatively nature-impooverished urban milieu, versus the nature-rich surroundings of rural life, has almost doubled from 30% to 54%, and is as high as 82% in North America (United Nations, 2014). The shift to urban living is expected to continue and become even more pronounced as the twenty-first century progresses. In financially wealthy, industrialized nations, less than 10% of each day, on average, is spent outdoors (Evans

¹ For the purpose of this article, our conceptualization of "nature" is similar to the definition outlined in Hartig, Mitchell, de Vries, & Frumkin (2014). Specifically, we define nature broadly as environments and physical features of nonhuman origins, ranging from plants to non-built landscapes. This conceptualization corresponds well with how nature is commonly operationalized by researchers; it is also in line with lay conceptions of what constitutes nature (Vining, Merrick, & Price, 2008; cf. Descola & Pálsson, 1996). We believe that this conceptualization offers a representative view of the literature on this topic, yet includes variation that might be parsed more precisely in future work. It is important to note that nonhuman animals fall under the umbrella of some conceptualizations of nature, but will not be focused on in this review (see Amiot & Bastian, 2014 instead).



& McCoy, 1998; MacKerron & Mourato, 2013; Matz et al., 2014) and per capita participation in nature-based recreation is declining (Pergams & Zaradic, 2008). Children are spending less time outdoors (Louv, 2005), opting for large amounts of screen time instead (Rideout, Foehr, & Roberts, 2010). Emblematic of the modern popularity of electronic media over nature-based recreation (Pergams & Zaradic, 2006), children seem to be better at identifying Pokémon than common wildlife species (Balmford, Clegg, Coulson, & Taylor, 2002). Simultaneously, the necessary behavior change required to address and mitigate environmental issues such as climate change remains largely unactualized, and the health of the natural environment continues to deteriorate due to human (in)action (Intergovernmental Panel on Climate Change, 2014). In sum, many people are not as connected to nature as they could be and this has implications, not only for the wellbeing of the environment, but also for the wellbeing of individuals. In fact, there is growing evidence that supports the age-old belief that connecting with nature promotes flourishing (i.e., enhanced hedonic and eudaimonic wellbeing) and positive mental health. Without regular contact with nature, however, people may be missing out on some of these psychological benefits.

We examine two related, but distinct, aspects of the human-nature experience—nature contact and nature connectedness—and how they relate to and promote flourishing. Nature contact involves interacting with the natural world, such as being immersed in a natural environment, being around natural elements indoors (e.g., plants), or being exposed to virtual representations of nature (e.g., viewing photographs or videos of natural landscapes). Contact with nature can be relatively brief, intermittent, or regular. Nature connectedness, however, refers to one's subjective sense of connection with the natural world. Although typically conceived of as an individual difference (see Tam, 2013), nature connectedness can also be measured as a state; it can fluctuate in the short-term depending on situational context. Individuals who are more connected to nature spend more time outdoors (Mayer & Frantz, 2004; Nisbet, Zelenski, & Murphy, 2009; Tam, 2013), and nature contact often increases momentary feelings of connectedness (Mayer, Frantz, Bruehlman-Senecal, & Dolliver, 2009; Nisbet, 2013, 2014; Nisbet & Zelenski, 2011). In this review, we also discuss the advantages of contact with nature as a potential wellbeing intervention, and how research from this area is being applied to connect individuals with nature to improve wellbeing. We then consider the gaps in the literature, and outline future research directions and implications.

2. Why is nature beneficial to wellbeing? Theoretical explanations

Three major theories address the question of why connecting with nature is beneficial to our wellbeing: biophilia, attention restoration, and stress reduction. The biophilia hypothesis posits that our ancestors' wellbeing and survival depended on connecting with nature (i.e., for finding food and water, navigating, and predicting time or future weather conditions, etc.; Kellert & Wilson, 1993). Humans have begun living in urban environments only recently (Wilson, 1984); therefore, the need to connect with nature likely remains an innate part of who we are. Although evolutionary concepts like biophilia are difficult to test, suggestive evidence comes from studies that find preferences for nature scenes over built environments (Dopko, Zelenski, & Nisbet, 2014; Hartig, Böök, Garvill, Olsson, & Gärling, 1996; Kaplan & Kaplan, 1989; Kaplan, Kaplan, & Wendt, 1972; Ulrich, 1981; Van den Berg, Koole, & van der Wulp, 2003), and attraction to nature being evidenced across diverse cultures (e.g., Ulrich, 1993; Newell, 1997) and at very young ages (e.g., Kahn, 1997). A multitude of studies, discussed below, also suggest that satisfying our need to connect with nature boosts wellbeing.

