

The pathways to Nature Connectedness: A focus group exploration

Ryan Lumber^a, Miles Richardson^b & David Sheffield^b

^a*Faculty of Health and Life Sciences, De Montfort University, UK*

^b*University of Derby Online Learning, University of Derby, UK*

Abstract

The biophilia hypothesis has been a catalyst for research on the human-nature relationship, with connection to nature an important area. However, the mechanisms involved in achieving this connection have not been explored in a systematic way. Three focus groups were conducted using the biophilia hypothesis as a framework to explore how connectedness to nature can be achieved from the perspective of individuals who engage with nature through the biophilic values. Seven themes emerged from the thematic analysis: investigating nature through scientific enquiry, engaging the senses, creating idyllic nature, noting nature through artistry, nature conservation, growing food and engaging with wild nature. Nature connectedness may result from specific interactions with nature with the seven pathways having implications for both the formation and maintenance of nature connectedness. The factors identified should inform interventions to increase the nature connectedness of individuals with a low connection but further empirical study is required.

Keywords: Nature connectedness, biophilia

Introduction

Humanity often perceives itself as separate from nature, especially in industrialised western societies (Vining, Merrick & Price, 2008). This has led to research aiming to reconnect humanity with nature becoming a common theme within the literature (Tam, 2013). The development of a positive human-nature relationship can arise from engaging with nature through the nine values of biophilia (Kellert & Wilson, 1993) and through the sensation of being connected with nature (Mayer & Frantz, 2004). Often biophilia and Connectedness to Nature are thought to relate, with biophilia acting as an innate desire to connect with nature (Kals, Schmacher & Montada, 1999; Nisbet, Zelenski & Murphy, 2008). While it has been previously proposed that perceiving similarity with nature through applying human characteristics (Tam, Lee & Chao, 2013), childhood experiences (Muller, Kals & Pansa, 2009), walking in nature (Mayer, Frantz, Bruheman-Senecal & Dolliver,

2009) and taking care of plants (Freeman, Dickinson, Porter & van Heezik, 2012) are related to, and therefore facilitate, nature connectedness, the biophilic routes to connectedness have not been examined systematically in any published research to our knowledge. This article outlines an initial qualitative exploration of the routes to nature connectedness from the perspective of individuals engaging with nature, framed through the biophilic values.

The biophilia hypothesis

Hundreds of thousands of years ago, the human species spread from the savannahs of Africa where the landscape offered both survival opportunities (such as shelter and food) and threats (dangerous flora and fauna) to survival, leading to preferences for certain aspects of nature and aversion to others (Kahn, 2011; Wilson, 2002). It has been argued that humanity has an innate tendency to have an affiliation for natural life or life-like processes, surmised as the biophilia hypothesis (Gullone, 2000; Kahn, 1997; Kellert & Wilson, 1993). Having an affiliation for life is theorised to stem from an evolutionary history of searching for survival enhancing settings (Frumkin, 2001; Kellert & Wilson, 1993; Windhager, Atzwanger, Bookstein & Schaefer, 2010) with the awe and wonder such settings provide responsible for the affiliation towards survival enhancing nature (Perkins, 2010). As urban living has occurred relatively recently in humanity's evolutionary history, the embedded learning tendencies derived from nature are unlikely to have been erased from our biology (Nisbet, Zelenski & Murphy, 2011). These innate tendencies are expressed through the nine values of biophilia (see table 1) that cover a range of ways in which individuals relate to or interact with nature (Kellert, 1993) and are often unconsciously manifested in cognitions, emotive responses, artistry and ethics (Kahn, 1997; 2011).

Each of the nine values may cross over into one another on a surface level but they are considered to be separate values with each focussed on its own particular area (Kellert & Wilson, 1993). Affiliating with nature through the nine values leads to an appreciation for diversity and the subsequent flourishing of the individual (Kellert, 1997 as cited by Nisbet et al, 2008). By interacting with nature in one or more of the biophilic values, the human brain may be shaped (in evolutionary terms) in a manner that allows for an innate learning of nature based activities (Gullone, 2000). Thus biophilia is not a hardwired biological process, rather a predisposition for certain natural settings that may be a core human instinct (Wilson, 2002). Biophilia is therefore seen as a biocultural model that occurs through inherited prepared learning (Wilson, 2002) that has been maintained through reliance on and an affiliation towards nature, leading to greater survival and evolutionary fitness (Wilson, 1993); Biophilia may therefore be crucial to optimum human functioning both affectively and psychologically (Nisbet et al, 2011). Tentative evidence exists for innate biophilia as children between the ages of eight and eleven are more likely to prefer savannah

like landscapes, with older children preferring savannah landscapes and their home environment equally (see Wilson, 2002). However an innate transmission of biophilia has been critiqued more recently, as the evidence of the transmission of biophilic tendencies through genetic heritability is questionable; rather it is far more likely a result of experiential learning instead (Simaika & Samways, 2010). The adaptive behaviour this produces will manifest in emotional connections to specific stimuli, the language used and preferences to particular aspects of nature that tie directly into one of the nine values (Wilson, 1993).

