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Article *in* Canadian Psychology/Psychologie canadienne · April 2018

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0708-5591/19/$12.00

2019, Vol. 60, No. 1, 21–34
http://dx.doi.org/10.1037/cap0000145

Is Nature Relatedness a Basic Human Psychological Need? A Critical Examination of the Extant Literature

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Most of the world's population in developed regions lives in urban areas, with this proportion growing annually. A key question regarding this trend is the effects that reduced contact with nature may have on human well-being and functioning. In this paper, we propose to evaluate, using the empirical literature, the hypothesis that human beings have a basic psychological need for nature relatedness. This proposition could have positive benefits for human well-being, the way we design human environments and communities, and the natural environment itself if properly evidenced; however, to date, no article has evaluated the extant literature for such a purpose. The objective of this paper is to use previous conceptualisations of basic psychological needs, and the criteria proposed by Baumeister and Leary (1995) and Sheldon (2011) to critically examine whether enough evidence exists to support this proposition. Research from diverse research areas are reviewed, with conclusions drawn for each criterion as well as for the overall literature. In general, research supports the proposition for a basic psychological need for nature relatedness, with stronger evidence pointing to the idea of this as a need-as-requirement than a need-as-motive, though both are well-evidenced.

Keywords: nature relatedness, nature attachment, psychological needs, well-being

The purpose of this review is to examine the support for the hypothesis that human beings have a basic psychological need to have and maintain connections with nature, and the satisfaction and frustration of this need can have important implications for human psychological and physical well-being. The hypothesis of the proposed need stems from earlier work by E. O. Wilson. Wilson (1984) proposed the biophilia hypothesis, which stated that human beings have an "innate tendency to approach life and lifelike processes" (p. 1), built on the fact that human cognitive and emotional evolution occurred almost exclusively in natural settings, and therefore our cognitive and emotional apparatuses should be most readily attuned to natural stimuli. Subsequent work spawned from the biophilia hypothesis has expanded its definition to be written as a basic human need, rather than a propensity (Hinds & Sparks, 2008; Kahn, 1997; Mayer & Frantz, 2004; Mayer, Frantz, Bruehlman-Senecal, & Dolliver, 2009; Nisbet & Zelenski, 2011, 2013; Nisbet, Zelenski, & Murphy, 2009, 2011). However, no article to date has ever systematically explored whether the idea of nature relatedness meets the criteria of a fundamental human psychological need, which could have widespread implications and applications if found. The purpose of the present article is to do so using the criteria established by previous theories using psychological needs as a construct, as well as the specific criteria outlined by Baumeister and Leary (1995) and Sheldon (2011).

This article was published Online First April 16, 2018.

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Basic Human Psychological Needs

Recently, Sheldon (2011) proposed a two-process model of psychological needs that builds and synthesizes previous frameworks. According to Sheldon, "psychological needs are evolved tendencies to seek out certain basic types of psychosocial experiences and to feel good and thrive when those basic experiences are obtained" (p. 552). The two-process model is meant as a comprehensive framework to the old, generalised division within needs theories: that which divides "needs as motives" from "needs as requirements." With respect to the latter, needs as requirements refers to the conceptualisation of a psychological need as a necessary experiential condition in order for a human being to achieve sufficient levels of well-being, and to promote growth. Similarly, the needs as motives conceptualisation views psychological needs as a form of motivation that compels individuals to pursue certain incentives or goals, built on older drive theory models of human psychological needs. A main dividing factor between needs-as-requirements and needs-as-motives is that they happen at different points in a temporal sequence; motives are salient at the inception of an action sequence, influencing what is attempted during the sequence, whereas experiences are more salient at the conclusion of a sequence, presumably influencing the likelihood of repeating the action sequence.

Criteria for Establishing a Basic Psychological Need

Despite the longstanding history of psychological needs in scientific literature, there is actually little information that explicates how a basic human psychological need should be evidenced appropriately. For this, one of the most important sources of guidance comes from an article by Baumeister and Leary (1995). In this seminal article, Baumeister and Leary outline a comprehensive set of criteria by which to evaluate whether something qualifies as

a valid psychological need, criteria which have been used by subsequent researchers (e.g., Anderson, Hildreth, & Howland, 2015; Sheldon, 2011).

> A fundamental [psychological need] should (1) produce effects readily under all but adverse conditions, (2) have affective consequences, (3) direct cognitive processing, (4) lead to ill effects (such as on health and adjustment) when thwarted, (5) elicit goal-oriented behaviour designed to satisfy it . . . , (6) be universal in the sense of applying to all people, (7) not be derivative of other motives, (8) affect a broad variety of behaviours and (9) have implications that go beyond immediate psychological functioning. (p. 498)

In relation to Sheldon's Two-Process Model, criteria 1, 3, 5, 8, and 9 of Baumeister and Leary's proposed requirements are seen as evidence of something as need-as-motive, while criteria 2, 4, 6, 7, and 9 are seen as requisite evidence for a need-as-requirement (Sheldon, 2011).

Theoretical Bases for Nature Relatedness and Evolutionary History

With respect to biophilia, some comprehensive reviews already exist that detail the evolutionary accounts for environmental preference/habitat selection, and the propensity to want to affiliate with other forms of life. Pertinent reviews have been published by Kahn (1997); Gullone (2000); Lee (2012), and Bratman, Hamilton, and Daily (2012). It has been shown in past research that human beings across cultures and age groups have a preference for savannah-like landscapes, the most favourable of which tend to include low-action water, low-density tree coverage, and a natural prominence overlooking an open landscape, as such places include all the necessary elements for human survival and human thriving (Kahn, 1997). With respect to a natural propensity to approach life, this can also be an adaptive strategy, as observing the behaviour of other organisms contributes to a greater understanding of when and how to approach or avoid them (Lee, 2012). In relation to the proposed need, research has shown that nature relatedness is positively related to pet ownership and self-reported love of animals, both wild and domestic (Nisbet et al., 2009).

With respect to the proposed need for nature relatedness, two theories have been developed that draw heavily on evolutionary theory to explain the positive well-being and attentional restoration effects of nature contact and attachment (see Bratman et al., 2012). The first of these theories is called Stress Reduction Theory (SRT). Originally put forth by Roger Ulrich (see Ulrich et al., 1991), SRT postulates that

> landscapes with views of water and/or vegetation and that contain modest depth, complexity, and curvilinearity would have been most beneficial to survival (allowing for the spotting of food sources, predators, etc.). These landscapes, according to SRT, help moderate and diminish states of arousal and negative thoughts within minutes, through psychophysiological pathways. (Bratman et al., 2012, p. 122)

The other complimentary theory is called Attention Restoration Theory (ART). This theory was originally conceived by Kaplan and Kaplan (1989), and suggests that being in nature allows humans to replenish their capacity for directed attention. Directed attention requires cognitive effort, as individuals must consciously use their faculties to focus on a stimulus that may or may not otherwise have attracted their attention. In order to achieve this, an individual must inhibit or suppress the urge to pay attention to different sources of distraction, and as a result, after prolonged use, this capacity can become fatigued (Bratman et al., 2012). By contrast, involuntary attention occurs when a person finds a particular stimulus intrinsically intriguing, and requires little to no cognitive effort. According to ART, situations in which directed attention is rendered unnecessary for a period of time allow for its restoration, and as such the experience that comes from viewing or being present within natural landscapes allows attentional reserves to replenish (Bratman et al., 2012). This would be an adaptive function, given that, among other things, directed attention would be necessary in locating prey and food, as well as identifying and tracking predators. These restorative properties may depend on the degree to which the landscape promotes extent (feeling immersed within the environment), being away (feeling apart from one's habitual activities and concerns of daily life), fascination (aspects of stimulus that capture involuntary attention and are found to be intrinsically interesting), and compatibility (how well the environment affords the ability to pursue desired goals within it; Bratman et al., 2012).