Attention restoration theory (Kaplan & Kaplan, 1989) provides another explanation for nature's beneficial effects.² This theory distinguishes between directed attention (which is used for executive functions and involves prolonged focus and effort) and involuntary attention (which is effortless yet demanding). Directed attention is a limited resource that becomes fatigued after extended use and, when depleted, may lead to negative emotional states (e.g., irritability) and declines in cognitive performance. Natural environments seem particularly restorative: they provide an opportunity to get away, contain fascinating rich stimuli that effortlessly engage our involuntary attention, and allow us to act without the need to constantly monitor our behavior (Kaplan & Kaplan, 1989). Numerous empirical studies report improvements in concentration, directed attention (Berman, Jonides, & Kaplan, 2008; Berto, 2005; Hartig, Evans, Jamner, Davis, & Gärling, 2003; Van den Berg et al., 2003), and emotional functioning (discussed below) after contact with nature.

Finally, stress-reduction theory (Ulrich et al., 1991) maintains that exposure to certain (unthreatening) natural environments that were evolutionarily beneficial for wellbeing and survival automatically elicits a variety of stress-reducing psychophysiological responses. Compared to built environments, nature can decrease arousal and perceived stress levels (Ulrich, 1979, 1981; Ulrich et al., 1991), and promote psychophysiological stress recovery (e.g., decrease blood pressure) after attentional abilities are fatigued (Hartig et al., 2003). Moreover, access to nearby nature can buffer against stress (Stigsdotter et al., 2010; Van Herzele & de Vries, 2012; Van den Berg, Maas, Verheij, & Groenewegen, 2010; Ulrich, 1981). Researchers in Japan have tested how specific elements of nature, such as wood or the sound of running water, influence the human stress response. Several decades of evidence suggests that contact with nature can lower pulse rates, reduce cortisol levels, and improve immune functioning (Tsunetsugu, Park, & Miyazaki, 2010; cf. Bowler, Buyung-Ali, Knight, & Pullin, 2010).

Beyond the idiosyncrasies of each theory, their implications are similar: connecting with nature should support human wellbeing and functioning. Next, we provide a comprehensive review of the empirical research that has tested this hypothesis.

3. Nature and hedonic wellbeing

Researchers have investigated the short- and long-term effects of contact with nature on hedonic wellbeing, and the association between hedonic wellbeing and nature connectedness. Hedonic wellbeing, which is also referred to as subjective or emotional wellbeing, consists of high levels of positive emotions, low levels of negative emotions, and a sense of satisfaction with one's life (Diener, 2009; Keyes, 2002). In essence, hedonic wellbeing is the *feeling good* component of wellbeing (Keyes & Annas, 2009).

Numerous studies have shown that brief contact with nature promotes positive emotional states. For instance, relatively brief walks in natural, versus urban/indoor, environments can lead to significant boosts in mood (Mayer et al., 2009; Nisbet & Zelenski, 2011), even for those diagnosed with mood disorders (Berman et al., 2012). A recent meta-analysis of 32 randomized controlled studies with over 2,000 participants corroborates this; contact with nature results in moderate, significant increases in positive affect, as well as small, but significant, decreases in negative affect (McMahan & Estes, 2015). Similar findings are reported in other systematic

² More recently, Stephen and Rachel Kaplan have developed a broader framework called the reasonable person model that focuses on how environmental factors can influence cognition, behaviour, and wellbeing by supporting human informational needs (see Kaplan, 2000; Kaplan & Basu, 2015; Kaplan & Kaplan, 2003, 2009). Although it is not as commonly cited in the nature-wellbeing literature as the other three theories, the reasonable person model can also help explain nature's wide-ranging beneficial effects on human flourishing.

reviews on the health benefits of nature (Bowler et al., 2010) and the effect of “green exercise” on mental wellbeing (Thompson-Coon et al., 2011). Additional support comes from an experience sampling study of 20,000 residents of the United Kingdom (MacKerron & Mourato, 2013). Even after controlling for a variety of confounding variables (e.g., weather, social company, type of activity, day of the week), people were happier when in natural environments than when in urban ones.

Technologically mediated or virtual exposure to nature (e.g., viewing images or videos) is also generally associated with enhanced hedonic wellbeing (see Velarde, Fry, & Tviet, 2007). When virtual exposure to nature is compared to actual contact with nature, however, real nature experiences provide a greater mood boost (Kahn, Severson, & Ruckert, 2009; Mayer et al., 2009; McMahan & Estes, 2015). Thus, while browsing nature photographs or watching a nature documentary is likely to improve mood, getting outdoors and connecting directly with nature may be optimal for maximizing happiness.