Table 1: The nine values of biophilia (Kellert et al, 1993)

VALUE	DEFINITION	FUNCTION
Utilitarian	Practical use of material nature	Sustaining physical life and security
Naturalistic	Pleasure from contact with nature	Development of mental, physical and outdoor skills and development
Ecologicistic-Scientific	Scientific study of the interconnectedness of nature and natural systems	Observing nature, increasing knowledge and understanding
Aesthetic	Appeal of nature's physical beauty	Feelings of security, inspiration and contentedness
Symbolic	Expressing ideas through nature based language and metaphors	Developing mentally, communicating with others/nature
Humanistic	Emotional bond with, and love for nature	Companionship, bonding and co-operation
Moralistic	Ethical concern/judgements and revering nature	Moral reasoning, meaning of life, affiliation
Dominionistic	Control and dominance of nature	Technological/mechanical skill, physicality, control
Negativistic	Aversion, removal and fear of nature	Security and physical protection

Empirical support for the hypothesis has been mixed (Khan, 1997) yet evidence supporting the hypothesis does exist. Natural scenes and plant life contain the aesthetic qualities required for mental restoration (Kaplan, 1995) and recovery from stress (Wilson, 2002). After surgery, recovery was quicker for patients who were given natural views compared to urban brick walls (Ulrich, 1984). Physical and mental health aside, humans have an intrinsic interest in both known and unknown nature; dinosaurs continue to fascinate and inspire, acting as an icon of lost biodiversity (Wilson, 2002) while zoos have larger annual attendances compared to all the major sports combined in the United States of America (Kellert & Wilson, 1993). Such factors along with the time invested in pet keeping (Kahn, 2011) and the

popularity of wilderness activities point to an advantage and desire to affiliate with nature through biophilia (Nisbet et al, 2011). The majority of research supporting the hypothesis does not test the rubrics of biophilia directly, as the hypothesis is difficult to test scientifically as the theory's ambiguous nature makes it difficult to refute (Kahn, 1999). As a result, far more research support has been reported for Biophobia, an innate aversion towards particular aspects of nature, with the claim that the existence of Biophobia indicates the existence of biophilia (see Gullone, 2000). As the link between biophilia and iophobia is difficult to justify (Joye & van den Berg, 2011), investigation into Biophhilia has diminished in favour of research into nature connectedness and place attachment. Despite this, biophilia has been a useful catalyst for research into the human-nature relationship (see Hartig et al, 2011).

Connectedness to Nature

A prevailing view held by modern western cultures is that humanity is set apart from (Vining et al, 2008) and even above nature (Maller et al, 2009) due to cultural perspectives of the uniqueness of humanity (Catton & Dunlap, 1978) and technological advances that allow the utilisation of and control over nature. No matter how far humanity advances technologically, nature and humanity can never be separate (Kahn & Hasbach, 2012). This is a pressing concern given that the distinction between nature and humanity is often seen to result in environmentally harmful behaviours (Haila, 1999). There is therefore a need to reconnect humanity with nature as doing so may help address the current environmental crisis (Tam, 2013). This will only be possible through reducing the sensation of separation in favour of nature being part of an individual's concept of self (Mayer & Frantz, 2004; Schultz, 2001). Extending the self-concept to include nature creates a feeling of kinship (Olivos, Aragonés & Amerigo, 2011) and commonality with all life (Fox, 1990) as nature and self are perceived as one and the same (Light, 2000). A connectedness to nature therefore creates a sense of belonging to the wider natural world as part of a larger community of nature (Mayer et al, 2009). This is not a new concept, as traditional indigenous belief systems often see the Earth and self as one and the same, with an individual's identity entwined with the fate of the wider environment (Macy, 2007). Since medieval times, the concept of 'Friluftsliv' – a lifestyle of joy, freedom and experience leading to a spiritual connectedness with nature – has existed in Sweden and continues to influence lifestyle and education to this day (Beery, 2013). Anthropomorphising nature may also be important for perceiving one's self as being part of nature as it is the 'cognitive mechanism' for developing a biocentric ethos (Kahn, 1999; Vining, 2003) as natural elements are humanised, leading to feelings of similarity and empathy (Tam et al, 2013). A biocentric ethos is thought to make any selfish benefit to humanity foresworn in order to preserve the richness and diversity of life, regardless of whether nature possesses

utilitarian properties or not (Naess, 1986), as everything in nature has a cultural, biological and individualistic value (Bourdeau, 2004; Drengson & Devall, 2010). Possession of this viewpoint (and therefore a connectedness to nature) is thought to lead to an appreciation of the richness of life and the flourishing of humanity (Naess, 1986) as harming nature when it is part of the self-concept is akin to harming oneself (Frantz et al, 2005; Mayer et al, 2004; Muller et al, 2009; Roszak, 1995). While a sense of self and nature as one and the same may fluctuate slightly depending on individual circumstances, a biocentric ethos is vital to humanity living in balance with wider nature (Wilson, 2002). Possession of a nature-self-concept results in an affective connection with nature, comprised of four aspects: love, freedom, security and being part of nature (Muller et al, 2009). Becoming emotionally affiliated with nature occurs through positive interactions during childhood (Hinds & Sparks, 2008; Muller et al, 2009) where the memory of the connecting experience and the emotions attached to it, become imprinted upon the landscape as a sense of place (Hawkes & Alcott, 2013). While an emotive attachment to nature comprises (in part) a connection to nature, being connected goes beyond a surface love for nature (Frantz et al, 2005) as proposed by biophilia; instead an appreciation for the interconnectedness between all life is gained (Nisbet et al, 2008). The emotional attachment to nature formed through childhood exposure to nature endures in the form of a trait which contributes to a desire to have contact with nature in adulthood (Muller et al, 2009) and even though contact may not always be possible due to restrictions on opportunity, the desire to have contact is ever present.

Engaging with nature and connectedness

There are many ways of engaging with nature in order to develop a connectedness with nature. It is thought that contact with garden space may counter the disconnection with nature brought on by urban living (Shaw, Miller & Wescott, 2012). Qualitative interviews have indicated access to personal nature spaces such as allotments tap into positive childhood experiences, with plants providing a place to relive positive physical and emotional interactions with nature from childhood (Hawkes et al, 2013). It is reported that 84% of the UK population have access to private gardens with such spaces thought to facilitate the sensation of nature connectedness through emotional attachments formed by feeding visiting birds and nurturing plants (Freeman et al, 2012). The type of gardening engaged with may be subjectively important as individuals taking part in wildlife gardening, a method of arranging garden spaces to explicitly encourage biodiversity, had a greater average sense of nature connectedness for some wildlife gardeners, while others had a lower connection with nature score than the general public (Shaw et al, 2012). Contact with nature has been tested empirically with walking in natural settings significantly increasing nature connectedness over exposure to virtual nature (Mayer et al, 2009).