Recently, a new theory has been put forth by Joye and van den Berg (2011) as a possible counter to SRT and ART. This theory, called Perceptual Fluency Account (PFA), "states that unthreatening natural scenes are affectively evaluated more positively than unthreatening urban scenes because our visual system more fluently processes certain aspects of the visual structure of the former than of the latter" (p. 266). In other words, PFA views attention restoration and stress reduction as by-products of fluent processing. The idea is that the increased level of visual coherence in natural scenes allows them to be processed more fluently than urban scenes. The self-similarity of a natural scene allow one to perceptually predict other components in the scene because of the perceptual redundancy, thusly allowing for faster processing of the scene overall. Urban scenes, on the other hand, tend to consist of perceptually divergent objects, which compete for visual attention and therefore make the scene substantially less easy to process.

These theories denote the psychological and psychophysical mechanisms by which our ancestors would have implicitly understood that they were in a supportive natural environment. Once individuals had decided upon supportive habitats, then repeated experiences within such environments would have developed an attachment to such. This would have further promoted survival, as it would have ensured that such individuals would have stayed within those supportive habitats. Moreover, the attachment generated from repeated experiences in the same natural environments would also ensure individuals seek to defend such environments through protective behaviours. Just as it would have been important for caregivers to protect their young, it would also have been important for our ancestors to defend their "home territories."

Definition of Nature Relatedness

For the purposes of this paper, the "need for nature relatedness" can be defined as a basic human psychological need to feel a secure and pleasant experiential connection to nature in a cognitive, emotional and physical sense. Several aspects of this definition should be further defined. To begin with, the term *secure* refers to the fact that the proposed need will not necessarily be

satisfied by environments in which the person does not feel safe (Staats & Hartig, 2004). However, there can be certain elements of heightened physiological arousal associated with interacting with somewhat dangerous elements of nature that are not necessarily deleterious to the satisfaction of the proposed need. For example, Sahrmann, Niedbalski, Bradshaw, Johnson, and Deem (2016) examined attendees at a touch tank exhibit in a zoo in which people were allowed to physically interact with animals such as stingrays and sharks, with which improper interaction could result in physical harm. Results showed that heart rate was highest during the interaction compared to before or after, but that mean levels of happiness and energy were higher after the interaction. Therefore, an element of exhilaration may be present in a person's interaction with nature that does not occlude the possibility to have the proposed need satisfied; however, if a person feels in danger then satisfaction of the proposed need will simply not be possible.

Another aspect of the definition of the proposed need is that interactions with nature should be pleasant. That is, there are several aspects of nature with which a person can interact that can be considered unpleasant, and it is not expected that such interactions would provide nourishment toward the proposed need. Rather, it is expected that the proposed need is facilitated by experiences which the person finds pleasant in a sensory, perceptual, and psychological sense. In fact, recent research has shown that the indices of well-being such as life satisfaction and self-esteem and their relationship to nature connectedness can be moderated by the degree to which nature is perceived positively by the observer (Zhang, Howell, & Iyer, 2014).

Furthermore, the definition of the proposed need describes an experiential connection to nature. The term *experiential* is used here to denote the fact that the proposed need is expected to be fully satisfied only by in vivo immersive experiences in nature. That being said, it is possible for a person to have some measure of fulfillment of the need from nonimmersive experiences, such as through recollections of past experiences with nature that were positive in valence, imaginings of possible future interactions, or physical or virtual representations of nature (e.g., photographs). Such nonimmersive experience may provide some temporary fulfillment of elements of the proposed need, eliciting similar positive well-being benefits as a full, multisensory experience of an actual natural environment. This would be akin to telephone conversations with respect to fulfillment of the social belongingness need from Baumeister and Leary (1995). In this case, people who have long-distance relationships are still able to maintain social bonds through telephone conversations, which offer only auditory sensory information; however, telephone conversations were only enough to stimulate some of the positive effects of the satisfaction of the need to belong, and it was still required that people have at least some in-person interaction with the other person in order to fully derive the positive benefits of the satisfaction of this need (Baumeister & Leary, 1995). Similarly, a recent meta-analysis on the effect of exposure to nature on emotional well-being demonstrated that true immersion in nature shows a stronger effect than exposure to representations of nature (McMahan & Estes, 2015).

A final aspect of the definition of the proposed need is the definition of *nature*. Previous definitions of nature used in the extant literature are generally too specific to the presence of life, as they are also generally built on the biophilia hypothesis. However, we wish to use a broader definition of nature that will also include nonliving systems, as our hypothesis of the need for nature relatedness is related to peoples' overall interactions with the natural world. Thus, we think that nature is "the physical world, including plants, animals, the landscape, and natural phenomena, as opposed to things made by people" (Soanes, 2002), with the exception of those elements that would be dangerous to human beings. We also include in our definition of nature that this may include "a range of scales and degrees of human management, from a small urban park through to relatively pristine wilderness" (Bratman et al., 2012, p.120). As will be discussed further in this article with respect to the cognitive categorisations of nature versus non-nature made by participants in psychological experiments, some human elements may be present in a given scene or landscape, but overall still be considered nature. What is important in this context is the predominance of human versus natural elements. In order for a scene or an environment to be considered "natural", it may contain elements of human construction or management, but the predominance of the elements of the environment must be naturally occurring (Kaplan, Kaplan, & Wendt, 1972).

With respect to defining nature, human beings will differ in their preferences for, and definition of what is natural enough, or how much "wildness" is tolerable (Davis & Gatersleben, 2013). With respect to this, we draw another parallel to the need to belong from Baumeister and Leary (1995). According to the need to belong, humans have a need for a certain minimum number and quality of close social bonds to satisfy the need, though the exact number can be different between individuals. Past this threshold, satiation occurs, wherein any additional relationships are subject to diminishing returns with respect to need satisfaction. Similarly, we anticipate a certain minimum of "naturalness" to be necessary in order for a natural scene to fully satisfy the proposed need for nature relatedness. Some people will prefer somewhat more human management, while others will prefer as little human interference in the natural landscape as possible. Past this threshold, additional naturalness will have diminishing returns for that particular individual with respect to psychological and physiological benefits.

Some other terms that will be used throughout the article will be *nature exposure* and *nature immersion*. Nature exposure will refer simply to the viewing of depictions of nature, or to actually being out in nature. Nature immersion refers to the psychological experience of feeling "inside" of a natural environment.