Given the positive hedonic outcomes, one may question why people are not spending time in nature (Evans & McCoy, 1998; MacKerron & Mourato, 2013; Matz et al., 2014). One explanation for this disconnect is that nature’s effects on wellbeing are underappreciated. Although people often overestimate the impact of emotional experiences (i.e., people make affective forecasting errors; Wilson & Gilbert, 2005), the reverse may be true for contact with nature. In experiments testing anticipated and actual experiences, Nisbet and Zelenski (2011) found that, on average, people tend to underestimate the mood benefits of brief contact with nature. This prediction error may be leading people to choose less healthy activities, resulting in missed opportunities to foster positive mental health and a greater connectedness with nature.

Relatively less attention has been given to examining the longer-term effects of nature exposure on hedonic wellbeing. There is, however, some evidence that repeated contact with nature leads to improved emotional functioning and greater life satisfaction. A survey of 3,000 Finnish participants found that those who reported spending more of their leisure time engaged in nature-based recreational activities had higher emotional wellbeing than those who reported spending less of their free time in nature (Korpela, Borodulin, Neuvonen, Paronen, & Tyrväinen, 2014). A series of large-scale European studies based on data from national surveys has investigated the influence of nearby green space on wellbeing and mental health (de Vries, Verheij, Groenewegen, & Spreeuwenberg, 2003; Maas et al., 2009; Van den Berg et al., 2010; White, Alcock, Wheeler, & Depledge, 2013). These studies consistently find that living in an area with more green space is associated with less mental distress than living in an area with less green space. Moreover, in a longitudinal study that had over 10,000 U.K. residents (White et al., 2013), living in a greener urban area was associated with greater life satisfaction. Thus, it appears that having access to nature near one’s home can provide a buffer against mental distress and promote a sense of satisfaction with one’s life (cf. Huynh, Craig, Janssen, & Pickett, 2013 for an exception).

Studies that ask participants to connect with nature have found similar results. For example, after a two-week intervention, participants randomly assigned to increase their time in nature reported higher net-positive affect compared to participants in a control condition (Passmore & Howell, 2014). Similar improvements were reported by Canadians participating in the David Suzuki Foundation’s month-long 30x30 nature challenge (Nisbet, 2013, 2014), which is described in more detail below. Richardson, Hallam, and Lumber (2015) had participants write about three good things they had noticed in nature for a five-day period. Positive feelings elicited by nature was one of the common themes identified in the writings. Overall, these studies support the

Beyond contact with nature, trait connectedness with nature is also associated with increased hedonic wellbeing. A recent meta-analysis of 30 samples containing over 8,500 participants found a significant relationship between nature connectedness and happiness indicators such as positive affect and life satisfaction (Capaldi, Dopko, & Zelenski, 2014). Connectedness may motivate people to seek nature contact, due to the reinforcing mental health benefits these experiences provide. Nature connectedness has also been linked with psychological resilience, which is key in managing stress and maintaining positive mental health (Ingulli & Lindbloom, 2013). In sum, a plethora of research shows that connecting with nature is associated with improved emotional functioning and satisfaction with life.

4. Nature and eudaimonic wellbeing

Although more research has focused on the link between nature and hedonia, some work has also explored nature's influence on broader aspects of wellbeing. Often loosely gathered under the term "eudaimonia", constructs such as meaning, autonomy, vitality, and feelings of transcendence represent additional components of mental health beyond merely feeling good. Eudaimonia has been described as the *functioning well* component of wellbeing (Keyes & Annas, 2009).

Contact with nature and nature relatedness has been linked with several indicators of eudaimonic wellbeing. For example, feeling that one's life is meaningful correlates positively with nature connectedness (e.g., Cervinka, Roderer, & Hefler, 2012; Nisbet, Zelenski, & Murphy, 2011). Furthermore, experiences in natural environments are an important source of meaning for adults of all ages (Fegg, Kramer, L'hoste, & Borasio, 2008; O'Connor & Chamberlain, 1996; Reker & Woo, 2011; Schnell, 2009; Steger et al., 2013), including clinical populations (e.g., Berger & McLeod, 2006; Granerud & Eriksson, 2014).