Viewing aesthetically pleasing natural settings facilitated wellbeing benefits through an increased connection to nature (Zhang, Howell & Iyer, 2014) with vegetation in the local area and outdoor physical activity increasing levels of nature connectedness. Actively noticing nature has also been shown to facilitate connectedness to nature, with the sensations of growth, beauty and wonder being examples of key themes (Richardson, Hallam & Lumber, 2015). Time outdoors has a positive correlation with Nature Relatedness (Nisbet & Zelenski, 2013; Nisbet et al, 2008) whilst an emotional affinity to nature is linked to activities as diverse as zoo visits, walking in rural environments or eating green vegetables (Muller et al, 2009). In a national study of Swedish nationals, activities such as gardening, studying nature, bird watching and walking in nature were all positively associated with a sense of belonging to the natural landscape (Beery, 2013). Finally, childhood experiences of camping, hiking, playing in woods and picking flowers are positively related to protective environmental behaviours as adults (Wells & Lekies, 2006) with childhood experiences again leading to more engagement and the possession of nature connected attitudes in adulthood (Beery, 2013).

Clearly some pathways facilitate a connected relationship with nature more effectively than others. The routes to a positive human-nature relationship have been investigated largely in an isolated manner without any systematic focus. What is needed is an exploration of the pathways to connectedness via a systematic approach that utilises established theory. As the biophilia hypothesis has been proposed to function as an innate desire to connect with nature, there is a need to explore how the nine values of biophilia might lead to the formation of a connectedness to nature through a methodical enquiry. To that end, an exploration of the pathways to nature connectedness was undertaken using a focus group methodology, structured around the nine values of biophilia.

Method

Aim

The study aimed to explore what factors are involved in becoming connected to nature from the perspective of individuals who engaged with nature via the biophilic values, with the participant's biophilic engagement with nature assessed by the first author.

Participants and focus group structure

A total of 11 participants (3 female) took part in one of three focus group discussions. Participants were recruited from local groups involved in a range of nature based activities as well as staff and students from the University of Derby. The

groups and individuals were invited to take part in the study based on the type of activity they regularly undertook that involved an engagement with nature. It was important to assign participants to groups where similar others were present, either in terms of their interest or their background to enable a positive group dynamic to form (Davies, 1999; Lehoux, Poland & Daudelin, 2006). This was done through the activity the participant regularly engaged with being mapped onto a value of biophilia by the first author with the participant assigned to the focus group that was structured around that particular value. For example a participant who worked as a pest controller was assigned to the dominionistic focus group whereas a participant who was a practicing zoologist was assigned to the ecologicistic-scientific group. Each focus group covered three biophilic values; utilitarian, dominionistic and negativistic in the first group, aesthetic, symbolic and naturalistic in the second and humanistic, ecologicistic-scientific and moralistic in the third. These three groupings were specifically chosen in order to create a positive group dynamic as the values grouped together were deemed the most similar to one another by the authors.

Procedure

The nine values of biophilia were used as a framework to explore the experiences and views of the participants with each focus group covering three values that were deemed similar in their essence. All of the focus groups took place at the University of Derby with participants provided with refreshments, but no financial or other incentive was offered. Participants were provided with a combined brief/consent form with the details of the purpose of the study and their rights to withdraw. After agreeing to take part the participant would then create a pseudonym to ensure anonymity when extracts were used.

A schedule was created for the focus group that covered the order of key questions, words or phrases linked to the questions used to encourage discussion and the order of prompts to be used. To start with, an 'ice-breaker' activity was used that involved participants introducing themselves and described an animal they would wish to be and why. Once each participant had introduced themselves, a group discussion on what they thought nature connectedness was, was enacted, with a 'mind map' created based on the participant responses. A series of prompts were then presented to facilitate discussion on how nature connectedness could be gained or increased by relating to nature through the particular biophilic value. Each of the prompts was based on one of the values of biophilia with three prompts used in each focus group. These included physical objects (plants, classification charts, nature-based art), images (farms, adverse weather, dams, animal charity logos, nature based phrases) and the *Inclusion of Nature in Self* scale (Schultz, 2001). The participants were free to discuss the topic area with one another in order to generate ideas with the researcher acting as a moderator to ensure the discussions stayed on topic, that all participants

were able to take part equally and that all three biophilic values were covered. It was important to accurately document the discussions held within the focus group so each was recorded using a Dictaphone and supplemented with researcher notes (Kidd & Parsall, 2000) to produce a transcript containing the interaction data for subsequent thematic analysis. Each focus group discussion lasted for an hour, after which the participants were provided with a debrief sheet explaining the purpose of the study and their right to withdraw up to three weeks after the focus group had taken place.