Place Attachment and the Need for Nature Relatedness

A similar construct to nature relatedness exists in psychological and sociological literature already, namely *place attachment*. Place attachment is an assignment of symbolic meaning to one's physical and social surroundings resulting in cognitive and emotional ties to an area with valued natural resources (Vaske & Kobrin, 2001). According to Fullilove (1996), place attachment is based on three psychological processes: familiarity (detailed knowledge of an environment), attachment (emotions and behaviours that maintain contact with the environment of attachment), and identity (integration of important phenomenological experiences in one's environment into one's sense of self). Increased place attachment has been associated with some similar well-being outcomes as nature relatedness, such as increased self-esteem, sense of mean-

ing, and sense of belonging (Scannell & Gifford, 2017; Vaske & Kobrin, 2001).

Place attachment is different from nature relatedness in that place attachment generally also includes a sense of social community belongingness. Brehm, Eisenhauer, and Krannich (2004) demonstrated that social attachment and nature attachment can be considered two distinct components of overall place attachment. Within urban environments, the social component is generally stronger than the physical attachment component. This helps demonstrate a conceptual difference between urban and natural environments with respect to the outcomes people derive from them, as people expect greater socialization in cities, but actually prefer to be alone in nature even compared to the company of close friends (Staats & Hartig, 2004).

The issue of attachment and relatedness brings up a unique characteristic of the proposed need for nature relatedness. For example, Baumeister and Leary (1995) differentiate between mere social contact, which can still be warm and positive but occurs briefly and with a novel or "nonattachment" person, with the type of interactions necessary to fully satisfy the need to belong. However, because of the proposed mechanisms by which nature relatedness is expected to act on a person, we conceptualise the proposed need somewhat differently. That is, we conceptualise that *nature contact*, which can be defined as an immersive experience within a novel or somewhat novel natural environment, can still be fulfilling of the need for nature relatedness, and can be sufficient in eliciting a feeling of connection with nature. In fact, research has shown that even a 15-min walk in nature is sufficient to increase feelings of state-level nature connectedness (Mayer et al., 2009; Nisbet & Zelenski, 2011). However, we also propose that nature contact will not necessarily be sufficient for some of the outcomes that will otherwise be generated by repeated contact with the same natural environment.

In discussing fulfillment of the need for nature relatedness, we refer to the cognitive, emotional, and physical restorative qualities that are associated with being immersed in a natural environment. Repeated exposure to the same environment is not theorized as being necessarily requisite to elicit positive outcomes, but will elicit additional outcomes over time. The idea is that being away from nature for prolonged periods of time will lead to fatigue in a person's cognitive capacities and emotional regulations that will ultimately be restored when a person has had a substantive immersive experience in a natural environment, which does not require familiarity. Put another way, we can consider a human being to be a "battery" with respect to cognitive, psychological, and emotional energy, and the natural environment to be the "charging station." When the battery is depleted, it can be restored by being put into a charging station; however, the charging stations can be considered interchangeable, and it is not necessarily true that the exact same station needs to be used every time for the replenishment of the battery.

But, there are further benefits to nature relatedness that one may only garner with repeated exposure to a familiar natural environment. Repeated experiences in the same natural environment will generate a cognitive and emotional attachment to that area and a stronger sense of place. For example, children who are reared with natural areas readily available may grow up to be more nature connected later in life (Windhorst & Williams, 2015). The repeated exploration of a specific natural environment will generate a set of experiences and cognitive representations of the environment that will create a feeling of security and belonging with respect to that particular environment and lead to greater identification with that environment. This, ultimately, will lead a person to feel safer within that environment, which will ease the ability of that environment to elicit the positive effects for the person's psychological well-being.

In addition, nature attachment will lead to protective behaviours. Research has shown that emotional affinity toward nature, which has all the basic definitional components of nature attachment, is predictive of protective and environmentally responsible behaviours (Kals, Schumacher, & Montada, 1999; Muller, Kals, & Pansa, 2009). Vaske and Kobrin (2001) also found that place attachment predicts increased environmentally responsible behaviours, such as learning about and discussing environmental problems and solutions with others, cleaning local parks, and conserving water; and this effect occurred through a mediated process in which place dependence led to increased place identity, which then led to increased environmentally responsible behaviour. Nature attachment will also create commitment to a specific natural environment, which will also increase protective behaviours, as research has shown that commitment to nature is predictive of increased proenvironmental behaviour (Davis, Green, & Reed, 2009). There is evidence as well that nature attachment is uniquely predictive of this protective orientation toward the environment compared to social attachment, as Brehm, Eisenhauer, and Krannich (2006) found that nature attachment is a significant positive predictor of attitudes toward the preservation of roadless areas, implementation of new policies to protect the environment, and protection of open agricultural areas, while social attachment was not a predictor of any of these outcomes.

Therefore, our conceptualisation of the need for nature relatedness and the means by which it can be satisfied incorporates both nature contact and nature attachment. However, we also posit that, past the requisite amount of experience within an environment to generate nature attachment, satiation will occur.

Is Nature Relatedness a Basic Psychological Need?

In the following sections we propose to examine the evidence for the proposition of a basic human psychological need for nature relatedness. To do this, we will draw mostly on Baumeister and Leary's (1995) set of criteria, as well as Sheldon's Two-Process Model (Sheldon, 2011). We will divide the research into separate sections of criteria based on the distinction from Sheldon's Two-Process Model between needs-as-requirements and needs-as-motives, while drawing from Baumeister and Leary to determine the content of the individual criteria. The first section will deal with the criteria relevant to establish a need as a requirement, while the second section will deal with the criteria relevant to establish a need as an essential motive. Therefore, the first section will deal with the following criteria: to be considered a need, nature relatedness (1) should have positive affective consequences when satisfied, and negative affective consequences when thwarted, (2) should promote health, development and/or well-being when satisfied (e.g., medical, psychological and/or behavioural), and (3) lead to ill-effects (i.e., pathology) when thwarted, (4) should be universal in the sense that results should not be culturally dependent, and (5) should not be derivative or other needs/motives. In a

complementary fashion, the second section will deal with the following criteria: nature relatedness (6) should direct cognitive processing, (7) should affect a broad variety of behaviours, (8) should occur in a variety of circumstances and settings, and (9) should elicit goal-oriented behaviour designed to satisfy the need. In examining these criteria, we will draw from peer-reviewed journals from a variety of scientific disciplines, with an emphasis on experimental or quasiexperimental research design. In articles where the researchers report results that are relevant to different criteria within the same article, we will separate the results into the relevant sections.

Need-as-Requirement Criteria

Criterion 1: Affective Consequences

The first criterion to be examined is that, to be considered a basic psychological need, there should be positive affective consequences when the need is satisfied, and negative affective consequences when the need is thwarted. Two meta-analyses have been done on this general area. Capaldi, Dopko, and Zelenski (2014) found that nature relatedness is consistently associated with increased positive affect, and McMahan and Estes (2015) found that exposure to natural environments is reliably associated with increased positive affect and decreased negative affect. In addition, the effect of nature exposure on decreased negative affect has been shown to be over and above what simple relaxation would predict (Hartig, Mang, & Evans, 1991), or the effect of exercise in general (Kinnafick & Thøgersen-Ntoumani, 2014). The most common elements of negative affect between studies that are reduced from nature exposure are reduced anger and aggression (Hartig et al., 1991; Hartig, Evans, Jamner, Davis, & Gärling, 2003; Park et al., 2011). In fact, these two components of negative affect can be increased during urban walks (Hartig et al., 1991, 2003). A set of studies by Park et al. (2011) showed that tension, anxiety, fatigue, and confusion are also decreased by a nature walk compared to an urban walk.