Empirical evidence links exposure to nature with increased autonomy, the ability to freely choose one's actions—an important part of eudaimonic wellbeing. In experimental research, the more immersed participants were in nature photographs, the more autonomous they felt (Weinstein, Przybylski, & Ryan, 2009). Experiences in nature also appear to provide the freedom to be one's authentic self. Mayer et al. (2009) found that participants who were randomly assigned to take a walk in nature reported significantly reduced public self-awareness. In qualitative research, adults who had spent time in the wilderness reported that what made their experiences especially meaningful was the fact that "there was virtually no reason to be anyone but themselves" (Fredrickson & Anderson, 1999, p. 30). Research from the outdoor education and experiential learning literature describes similar benefits of wilderness and nature immersion experiences on autonomy and other measures of psychological wellbeing like personal growth, self-esteem, self-regulation, and social competency (e.g., Norton & Watt, 2014; Passarelli, Hall, & Anderson, 2010; Ray & Jakubec, 2014).

The experience of vitality—fully feeling alive and energized (Ryan & Frederick, 1997)—appears to be enhanced by connecting with nature. When research participants tracked their daily activities, greater vitality was associated with activities involving nature, regardless of physical exercise and social companionship levels (Ryan et al., 2010). An increase in vitality was even reported by participants who merely imagined themselves in an outdoor setting. In experimental studies, participants randomly assigned to walk in nature reported greater vitality than those who walked indoors (Nisbet & Zelenski, 2011; Ryan et al., 2010). Finally, meta-analytic results show that those with a stronger connection with nature than others tend to



The elevating feelings of awe and inspiration, connection to a greater whole, and spiritual exaltation—the transcendent aspects of eudaimonic wellbeing—have been linked with nature as well. The sights and sounds of nature are some of the most common elicitors of awe (Keltner & Haidt, 2003; Shiota, Keltner, & Mossman, 2007; Terhaar, 2009), particularly fractal patterns found in trees, clouds, rain, and birdsongs (Forsythe & Sheehy, 2011; Richards, 2001). Indeed, panoramic photographs of nature have been described as the “prototypical awe elicitor” (Shiota et al., 2007, p. 951), and even mundane images of nature can lead to increased feelings of awe (Joye & Bolderdijk, 2014). Briefly viewing either unspectacular or awesome photographs of nature can make people feel more connected to others, more caring, and more spiritual (Joye & Bolderdijk, 2014). Several other studies provide empirical support for a close relationship between spirituality and nature (Diessner, Solom, Frost, Parsons, & Davidson, 2008; Leary, Tipsord, & Tate, 2008; Saraglou, Buxant, & Tilquin, 2008; Vining et al., 2008). Even imagined experiences in nature can evoke intense feelings of awe and connectedness, as well as the feeling of being in the presence of something greater than oneself (Shiota et al., 2007).

Thus far, we have primarily focused on the individual benefits of connecting with nature. However, just as conceptions of flourishing and mental health are incomplete without considering the social context (Keyes, 1998; World Health Organization, 2006), so is a discussion of nature’s benefits without considering social aspects of wellbeing. Research shows that the amount of neighborhood green space is correlated with stronger social ties reported among neighbors and greater prosocial activity in the neighborhood (Kuo, 2003; Kuo, Sullivan, Coley, & Brunson, 1998; Sommer, 2003; Sullivan, Kuo, & Depooter, 2004). The prosocial effect of exposure to nature has also been demonstrated in experimental studies using videos or photographs (Joye & Bolderdijk, 2014; Zelenski, Dopko, & Capaldi, 2015), a plant-filled room (Weinstein et al., 2009), or after immersion in a forested urban park (Guéguen & Stefan, 2014). The widespread social norm of giving flowers to others is also suggestive of nature’s ability to foster positive relations. Indeed, evidence from experimental studies demonstrates that participants primed with flowers are more likely to help strangers (Guéguen, Meineri, & Stefan, 2012), give money to others (Raihani & Bshary, 2012; Stefan & Guéguen, 2014; Stillman & Hensley, 1980), act gregariously (Haviland-Jones, Rosario, Wilson, & McGuire, 2005), and feel attracted to someone they have just met (Guéguen, 2011, 2012). Trait nature connectedness is positively associated with humanitarianism (Nisbet et al., 2009), social wellbeing (Howell, Dopko, Passmore, & Buro, 2011; Howell, Passmore, & Buro, 2013), kindness (Leary et al., 2008), empathic concern (Zhang, Piff, Iyer, Koleva, & Keltner, 2014), altruistic concern (Schultz, 2001), and perspective taking (Schultz, 2001).