Analytical Method

Thematic analysis is perhaps, the most often used qualitative approach in research (Roulston, 2001; Buetow, 2010) as the flexibility it affords can be tailored to a semantic (Bailie, Kuyken & Sonnenberg, 2012) or a deeper, phenomenological approach (Sullivan, 2003) dependant on the research aims (Braun & Clarke, 2006). Because the aim of the research was to examine the factors involved in facilitating nature connectedness a semantic approach was chosen. The semantic approach is tied and influenced by previous research and by using a theoretical framework to explore the experiences of participants and the meanings ascribed to them which are found explicitly in the verbal accounts given but through the analysis, go beyond description by providing interpretation to theorise wider meanings and implications (Braun et al, 2006; Bailie et al, 2012). Such a realist epistemology sees the relationship between meanings, experience and language as simple and overt that lends itself well to a detailed exploration of a specific area of interest in a top-down, deductive approach (Braun et al, 2006). A theoretical epistemology was chosen before any data was collected when planning and designing the study. The biophilia hypothesis states that humanity interacts with nature in nine ways (Kellert et al, 1993), with this hypothesis used as the theoretical underpinning of the focus group research. This meant that the study and subsequent thematic analysis was theory driven as the research aimed to explore the routes to nature connectedness from the perspective of individuals who engaged with nature via biophilia. In order to avoid the main criticism that thematic analysis can be an unclear or incomplete methodology (Buetow, 2010), the analysis followed the methodological guidelines proposed by Braun and Clarke (2006): familiarisation with the data, transcript creation, re-reading of the transcripts, initial impressions noted, initial coding of the data, creation of themes and the thematic map, and naming of the super-ordinate themes.

Results

It is acknowledged that due to participants not attending the focus group sessions, the size of the focus groups was not ideal, as typically focus group sample sizes range from between six to ten participants per group (Bloor et al, 2001). The study

therefore represents an initial enquiry of the pathways to Nature Connectedness. The use of previous findings to inform the focus group discussions may have led to some researcher influence to be present in the analysis and subsequent findings. Focus groups contain an inherent researcher influence that is vital to the facilitation of the interaction data generated by a shared exploration of the focus group topic (Lehoux et al, 2006). This strengthens the data obtained as new insights can emerge on previously hidden aspects through group exploration (Lambert & Loiselle, 2007) that may be missed by other methods such as survey data (Itaoka, Saito & Akai, 2011). The thematic analysis initially generated thirty themes that were combined to form seven main themes from the focus group data with each theme exploring how participants became connected to nature. The themes were: scientific enquiry of nature, engaging with the senses, creating idyllic nature, noting nature through artistry, conservation of nature, growing food and relating to wild nature.

1. Scientific enquiry of nature

The scientific exploration of nature was seen as a key factor in choosing to interact with nature that led to the initial nature connecting experiences for some of the focus group members:

Once you see the communities that live within a bush or a tree, it's not just a tree, it's a whole inter-connected web like nature connectedness. Nature itself is connected to everything else; nothing lives in isolation...for some it sparks, it did for me and it affected my entire life once I got my head around it. [Ragnar, Focus Group 3]

The study of nature through science was a catalyst for nature connection experiences, especially in childhood where “it planted that seed that made me go further” with these initial experiences informing vocational choices as “now I’m a zoologist”. The appreciation for nature that was instilled in them through a scientific investigation of nature impacted on the whole life of the individual and the choices they made. By engaging with their natural curiosity, the focus group members spoke of their love for exploring and investigating local nature, as there were “loads of ponds up there and they were brilliant newt ponds so again we used to come home with newts in our pockets”. However, they also spoke of their regret at doing this as “if I look back on mine I wouldn’t do what I did do and that was bring it all home in jam jars” as they felt partly responsible for the demise of at risk species. By applying scientific methods in their exploration of nature such as looking “under a low powered microscope...look down a lens and it’s hundreds of little things swimming about... it’s amazing” provided new insights and new worlds, hidden within the mundane. This fostered an appreciation and value for nature as they went beyond a surface understanding to sense the connectedness inherent in nature through the newfound value they now possessed.

By engaging with nature through science, especially in childhood, a deep appreciation for nature and the interconnectedness between all life was formed (Auster et al, 2008). This insight was seen as a route to nature connection as the individual became aware of how they fit into a wider natural context and the role they can play both in harming or protecting the natural environment with the new found value being the determining factor. This relates to the concept of deep ecology, where individuals value the richness and diversity of nature regardless of its potential for human use as humanity and nature are inter-related and part of the same community of life (Drengson et al, 2010; Naess, 1986).

2. Engaging the senses

Having an interaction with nature was seen as important in becoming connected to nature, as positive experiences were seen to encourage a connection. The way in which nature was interacted with was important, with the physical senses of touch and smell deemed more important than sight by some and the aesthetics it could provide:

You draw your hand through (does so with a plant) like that in a mass of mint and then smell it; beautiful smell...if you just looked at it, you wouldn't get the smell so you've got to touch it [Don, Focus Group 2]

By engaging with the physical senses, interactions with nature are heightened and a connection made as “it just brings you closer to nature” through natural smells and physical contact. The act of physically touching nature was seen as going a step further in their connection than simply passively looking at nature as “you can see things but that’s an entirely different thing to actually touching something”. The desire to touch nature transcended the self into more than a passive observer by becoming actively engaged with their natural surroundings. Physical contact facilitated the release of smells in plants notably from “lavenders and herbs” in a “really nice smelling corner of a garden” creating pleasurable sensations that made them feel “very peaceful and you can just chill out and lose yourself”. It was also seen as a way of engaging people whose sight was limited as there are “sensual gardens for sight impaired people” so the act of smelling a fragrance was deemed to be accessible to most.

Through interacting with nature via touch, an emotional attachment to nature was formed, with emotion being a determinant of nature connection (Mayer et al, 2004). Physical contact alone was not enough for some of the focus group members as it became a means to acquire another sense important in becoming connected to nature: smell. Engaging with nature through the senses has been linked with restoration and nature connectedness (Ratcliffe, Gatersleben & Sowden, 2013; Richardson, Hallam & Lumber, 2015) with smell having been found to increase

sensory perception when engaging with restorative natural surroundings that produces a sense of tranquillity (Kjellgren & Buhrkall, 2010). This fed into the restorative benefit of gardens, generated by the pleasurable smells and physical sensations it contained that created a deeper sense of connectedness and an intertwined garden-gardener identity (Freeman et al, 2012).