With respect to the effects of nature relatedness and exposure on positive affect, this association/effect has been shown using a number of research methods. That is, positive affect has been shown to increase after walking in nature (Berman, Jonides, & Kaplan, 2008; Hartig et al., 1991, 2003; Mayer et al., 2009), as well as after simply viewing nature slides, videos, or virtual reality representations built on photographs and real environments (Kinnafick & Thøgersen-Ntoumani, 2014; Valtchanov, Barton, & Ellard, 2010; Valtchanov & Ellard, 2010). Moreover, significant relationships between increased nature relatedness and increased positive affect have been shown in several studies (Howell, Dopko, Passmore, & Buro, 2011; Howell, Passmore, & Buro, 2013; Nisbet & Zelenski, 2011, 2013). Congruently, Mayer et al. (2009) found that increased nature connectedness was a significant mediator between the effect of nature immersion on increased positive affect.

Conclusions About Affective Consequences

Based on the literature reviewed above, it is safe to conclude that nature exposure and nature relatedness/connectedness have affective consequences. However, the effects of nature exposure and relatedness on negative affect are, admittedly, somewhat more temperamental than the effects on positive affect. There are some studies (Mayer et al., 2009; Nisbet & Zelenski, 2011; Valtchanov & Ellard, 2010) that either found no relationship between nature relatedness and negative affect, or did not find group differences on such after their experimental task. Thus, while we conclude that this criterion is met, we would also recommend that further research be done to examine why the effect of nature relatedness on the decrease of negative affect is less consistent than the effect on positive affect.

Criterion 2: Promotion of Health and Well-Being

Another stipulated criterion for a basic human psychological need is that "a motivation can be considered fundamental only if health, adjustment, or well-being requires that it be satisfied" (Baumeister & Leary, 1995, p. 498). There are three main categories of health and well-being effects of nature relatedness on human functioning: physiological stress reduction and immunization, psychological well-being, and cognitive/attentional restoration. At this point we would also like to point out valuable reviews that also examine research in this area, though with more constricted inclusion criteria, that is, only looking at nature immersion studies (Bowler, Buyung-Ali, Knight, & Pullin, 2010), only looking at cognitive effects (Bratman et al., 2012), looking at hedonic and eudaimonic well-being (Capaldi, Passmore, Nisbet, Zelenski, & Dopko, 2015), and only looking at the effects of plants on health (Stefan, Gueguen, & Meineri, 2015).

Research on physiological benefits of exposure to nature essentially began with the work of Ulrich in the mid-1980s. Ulrich (1984) found that patients recovering from surgery whose windows had a view of nature compared to non-nature had shorter postoperative stays, and required less pain medication while in recovery. The resultant work in this area of inquiry is guided by SRT, previously discussed, which examines effects on stress reduction and insulation. For example, Ulrich et al. (1991) found that those who viewed nature scenes after a stress induction procedure had faster and more complete physiological recovery from stress compared to participants who viewed urban slides. Parsons, Tassinary, Ulrich, Hebl, and Grossman-Alexander (1998) showed that viewing nature-dominated videos compared to urban-dominated videos was associated with less autonomic arousal while viewing a stressful video, better recovery from stress after stress induction, and better insulation against a second stressor. Similarly, Laumann, Gärling, and Stormark (2003) also found that stress recovery is better in participants who viewed a nature video compared to an urban one following a stressor. In fact, the nature video group had significantly reduced heart rate while watching the video compared to their own baseline measure, demonstrating that not only did it facilitate stress recovery, but was also relaxing. Similar findings also come from virtual reality representations of nature. Valtchanov and Ellard (2010), as well as Valtchanov et al. (2010) found that viewing virtual reality nature scenes lead to better stress recovery as evidenced via reduction in skin conductance.

In addition to recovery from stress and surgery, there is also evidence that being in nature is associated with reduced physiological arousal on its own, without the necessity of prior stressors. Tsunetsugu et al. (2013) showed that diastolic blood pressure was

lower when participants were in nature areas compared to urban ones; as well, parasympathetic activity was higher, sympathetic activity was lower, and heart rate was lower in the nature areas. Thus, there is evidence that experiencing nature can be physiologically relaxing unto itself.

A number of studies have also examined the impact of nature immersion and nature relatedness on human psychological well-being. Early evidence for the well-being effects of nature immersion and relatedness on human well-being was presented by Hartig et al. (1991). In addition to their other findings, these authors also found that the participants in the nature walk condition reported significantly higher levels of self-reported overall happiness than the other two corresponding groups. Correspondingly, the meta-analysis from Capaldi et al. (2014) showed that nature relatedness is consistently and positively associated with increased life satisfaction and increased vitality. With respect to the latter finding, a series of experimental and quasiexperimental studies by Ryan et al. (2010) demonstrated that being in nature leads to increased feelings of vitality even when controlling for past-day's vitality, present-day's exercise, present-day socializing, and simply being outdoors at all. In fact, when viewing photographs of nature versus urban scenes, there is increased vitality from viewing nature, and decreased vitality from viewing urban scenes (Ryan et al., 2010). Nature relatedness has also been shown to be associated with increased happiness and higher feelings of general purpose and meaning in life (Howell et al., 2013), as well as increased mindfulness (Howell et al., 2011), even when controlling for socially desirable responding.

In addition, it has been shown that nature relatedness is positively associated with increased overall psychological well-being (Howell et al., 2011, 2013), that feelings of meaning in life are a significant mediator in the relationship between nature relatedness and well-being (Howell et al., 2013), and that nature relatedness is reliably and positively associated with two dimensions of psychological well-being: autonomy and personal growth (Nisbet et al., 2011). Nature relatedness has also been shown to have cognitive restoration effects for people that have had executive functioning or attentional capacities fatigued. A number of studies have shown that going on a walk in a nature setting compared to an urban one leads to better cognitive restoration from fatigue (Berman et al., 2008; Hartig et al., 1991, 2003), or that viewing nature videos or slides leads to the same outcome difference compared to viewing urban videos or slides (Berto, 2005). This effect has been shown using a number of different cognitive fatigue procedures, such as extended Stroop Task and binary classification task (Hartig et al., 1991, 2003), the Sustained Attention to Response Test (Berto, 2005), or backward digit-span task and Attention Network Task (Berman et al., 2008). In fact, there is evidence that going on a walk in an urban environment can actually increase attentional fatigue compared to baseline, while going on a nature walk can decrease it (Hartig et al., 2003).