3. Creating idyllic nature

When becoming connected to nature, the focus group members recognised that not all of nature would necessarily be connected to as individual preferences for 'pleasant' nature abound:

We just want to see it nice and rosy and sweet and flowers and little bunny rabbits and buttercups; that's nature but it isn't, you know, you see whatever there is, is nature [Stersvevier, Focus Group 1]

The focus group discussions turned often to what constituted nature, feeling that it was very difficult to separate humanity and its creations (such as buildings or technology) from biological nature, forming the view that "we kind of divide natural things and manmade things and separate them ... we are all part of nature as it is". This line of thought led to a discussion of the notion that an ideal or romanticised view of nature existed within society as the 'cute' and 'attractive' aspects of nature drew people in as connections would form with some but not all aspects of nature. Such personal preferences in turn led to the arrangement of natural spaces "I like them with varying coloured leaves... I like a natural looking garden, I don't like a formal one" where moulding natural spaces to conform to an ideal facilitated a connection through the restoration the space provided "with gardening that's how I lose myself".

Preferring particular types of nature mirrors the perspective of Fox (1990) where interactions with nature that are perceived as positive allow for an experience of similarity leading to a connection with it. The preference for particular animal species has been documented previously with larger size (termed charismatic megafauna), human attributes and particular colour providing appeal (Simaika et al, 2010; Stokes, 2007). The focus group members deemed the interaction with an idyllic form of nature to be a route to nature connection as they felt that such aspects, for the majority of society, would be the kind of nature they would want to connect to. Nature connectedness may therefore be based on preferences for particular aspects of nature such as gardens (Freeman et al, 2012) with such natural environments selected based on their perceived restorative properties (Kaplan, 1995).

4. Noting nature through artistry

Being connected to nature leads to a desire to have direct experiences with the

natural world that can be interpreted and shared through artistry such as photography or painting:

It's, you're taking the picture like that because you don't see it every day, it is something different and you're taking pictures so you can show it to other people to say 'look, I saw this yesterday, not seen one of these before' [Don, Focus Group 2]

Nature was seen as often being pushed into the background as even when people engaged with an outdoor physical activity nature was missed out:

I've got an uncle who loves walking, but he cannot see the point in walking across a field; it's always street walking...a lot of people sort of feel oblivious to [nature]

Noticing nature was important in becoming connected, with novel often aesthetically pleasing nature capturing an individual's attention. Once nature had been noticed, a connection would be experienced that could be preserved as "they might take the sketch pad and sketch, paint" or "go out and take photos". The act of preserving the connecting experience was seen by some to inspire others to achieve their own connection to nature as it "gets people out to visit the places that you see" as they become interested and encounter nature first hand. An alternative view saw artistry as serving a personal function "if you take a good photograph of something you'll always remember; you'll look it up in your book and think I remember that" as the experience of connecting with nature would be preserved and re-lived.

The visual appeal of nature has a strong influence on becoming connected to nature as beautiful or dramatic nature is novel enough to catch the eye of otherwise oblivious individuals. This relates to the finding that actively noticing nature led to an increased connectedness with nature with the sensations, growth, beauty and wonder being key themes (Richardson, Hallam & Lumber, 2015). Whilst taking notice of nature is important, it was the result of taking notice of nature that the focus group members saw as being the important factor in connecting to nature. By having a photograph or painting, the interaction with nature is remembered and facilitated the reliving of the connecting experience. It was the preservation of the scene that was an important factor for the focus group members as this was seen to not only inspire the keeper of the scene but also those who viewed it as they would want to have a similar experience of their own that may relate to the importance of fascination described by Kaplan (1995).

5. Nature conservation

One of the most frequently discussed themes that emerged from the focus group discussions was that of the negative impact humanity had upon nature; this created a need to become involved with some form of practical work to make amends:

Our actions which will alter what happens to the Earth. We can't do all the things that we've done and not have any effect I mean the reason we have floods in places because we take away the tree's, build things on the floodplains, pushes the water out of other areas so we alter our own environment. We're altering it in this case for the worst but we have the ability to alter it for the better [Colin, Focus Group 1]

Humanity was seen as not only separate from, but also as an enemy of nature with the prevailing opinion that “humans are the worst thing on this planet” stemming from the irresponsible use of nature by wider society. But there was contention within the group as some felt that despite knowing that the current exploitation of natural resources could not continue, changes in their own behaviour could make little difference: “I still go down to the shop ... but everyone does, you still go down to the shop and there's fish there”.

This was a view not held by all as others had made a choice and felt that their actions would be the start of change “there's everything there but there are people who have made a choice, like I've chosen to abstain from eating fish”. Taking practical action was important as the participants wanted to make a difference in protecting nature as “they've had a tough time so I think any help that they get from us is needed” especially in “improving our environment in England; protecting our species” as protecting local nature was considered a high priority. By acting to conserve nature, especially local natural spaces, an emotive connection would form towards the conserved natural entity.

As a species, humans were perceived to destroy natural habitat and organisms purely for selfish gain. It was acknowledged that even possessing pro-environmental attitudes and knowledge did not necessarily lead to pro-environmental behaviours, despite such attitudes being a component of connection to nature (see Mayer et al, 2004). Participating in activities that benefit local nature were crucial therefore in turning pro-environmental attitudes into positive action that would then work to increase an individual's connection to nature. The local natural spaces would become valued for the animals and fauna it contained and the inter-connectedness of all life would be appreciated and related to (Fox, 1990). This would lead to a desire to protect the local habitat manifested in practical action, supporting the notion of place attachment in creating pro-environmental behaviours (Scannell & Gifford, 2010a; 2010b).

6. Growing food

Living in modern urban environments was seen as isolating an individual from nature as a lack of any practical reliance on what nature provides caused a disconnection:

Everything we want and need in the supermarket or we've got a house and all that sort of thing and city, if you go to the rural you have to nurture it whereas you don't in the city because

someone else is doing it for you. So the people in the city don't think about nature too much because they don't have to...we're busy doing other things [Colin, Focus Group 1]

Humanity was seen as removed from nature, as the fast pace of urban life leads to a reliance on convenience for food and other needs, leading to a disconnection as a lack of reliance on nature leads to low appreciation for the natural world as “if you've got all this that can take away from your feeling of connectedness to nature”. The disconnection from nature stems from a lack of appreciation for what nature provides as individuals “are less concerned about what happens to nature” and was especially prominent in children as “they don't know that sheep or cows provide our food ... they thought cheese grew on trees, they had no idea”. Engaging with a natural process such as growing “a lot of stuff which they eat and cook” was perceived to increase nature connectedness as the value of nature increased because “you cared about nature” and invested time into growing the food. There was hesitation over a complete abandonment of the gains made by modern living “it also allows you to do a lot of things that society has become reliant on” and so a wholesale “pitching in and just growing food and stuff” was not required to facilitate nature connectedness.

A reliance on urban conveniences was seen to provide a higher quality of life but at the same time reduced the connectedness individuals felt with the nature around them. For the focus group members, the main factor to increase nature connection was to become involved hands on with some form of nature based process. This relates to previous research on allotment space being perceived to reconnect the individual to nature by providing an opportunity to act within it (Hawkes et al, 2013) with the food produced and then consumed by the individual out of a desire to feel more connected (Holloway & Kneafsey, 2004). There was disagreement over the complete dedication to being involved in natural processes but growing food on a small scale would provide a connection without diminishing the gains an urban lifestyle afforded them. This notion is supported by Light (2000) where city living that encourages diversity (both cultural and biological) can encourage a deeper connection to nature where nativism is not necessary to live in a positive way with nature.

7. Engaging with wild nature

The relationship that forms as a result of having a connection with nature was seen as lifelong with some focus group members being unable to remember a time when they weren't connected to nature. The relationship was described as fundamental to the self, a requirement for living:

I do feel, if you like not alone and that you are a part of something...that I would feel that half of me was missing if there was no nature you know, and I definitely feel that I'm one of those people that need it [Scarlet, Focus Group 3]

The sense of companionship was an enduring bond that developed through positive interactions with animals and wider nature as the individual felt a sense of similarity with a specific aspect of nature. The focus group members expressed this similarity in the form of emotional attachments: “I would fight for animals ... because Orangutans are endangered and in crisis”; anthropomorphism: “a chimp ... we’re the closest in sort of intelligence level ... so that’s probably the thing I value the most”; and scientific similarity: “they’ve all got the same bones as we have; they’re from a common ancestral origin”. All three routes were seen to enable a relationship to be formed with a natural organism and developed through positive interactions. Pet ownership was not capable of facilitating a connection with nature as the focus group members felt “that having a pet is being connected but I personally don’t feel that way” as the process of domestication meant the animal was no longer subject to the natural order and were almost human themselves as they “eat out of the cupboard like I do”. By being “close up to a wild animal” that is not “outside of the natural order”, a connection to nature could be achieved by forming a relationship with undomesticated nature.

Having a relationship with nature was an important aspect of an individual’s self-concept (Schultz, 2001) that helped to foster a sense of commonality with wider nature (Schultz, Shriver, Tabanico & Khazian, 2004). This was facilitated through emotional attachments (an important aspect in pro-environmental attitudes, Mayer et al, 2004), and perceiving a shared genetic heritage and equal value of all life (Drengson et al, 2010; Fox, 1990). A contradiction did exist as humans were still perceived to be separate from nature (Haila, 1999; Vining et al, 2008) so any area of nature touched or subject to large scale human influence such as domestication of animals was perceived to be against the natural order and so could not facilitate nature connectedness. From this perspective, anthropomorphising nature (Tam et al, 2013) was therefore not conducive for nature connectedness as only engaging with wild animals was a route to connectedness as they retained their natural status by being free from human influence. It is worth noting that the discussions only related to the anthropomorphism of animals as fauna or natural spaces were not explored; therefore further investigation of the anthropomorphisation of other natural entities and nature connectedness is needed.

Discussion

The pathways identified by the thematic analysis propose seven ways in which an individual can become connected to nature and are summarised in table 2 along with an approximate mapping to the values of biophilia. While the biophilia hypothesis was used as a framework to cover the breadth of human interactions within nature for the focus group discussions, there are distinct differences between the seven pathways and the nine biophilic values. This does not discredit the nine biophilic

values in any way, rather the seven pathways represent the activities that led to a positive relationship with nature for the participants and may be the result of the differing conceptual approaches of biophilia and nature connectedness. Following this qualitative exploration, the seven pathways were further refined with five identified and tested quantitatively with contact (naturalistic), emotion (humanistic), meaning (symbolic), compassion (moralistic), and beauty (aesthetic) emerging as significant pathways of nature connectedness (Lumber, Richardson & Sheffield, 2017).