Conclusions About Well-Being Effects

The evidence for the effects of nature relatedness on multiple areas of human health and well-being are quite robust, representing probably the strongest area with respect to research on nature relatedness. There is evidence of nature relatedness having a positive impact on human health and functioning in three major areas: stress-related physiology and recovery, psychological well-being, and cognitive recovery from response inhibition and attentional fatigue. The former and the latter are congruent with both SRT and ART theories described in the introduction of this article, while the psychological well-being effects are congruent with the conceptualisation of needs supplied by Self-Determination Theory (SDT).

A key element in future research on physiological effects of nature relatedness would be investigating what factors contribute to the higher rates of statistical significance in some outcomes relative to others (e.g., skin conductance, heart rate, vs. blood pressure), so that SRT can be refined and improved based on such possible distinctions. Moreover, the results of the cognition studies would also be more stable if researchers employ the same task as both fatigue and outcome rather than two separate, usually disparate, tasks. Nevertheless, we conclude that this criterion has been successfully met by the available scientific literature.

Criterion 3: Consequences When Thwarted

Yet another criterion of a proposed fundamental human psychological need outlined by Baumeister and Leary (1995) and Ryan and Deci (2017) is that failure to satisfy the need should lead to maladaptive, even pathological outcomes with respect to physical health, mental health, and/or behaviour. This is essentially the difference between a "want" and a "need", as failure to satisfy a want simply leads to stronger desire, whereas failure to satisfy a need leads to pathology (Sheldon & Schüler, 2011). Out of the research so far discussed, studies that compared a nature group with an urban group can be thought of as contrasting when the need for nature relatedness is satisfied and thwarted, respectively. For example, studies have shown an increase in negative affect for the urban group (Hartig et al., 1991, 2003; Kinnafick & Thøgersen-Ntoumani, 2014; Mayer et al., 2009), a negative correlation between nature relatedness and negative affect (Nisbet & Zelenski, 2011), a decrease in psychological well-being for the urban group compared to the nature group (Laumann et al., 2003; Ryan et al., 2010), higher heart rate (Laumann et al., 2003; Tsunetsugu et al., 2013; Ulrich et al., 1991), higher diastolic blood pressure, higher sympathetic nervous activity and lowered parasympathetic nervous activity (Tsunetsugu et al., 2013) for participants in urban conditions compared to natural ones. However, to truly evidence this criterion will require evidence of pathology or maladaptation. That is, the absence/lessening of a positive does not necessarily denote the presence of a negative.

To do this, differences in prevalence rates of psychopathology and illness/disease between people living in urban versus rural environments can be contrasted. Such research falls into articles that examine prevalence rates in children and youth, and articles that examine such in adults. With respect to the articles examining children and youth, comparisons are drawn between children who are raised in urban versus rural environments (Jané et al., 2006; Walrath et al., 2003; Zahner, Jacobs, Freeman, & Trainor, 1993), or based on the amount of green space in a proximal radius of one's home (Flouri, Midouhas, & Joshi, 2014), while controlling for socioeconomic status (SES) and demographic characteristics. The results show that children raised in urban environments have higher prevalence rates of somatic complaints, internalizing problems, social withdrawal, delinquency, aggression (Zahner et al.,

1993), impairment in behaviour toward others, mood and emotional problems and disorders, self-harming, dysfunctional communication and thought processes (Flouri et al., 2014; Walrath et al., 2003), specific phobias, adjustment disorder, reactive attachment problems, Asperger disorder, attention deficit and hyperactivity disorder, and generalised anxiety disorder (Jané et al., 2006). In sum, children growing up in rural environments wherein nature is a much more prevalent feature of the landscape tend to develop along a trajectory that much less often leads to a plethora of various pathologies and maladaptive outcomes.

Studies using adult samples tend to use the amount of available green space within a specific proximal distance from one's home as the predictor of prevalence rates of various pathologies. Maas et al. (2009) showed that having 10% more green space than average in a 1-km radius from one's home led to lowered prevalence rates of coronary heart disease; neck and back complaints; severe back complaints; severe neck and shoulder complaints; severe elbow, wrist, and hand complaints; depression; anxiety disorders; upper respiratory tract infections; asthma; migraines; vertigo; infectious disease of the intestinal canal; acute urinary tract infections; and diabetes. Similar research by Mitchell and Popham (2008) demonstrated that, for low income families for whom mortality rates tend to be higher from certain causes such as cardiovascular disease, having more available green space within close proximity to one's home was associated with decreased mortality rates for overall mortality as well as for circulatory disease specifically, even when controlling for education level, employable skills, population density, and measures of pollution present in personal living environments or respondents.

Cohen-Cline, Turkheimer, and Duncan (2015) compared pairs of monozygotic twins that had been reared together but lived apart at the time of the study, drawing from the University of Washington Twin Pair Registry circa 2008 to 2014 with respect to green space around the home. The results showed that decreased access to green space led to significantly higher depression and stress while controlling for income, exercise level, population density and neighbourhood deprivation. By looking at monozygotic twin pairs, the authors also parceled out that there was a genetic influence on health outcomes relative to available green space.

Conclusions About Consequences When Thwarted

With respect to this criterion, the current research does a reasonable job at evidencing the proposed need for nature relatedness and it provides support for the idea that failure to satisfy a need leads to pathology. One recommendation we have for research in this area in order to strengthen findings would be to use propensity matching (e.g., Marselle, Irvine, & Warber, 2014) to match participants together based on similar characteristics, rather than attempting to simply control for demographics and SES.

Criterion 4: Universality

Providing evidence for the universality of a proposed psychological need means demonstrating the degree to which research findings can be said to be culturally independent. With respect to this, the research reviewed in this article does stem from a fair collection of various cultures. Admittedly, the majority of the research that is discussed herein comes from the United States (e.g., Berman et al., 2008; Cohen-Cline et al., 2015; Hartig et al., 2003; Parsons et al., 1998; Ryan et al., 2010; Ulrich et al., 1991; Walrath et al., 2003; Weinstein, Przybylski, & Ryan, 2009) and Canada (e.g., Howell et al., 2011, 2013; Nisbet et al., 2009; Valtchanov & Ellard, 2010; Zelenski & Nisbet, 2014). However, research has also been done using participant samples from Sweden (e.g., Hartig, Böök, Garvill, Olsson, & Gärling, 1996), Italy (Berto, 2005), Spain (Jané et al., 2006), the Netherlands (Maas et al., 2009), the United Kingdom (Astell-Burt, Mitchell, & Hartig, 2014; Flouri et al., 2014), and Japan (Park et al., 2011; Tsunetsugu et al., 2013). Thus, the research pertaining to this review has been conducted in a fair variety of cultures.