Table 2: The seven pathways to Nature Connectedness

BIOPHILIA MAPPING	PATHWAY	HOW NATURE CONNECTEDNESS IS FACILITATED
Ecologicistic-Scientific	Scientific enquiry of Nature	Through an appreciation of the interconnectedness of all life, (including humanity) by investigating nature using scientific methodology
Naturalistic	Engaging the senses	Engaging the senses including touch, sound and smell to feel deeply in connected with nature
Dominionistic	Creating idyllic nature	Shaping natural spaces to become more in line with a personal ideal that facilitates restoration
Aesthetic	Noting nature through artistry	Actively taking notice of nature to experience nature connectedness and preserving the experience through artistic expression
Moralistic	Conservation of nature	Protecting local natural environments from human caused harm leading to an emotional attachment for the conserved habitat
Utilitarian	Growing food	Appreciating nature by nurturing and growing produce that is eaten to increase the value held for nature
Humanistic	Engaging with wild nature	Forming an emotional attachment to non-domesticated, wild animals through a sense of similarity through positive interactions

The seven pathways & biophilia

The biophilia hypothesis asserts that human interactions with nature result from an innate need to affiliate with life through the nine values (Kellert & Wilson, 1993). Whilst the nine values were utilised as a framework for the focus group discussions, they did not directly map onto the seven pathways identified by the thematic analysis. The utilitarian value places an emphasis on the practical use of nature and while the growing food pathway advocated the production of food, sustenance was not the end goal; rather it was always out of a desire to feel closer to nature. Creating idyllic

nature was comparable to the dominionistic value as both advocated a control over natural spaces. Yet by shaping nature to be personally ideal, a connection came from the restoration this provided, through the natural space being similar to nature that was not born from a desire to dominate natural spaces despite it being a form of control over nature. The humanistic value was similar to the engaging with wild nature pathway as an emotional bond formed with animals but the value's focus on animal companionship differs from the pathway as companion animals were too domesticated and could not facilitate nature connectedness. Noticing nature due to its visual appeal was shared by both the aesthetic value and the noticing nature through artistry pathway. While the aesthetic value sees visual appeal as a mechanism for survival, the pathway instead emphasised the role of inspiration and awe of nature as creating a desire to preserve the resulting experience of nature connectedness rather than explicitly focussing on the survival benefits that natural aesthetics provide.

Although some of the pathways contained noticeable differences from the values of biophilia, there was a direct comparison between two pathways and the biophilic values. Through the conservation of nature, ethical judgements were employed to protect nature and formed a connection with the local environment. The desire to protect natural spaces expressed in the conservation pathway are similar to the moralistic value, with both placing the ability to affiliate with nature through moral reasoning as an important factor for the relationship with nature. The ecologicistic-scientific value linked directly to the scientific enquiry pathway. Both placed an emphasis on the study of nature that lead to an appreciation for the interconnectedness within natural systems. The only difference between the two is the overall function; the biophilic value emphasises further understanding as a means to an end whilst the pathway leads to an experience of nature connectedness through scientific investigation.

However, not all of the nine values relate to the seven pathways identified, as the negativistic, naturalistic and symbolic values have no direct comparison. This may be due to the naturalistic value representing direct contact with nature through outdoor skills and whilst an engagement with nature is present in the seven pathways, contact was not always necessary. Neither an expression of ideas through nature nor an aversion to nature was seen as a path to nature connectedness. Whilst it is unsurprising that an avoidance of nature would not be a pathway to connectedness, the lack of symbolic language in any of the pathways was unexpected and warrants further exploration.

The difference between biophilia & Nature Connectedness

The differences between the nine values and the seven pathways may be due to biophilia and nature connectedness being different constructs. Biophilia suggests that humanity has an innate tendency to affiliate with nature because doing so provided

survival opportunities (Frumkin, 2001; Kellert & Wilson, 1993; Windhager et al, 2010). As a consequence of evolutionary advancement, the perception that humanity was set apart from nature emerged that influenced the prevailing view in western cultures of the uniqueness of humanity (Catton & Dunlap, 1978) and along with technological innovation, contributed to the (false) view that humanity no longer relied on nature. While the perception of a separation from nature pervades western society, it has not been forgotten that engaging with nature was advantageous and through learning, an affiliation for life could be activated (Simaika et al, 2010). However, despite technological advances, humanity has never stopped being a part of nature (Kahn & Hasbach, 2012) as the biophilia hypothesis would imply. In contrast, nature connectedness is more than an innate need to affiliate with a separate other; it is the recognition that humanity is a part of nature. For the participants, becoming connected to nature was a realisation that humanity is part of an interconnected web of life, as evidenced by the scientific investigation of nature pathway. Connecting to nature was also an act of self-realisation of the similarity between other aspects of nature and the individual (Schultz et al, 2004), brought on by engaging with wild nature and through the conservation of local nature to which the individual had become attached to.

Engagement with nature and connectedness

Previous research has found that by actively engaging with nature, connectedness could be facilitated (Martin, 2004; Nisbet et al, 2008; Zelenski & Nisbet, 2012). Engaging with nature was a component to nature connectedness for the focus group members but becoming connected required contact with nature via the specific pathways rather than general contact as advocated by previous research. Contact with nature during childhood has been proposed as particularly important as a predictor of an emotional affiliation for nature and continued interactions with the natural world in adulthood (Muller et al, 2009). This was supported by the scientific enquiry of nature and growing food pathways as both advocated the importance of engaging with nature specifically during childhood.

Limitations and future research

While focus groups are a valid method of qualitative exploration, the results only represent the perspective and experiences of eleven individuals and their own personal connection to nature. The data obtained provides an initial examination of the pathways to nature connectedness but further empirical investigation is required to ascertain the efficacy of the seven pathways identified both theoretically as a concept and practically in facilitating nature connectedness. Future research could do this through a theoretical investigation of the seven pathways to determine how the proposed factors relate to nature connectedness conceptually or through the

translation of the identified routes into interventions where their effectiveness could be tested. It is envisioned that as an intervention, the seven pathways do not operate in isolation and may complement one another to be enacted concurrently. Activities or interventions could be designed to facilitate nature connectedness where all or several of the seven pathways are represented within the activity engaged with; thereby lending further support to the notion of certain pathways to nature connectedness.