Criterion 5: Not Derivative of Other Needs

Another criterion in establishing a new fundamental human psychological need is that it should not be derivative of another motive or need. One area in which it could be conceptualised that nature relatedness has some cross-over with other constructs could be with respect to feelings of connectedness overall. That is, is there a general need to be connected to something greater than oneself, or is there something specific to nature connectedness? Zelenski and Nisbet (2014) examined this question and found that nature relatedness was significantly associated with satisfaction with life, positive affect, feelings of personal growth, happiness, subjective vitality, and psychological well-being when controlling for general connectedness (feeling connected to one's country, culture, family, music, home, and friends). In a second study, the authors demonstrated that nature relatedness was significantly, positively related to positive affect, vitality, and feelings of personal growth, as well as significantly, negatively related to negative affect when controlling for general interpersonal connectedness. Thus, the findings from these studies suggest that nature relatedness is independently related to well-being, above and beyond other forms of connectedness. Walking in nature can also be a social activity, and one that involves physical exercise, warranting the question of whether the benefits of immersion in nature may be derivative of these two factors, rather than of the experience of nature itself. However, Ryan et al. (2010) demonstrated that the effect of being in nature can account for changes in well-being at a daily level above and beyond social contact and physical activity. The results from the Kinnafick and Thøgersen-Ntoumani (2014) study also demonstrated that the beneficial effects of nature versus urban environments occurred regardless of the presence of activity. Also, as previously discussed, Staats and Hartig (2004) found that, when safety is not a concern, participants preferred walking with company in the urban environment, and walking alone in the natural one. Lastly, the authors found that company had a negative direct effect on perception of recovery and reflection in the natural environment. Similarly, Staats, Van Gemerden, and Hartig (2010) found that when participants were attentionally fatigued they showed a higher preference for activity in urban-nature compared to a nonattentional fatigue condition, which was contrary to the finding that participants preferred to have company with respect to activity in urban environments.

Combined, this evidences the idea that there is something particular to natural environments with respect to replenishment of cognitive and emotional resources that is separate from social

contact or physical activity, and is specific to this type of environment with respect to perceptual and experiential features and characteristics.

Summary of Need-as-Requirement Criteria

Overall, the evidence of Criteria 1 through 5 with respect to the proposed need for nature relatedness meeting the conditions to qualify as a need-as-requirement is quite strong. Experiences in nature and feeling a stronger connection to the natural world increase one's positive affect, and decreases negative affect, whereas experiences in urban environments can cause the opposite. Being in nature and feeling close to it also has a positive impact on one's physiological, psychological, and cognitive health and well-being through a number of different indices, while there is concomitantly an increase in psycho- and physiological pathologies when contact with nature is lessened. There does not appear to be any evidence that these relationships are culturally dependent, nor is there any evidence that the effects of nature on human health, functioning, and optimal growth are derivate of other needs. Therefore, it is safe to conclude that the proposed need for nature relatedness meets the criteria of a need-as-requirement.

Need-as-Motive Criteria

Criterion 6: Directing Cognitive Processing

The sixth criterion is that the proposed need should direct cognitive activity, which means answering several questions (Baumeister & Leary, 1995): do people naturally, cognitively categorise nature versus non-nature? Do they process information about nature differently than non-nature? Do people cognitively blur the lines between nature and self? Do people present any biases in information processing with respect to nature? And lastly, do people think more about nature than other environments? With respect to the first question, Kaplan et al. (1972) factor analysed participants' ratings of photographs ranging in naturalness-urbanity with various levels of overlap. Two clear factors emerged: nature and urban, with the nature factor comprising nature and predominantly nature slides, and the urban factor comprising urban and predominantly urban slides. Similarly, van den Berg, Koole, and van der Wulp (2003) had participants rate nature and urban videos on "naturalness", with the results supporting that the nature videos were clearly rated as having higher naturalness. Work by Greene and Oliva (2009) showed that, with respect to response times (RTs) of perceptual classification, participants had the fastest RTs in their decision of whether the scene was natural or man-made, even before specific elements of the scene could be identified. Thus, it seems that the ability for human beings to differentiate between natural and non-natural scenes is one that is rapid, occurs at the perceptual level, and happens even before participants have identified the specific categorisation of the scene.

There also is robust evidence that people will process information about nature differently (Gullone, 2000; Kahn, 1997). Going back to the Kaplan et al. (1972) study, the authors also demonstrated that participants greatly preferred the nature slides with respect to how pleasing, likable, and fascinating they were, and if they would view it for longer if given a chance. Staats, Kieviet, and Hartig (2003) and Hartig and Staats (2006) found that participants rated nature slides as having higher beauty, niceness and pleasantness, that nature slides elicited more positive attitudes toward walking in the depicted environments and a greater expectancy of recovery and reflection within the environments, and that these findings were strongest in a cognitively fatigued condition. So, participants not only ascribe different characteristics to natural environments compared to urban ones, but also ascribe such environments as having different behavioural and cognitive affordances, that is, restoration and reflection for nature, and socializing for urban.

Further evidence of direction of cognition can be found in research examining the internalization of nature into the self-concept. One of the pieces of evidence cited by Baumeister and Leary (1995) with respect to this criterion was a study by Aron, Aron, Tudor, and Nelson (1991), which showed that people will incorporate their significant others into their self-concept, as represented by pictorial ratings of the overlap of oneself and one's partner (Inclusion of Others in Self Scale). Schultz (2001), adapting the IOSS into the Inclusion of Nature in Self (INS) scale, showed that the more one included the natural environment in their self-concept, the more likely they were to be concerned for the environment and commit proenvironmental behaviours. A later study by Schultz, Shriver, Tabanico, and Khazian (2004) adapted the Implicit Association Test to show that people can implicitly associate nature with themselves. Nisbet and Zelenski (2013) had participants complete the INS along with their nature relatedness scale, and showed that the INS was significantly and positively correlated with nature relatedness.

Conclusions About Directing Cognition

The overall conclusion to be drawn from the research regarding this criterion is that it has been sufficiently met. However, there is not yet any direct evidence regarding whether people show biases in information processing with respect to nature versus non-nature, nor for whether people think more about nature than other environments. A bias would require that people distort information about nature in a way that they do not about other environments, and thus, to evidence this criterion more fully, future research will need to examine whether or not this occurs. Further research could help to flesh out this criterion more thoroughly.

Criterion 7: Affect a Variety of Behaviours

A fundamental human psychological need should affect a wide variety of behaviours if it is to be considered important. With respect to this, Nisbet et al. (2009) found that nature relatedness was significantly, positively related to pet ownership, organic product purchasing, fair trade product purchasing, being a member of an environmental organisation, participating in nature activities, vegetarianism, frequency of time spent outdoors, and frequency of time spent in nature over the course of an 8-week measurement period. Similarly, Davis et al. (2009) found that greater inclusion of nature into one's self-concept is predictive of ecologically friendly behaviours such as energy-saving, waste avoidance, and recycling.

With respect to interpersonal behaviours, Zelenski, Dopko, and Capaldi (2015) examined the relationship between surrogate nature exposure and sustainable behaviour in a resource dilemma.

The results from this study showed that participants in the nature condition lasted for significantly more seasons, harvested less fish per season, and made less profit per season. Weinstein et al. (2009) and Zhang, Piff, Iyer, Koleva, and Keltner (2014) also examined the relationship between nature exposure and interpersonal behaviours. Participants viewed slide photographs of either natural environments or urban ones, and then took part in a funds distribution task. The results demonstrated that when people were first exposed to nature slides, they were more likely to be generous in the funds distribution task. Moreover, mediational models were supported in both studies wherein greater feelings of immersion in nature predicted greater levels of nature connectedness, which in turn predicted a greater likelihood of generosity in the funds distribution task.

Conclusions About Affecting a Wide Variety of Behaviours

The literature in this area demonstrates that nature exposure and nature relatedness affect a variety of behaviours in a satisfactory way. Therefore, it is safe to conclude from the available literature that this criterion has been satisfactorily met by current research.

Criterion 8: Occurs in a Wide Variety of Settings

Another necessary criterion is that the need must occur in a wide variety of settings. With respect to the research described in previous sections, studies have used a variety of stimuli with positive effect, ranging from simple window views (Ulrich, 1984), viewing photographs of nature (Hartig et al., 1996), using videos of walking through nature or various nature scenes (Berman et al., 2008; Berto, 2005; van den Berg et al., 2003), using virtual reality open-concept nature areas (Stefan et al., 2015; Valtchanov et al., 2010) and actual walks through nature (Hartig et al., 1991, 2003; Mayer et al., 2009; Ryan et al., 2010). In addition, the environments depicted have a significant amount of range, from a simple view of trees (Ulrich, 1984), a tree-lined footpath alongside a river near a university campus (Ryan et al., 2010), an arboretum (Berman et al., 2008), various scenes of lakes, rivers, hills and forests (Berto, 2005), a nature preserve (Mayer et al., 2009), brushy mixed forest (Valtchanov et al., 2010), deciduous forest (van den Berg et al., 2003), fields and lowland forest in a canyon valley (Hartig et al., 2003), a hike in the mountains (Hartig et al., 1991), or several different forested and urban regions (Tsunetsugu et al., 2013). Moreover, there is a similar diversity in the types of urban stimuli used, ranging from a view of a brick wall (Ulrich, 1984), street-side views along a river (van den Berg et al., 2003), mixed residential and commercial neighbourhoods (Hartig et al., 1991), downtown centers (Berman et al., 2008), and large cityscape vistas (Weinstein et al., 2009). Thus, not only have a variety of designs and types of stimuli and procedures been able to demonstrate effects of nature relatedness on various outcomes (as well as the negative effect of non-natural areas), but the content of these stimuli and procedures in terms of the types of environments depicted has also shown a good deal of variety.

However, one could criticise that the stimuli used, while variable, are all mostly visual by nature. With respect to this point, research by Benfield, Taff, Newman, and Smyth (2014) examined the impact of natural and man-made auditory stimuli on affective state. The results showed that only the natural sound condition showed mood recovery from a stress-inducing video with respect to pleasantness–unpleasantness and tiredness–positivity. In fact, for positivity–tiredness, the natural sounds plus motorized noise and the control conditions actually showed a decrease in affect. Thus, the restorative effects of nature can also be derived from auditory stimuli, and even simply adding man-made noise on top of natural sounds is enough to diminish the restorative property of being in nature, or even counteract it.

Another criticism that can be made is that the contrasts examined in the experiments discussed thus far almost always involve a comparison between a nature versus an urban stimuli or environments presented in a somewhat polarized format, where the two are intended to be distinct from each other. However, a study by Tyrväinen, Ojala, Korpela, Lanki, and Tsunetsugu (2014) examined the well-being effects of environments with smaller gradations between stimuli. The results demonstrated that participants (a) felt significantly more restoration, vitality and positive emotions after walking in the urban-park and urban-forest conditions compared to the city-centre, and (b) felt significantly less negative emotions following the walk in the urban-forest environment compared to the urban-park and city-centre conditions. Furthermore, one could hypothesise that the urban stimuli are inherently chosen in order to provide an "ugly" view of cities, compared to nature scenes that are meant to be aesthetically pleasing. However, a study by Gidlow et al. (2016) chose urban and nature areas for participants to walk in for their experimental manipulation that were equivalent in terms of participant ratings of pleasantness. The results showed that participants experienced significantly more restoration and had better cognitive task performance following a walk in a nature condition compared to a pleasant urban condition.

Therefore, from the review of evidence listed above, it is safe to conclude that the effects of nature exposure and relatedness occur in a wide variety of settings, using a variety of stimuli and approaches, and thus that this criterion has been satisfactorily met.

Criterion 9: Elicit Goal-Directed Behaviour

One of the important criteria in establishing a new fundamental human psychological need, specifically as a need-as-motive, is that the need should elicit goal-directed behaviour that is meant to satisfy it. Although, as our review strongly suggests so far, the evidence supporting this criteria can be derived, at least in part, from the activities that people pay attention to and engage in to fulfill a need (Anderson et al., 2015), our interpretation of this criteria and the distinctions between a need as motive and a need as requirement proposed by Sheldon (2011) suggest that the effects on goal-directed behaviour should vary when the need has been fulfilled when compared to when the need has not been fulfilled. In other words, people who have recently experienced satisfaction of nature relatedness should be less motivated to experience nature compared to those whose need is not yet satisfied.

A study by Bringslimark, Hartig, and Patil (2011) examined Norwegian office workers and compared the personalizing behaviours of those who had a window view with those that did not have a window view. The results of this experiment showed that those who did not have a window view in their office workplace were 5 times more likely to have personalized their office space with plants, and were 3 times more likely to personalize their office

space with pictures of nature. Thus, it seems that when people are denied a simple view of the outside world, there is a greater tendency to put elements of nature into one's workspace in order to compensate. Staats and Hartig (2004) also found that, when participants were attentionally fatigued, they were more likely to have an increased positive attitude toward walking in nature and a decreased positive attitude toward walking in an urban environment. This can be taken as indirect evidence that when a person is low on the outcomes that the proposed need can provide differentially from other external environments, this will increase the person's drive to experience nature, and decrease the drive to experience other types of physical environments.

It is known that nature relatedness is connected to an increased frequency of time spent outdoors and in nature, as well as behaviours that are protective of nature. However, what is not known is whether a need for nature relatedness causes people to approach nature due to a deficit in nature experience, or whether the tendency to approach nature diminishes once the nature experience has been replenished. To establish this, research would need to thwart nature relatedness in a controlled, experimental fashion, and examine whether this causes people to approach nature on their own. Unfortunately, simply dividing participants into groups that walk in or view nature compared to urban environments and then taking dependent measures does not directly illuminate this issue. If the usual paradigm of research in this area were reversed, it could provide evidence of goal-directed behaviour. It is possible to manipulate aspects of well-being in an experimental way, such as inducing negative affect in participants, so future studies could employ a means of experimentally manipulating levels of negative affect in participants, and then allowing them a choice of either a 10-min walk, for example, through a nature environment or a 10-min walk through an urban environment.

In sum, there is some direct evidence of goal-directed behaviour, but the lack of evidence regarding the effects on goal-directed behaviour when the need has been fulfilled when compared to when the need has not been fulfilled creates a problem with the general conclusion of establishing nature relatedness as a need-by-motive. Nevertheless, there is certainly the possibility of this criterion being met in the future by more directed experimental approaches, given the paradigms and suggestions that have been illuminated herein.

Summary of Need-as-Motive Criteria

The evidence for the proposed need for nature relatedness meeting the conditions to qualify as a need-as-motive is quite substantial. To begin with, human perception and cognition seems to readily categorise nature versus non-nature; people ascribe different properties and affordances to nature than they do to other physical environments; and human beings readily incorporate the natural environment into their own self-concept. Experiences in nature and increased nature relatedness also affect a wide variety of individual and interpersonal behaviours, ranging from proenvironment behaviours, consumer behaviours, pet ownership, how people choose to eat, political activism, and cooperation over a natural resource. The effects documented in this review also occur given a wide variety of stimuli and settings; effects can be seen from a simple window view of nature compared to a brick wall all the way to full immersive experiences walking in nature compared to urban areas, with various gradations of overlap between the two being evidenced.

The main deficit with respect to the conditions of a need-as-motive is the lack of direct evidence supporting the proposition that deficits in the need for nature relatedness lead to goal-directed behaviour meant to satisfy the need, which in turn would be subject to satiation once the need has been fulfilled. This presents a dilemma as, in essence, the flagship criterion for establishing something as a need-as-motive is the presence of goal-directed behaviour. However, the strength with which the evidence supports the other three criteria for this side of establishing a basic human psychological need is also undeniable. Therefore, we would suggest a conditional conclusion with respect to the proposed need as meeting the requirements of being a need-as-motive as defined by Sheldon (2011). That is, we conditionally conclude that the proposed need meets the requirements to be considered a need-as-motive, on the condition that future research can provide direct evidence that deficits in the proposed need do, indeed, elicit goal-directed behaviour as it is defined in this article.

Overall Discussion, Future Directions, and Implications

In this article, we explored a diversity of criteria previously established by Baumeister and Leary (1995) and expanded upon by Sheldon (2011) for establishing a basic psychological need with respect to a new proposed need for nature relatedness. It is our overall conclusion that the extant literature supports the claim that human beings have a basic psychological need to feel a secure and pleasant experiential connection to nature in a cognitive, emotional, and physical sense. The literature amply supports the proposed need as a need-as-requirement, and mostly supports the proposed need as a need-as-motive, with the exception of the criterion of eliciting goal-oriented behaviour, which needs further validation to be fully supported.

Human emotional and cognitive apparatuses developed in the context of the natural environment; yet, in the modern world the majority of citizens live in urban environments, and this number is growing every year. The resultant lessened contact with nature from living in human-built environments could be costing human beings a necessary nutriment to their overall optimal development and functioning. That is to say, by not recognising the necessity of periodic experiential immersion in nature, human beings are robbing their basic faculties of the restorative experiences they need in order to develop and function optimally. The longer one spends away from meaningful contact with nature, the more negative emotions, cognitive fatigue, and physiological stress can rise, and the more likely somatic and psychological symptoms and conditions can become prevalent. Moreover, in a world where increasing population creates an ever-growing need for increased altruism, fostering experiences with nature can help to generate more commitment to the physical environment surrounding one's home, leading to more active behaviour in supporting and protecting that environment, as well as more altruistic and generous interpersonal behaviours including better coordination of shared resources.

The implications of this newly proposed need in the human and natural realm could be widespread. For instance, it would have implications for city planning and for the maintenance of existing

green areas in cities, where prevalence rates of both mental and physical illness can be lessened by the inclusion of more green spaces, thusly reducing medical costs. Moreover, it could have an impact in national policy making with respect to highlighting the importance of setting aside protected nature preserves and green spaces all over the world. There would also be an impact in clinical interventions such that new lines of therapy could be investigated that utilize the restorative properties of experiencing nature in reducing cognitive fatigue, negative emotions, and physiological stress. The framework provided by establishing nature relatedness as a basic psychological need can help to orient practitioners and policy developers alike toward the integration of knowledge from previously disparate areas of research, increasing the practical utility of that information by demonstrating clear criteria by which experiences in nature can be used to increase human well-being and health in a variety of ways. Moreover, the research reviewed in this article can help to demonstrate what kind of nature contact (e.g., a short 15-min walk) and in what kinds of environments (nature and urban-nature with reduced levels of traffic noise) is sufficient in eliciting these positive outcomes.

However, we believe that by establishing nature relatedness as a fundamental basic human psychological need, it can provide a common theoretical framework by which all future research in this area can be guided. Our hope is that the present article can provide a strong, theoretical basis by which to guide future research in a more organized, collected way. For example, while there are several articles that examine prevalence rates of disorders relative to the amount of green space near one's home, future research should be more strongly guided by SRT, ART, and PFA in order to determine which types of medical and psychological disorders to target as outcomes. Moreover, no research to date has conducted an analysis of how access to green space relates to cognitive health outcomes. This could be particularly helpful in potentially developing new and simple ways to, for example, help ameliorate known cognitive deficits that occur in older adults based on the known cognitive benefits of exposure to natural areas.

In addition, there are more questions yet to be answered. One such question stems from Sheldon's work (2011). That is, are there compensatory mechanisms that come into play when the need for nature relatedness is acutely and chronically dissatisfied? In SDT, it is known that people will employ compensatory motives when a need is not fulfilled (see Ryan & Deci, 2017). However, Sheldon proposes that chronic need dissatisfaction can lead to different outcomes than acute, and that these processes should be examined separately in order to determine exactly what differences exist. This would be an interesting avenue of exploration, as chronic dissatisfaction of the need for nature relatedness may help explain why some people disconnect from the need-as-motive and abuse the environment rather than protect it. In this way, future research can help to uncover how to better protect people from chronic dissatisfaction of their need for nature relatedness and the corresponding detriments that would occur to well-being, while concomitantly helping to better protect the environment from future degradation.

Résumé

La population mondiale des régions développées vit majoritairement en zone urbaine, et cette proportion croît d'année en année. La principale question concernant cette tendance a trait aux effets éventuels du contact réduit avec la nature sur le mieux-être et le fonctionnement humain. Dans le présent article, nous proposons d'évaluer, au regard des écrits empiriques, l'hypothèse voulant que les êtres humains aient un besoin psychologique fondamental de liaison avec la nature. Cette proposition, si elle est dûment étayée, pourrait avoir des effets positifs sur le mieux-être humain, sur la façon dont nous concevons les collectivités et les milieux humains, ainsi que sur l'environnement naturel. Or, à ce jour, aucun article n'a évalué les publications existantes dans un tel objectif. Le présent article vise à utiliser les conceptualisations établies des besoins psychologiques de base ainsi que les critères proposés par Baumeister et Leary (1995) ainsi que Sheldon (2011) pour examiner de manière critique s'il existe suffisamment de preuves pour étayer cette proposition. La recherche effectuée dans divers domaines sera examinée, et des conclusions seront tirées pour chaque critère, ainsi que pour la documentation dans son ensemble. De manière générale, la recherche confirme la proposition voulant que l'humain ait un besoin psychologique fondamental de liaison avec la nature. Des preuves mieux étayées semblent indiquer qu'il s'agit d'un besoin motivé par la nécessité plutôt que par la volonté, même si ces deux possibilités sont bien démontrées.

Mots-clés : Liaison avec la nature, attachement à la nature, besoins psychologiques, mieux-être.

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Received October 2, 2017
Revision received February 10, 2018
Accepted February 20, 2018 ■