The seven pathways to Nature Connectedness

The utilisation of the focus group methodology to explore the pathways to nature connectedness, structured around the nine biophilic values has not been conducted before and contributes to understanding of how nature connectedness occurs. The perspectives of the focus group members who engaged with nature through biophilia highlighted seven potential pathways for engaging with nature that, for them, facilitated connectedness. By engaging with nature through the seven pathways, the focus group members formed a connection to nature as nature became a part of their self-concept (Schultz, 2001). Previously, anthropomorphising nature (Tam et al, 2013) has been linked to nature connectedness as a process of perceiving similarity through ascribing human qualities to nature. The requirement of engaging with wild nature that is devoid of human characteristics for the focus group members did not support this link as it was the animal's own characteristics and not those considered to be human that were important. A connection to nature was facilitated instead through childhood experience (Muller et al, 2009) by growing food and investigating nature through scientific enquiry. Noticing nature (Richardson, Hallam & Lumber, 2015) through the senses and artistry and caring for plants (Freeman et al, 2012) when creating idyllic natural settings and through protecting local environments also led to nature connectedness.

While there were similarities between nature connectedness and six of the nine values of biophilia, nature connectedness is more than an innate need for nature; it is rather, a realisation that there is no divide between humanity and nature, an acceptance that as a human being, you are an interconnected natural organism. The seven pathways reveal a varied range of routes to engagement with nature through scientific enquiry, by engaging the senses, in creating idyllic nature, by noting nature through artistry, through the conservation of nature, by growing food and through engaging with wild nature. The pathways identified therefore provide potential routes to the formation of an individual's connection to nature and the associated benefits to wellbeing and pro-environmental behaviour that it brings.

References

- Auster, P.J., R. Fujita, S.R. Kellert, J. Avise, C. Campagna, B. Cuker, P. ... & P. Glynn. (2008). Developing an ocean ethic: science, utility, aesthetics, self-interest and different ways of knowing. *Conservation Biology*, 23: 233-235.
- Baillie, C., Kuyken, W. & Sonnenberg, S. (2012). The experiences of parents in mindfulness-based cognitive therapy. *Clinical Child Psychology and Psychiatry*, 17: 103–19.
- Beery, T.H. (2013). Nordic in nature: friluftsliv and environmental connectedness. *Environmental Education Research*, 19: 94–117.
- Bloor, M., Frankland, J., Thomas, M. & Robson, K. (2001). *Focus Groups in Social Research*. United Kingdom: Sage.
- Bourdeau, P. (2004). The man-nature relationship and environmental ethics. *Journal of Environmental Radioactivity*, 72, 9-15.
- Braun, V. & Clarke, V. (2006) Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3: 77-101.
- Buetow, S. (2010). Thematic analysis and its reconceptualization as “saliency analysis”. *Journal of Health Services Research & Policy*, 15: 123-125.
- Catton W.R. & Dunlap, R.E. (1978). Environmental sociology: A new paradigm. *American Sociologist*, 13: 41-49.
- Davies, A.R. (1999). Where do we go from here? Environmental focus groups and planning policy formation. *Local Environment*, 4: 295–316.
- Drengson, A. & Devall, B. (2010). The deep ecology movement: origins, development & future prospects. *The Trumpeter*, 26: 48–69.
- Fox, W. (1990). Transpersonal ecology: “psychologising” ecophilosophy. *The Journal of Transpersonal Psychology*, 22: 59-96.
- Frantz, C., Mayer, F.S., Norton, C. & Rock, M. (2005). There is no “I” in nature: The influence of self-awareness on connectedness to nature. *Journal of Environmental Psychology*, 25: 427–436.
- Freeman, C., Dickinson, K.J.M., Porter, S. & van Heezik, Y. (2012). “My garden is an expression of me”: Exploring householders’ relationships with their gardens. *Journal of Environmental Psychology*, 32: 135–143.
- Frumkin, H. (2001). Beyond toxicity. Human health and the natural environment. *American Journal of Preventative Medicine*, 20: 234-240.
- Gullone, E. (2000). The biophilia hypothesis life in the 21st century: increasing mental health or increasing pathology? *Journal of Happiness Studies*, 1: 293–321.
- Haila, Y. (1999). Biodiversity and the divide between culture and nature. *Biodiversity and Conservation*, 8: 165–181.
- Hartig, T., van den Berg, A.E., Hagerhall, C.M., Tomalak, M., Bauer, N., Hansmann, R., ... Nilsson, C. (2011). “Health benefits of nature experience: Psychological, social and cultural processes”, in K. Nilsson, M. Sangster, C. Gallis, T. Hartig, S. de Vries, K. Seeland, & J. Schipperijn (Eds.), *Forests, Trees and Human Health*. Dordrecht: Springer Netherlands.
- Hawkes, F.M. & Acott, T.G. (2013). People, environment and place: the function and significance of human hybrid relationships at an allotment in south east England. *Local Environment: The International Journal of Justice and Sustainability*, 18: 1117-1133.
- Hinds, J. & Sparks, P. (2008). Engaging with the natural environment: The role of affective connection and identity. *Journal of Environmental Psychology*, 28: 109-120.
- Holloway, L. & Kneafsey, M. (2004). *Geographies of Rural Cultures and Societies*. Ashgate Publishing: England.
- Itaoka, K., Saito, A. & Akai, M. (2011). A study on roles of public survey and focus groups to assess public opinions for CCS implementation. *Energy Procedia*, 4: 6330-6337.
- Joye, Y. & van den Berg, A. (2011). Is love for green in our genes? A critical analysis of evolutionary assumptions in restorative environments research. *Urban Forestry & Urban Greening*, 10: 261-268.

- Kals, E., Schumacher, D. & Montada, L. (1999). Emotional affinity toward nature as a motivational basis to protect nature. *Environment and Behaviour*, 31: 178-202
- Kahn, P.H. (1997). Developmental psychology and the biophilia hypothesis: Children's affiliation with nature. *Developmental Review*, 17: 1-61.
- Kahn, P.H. (1999). *The Human Relationship with Nature: Development and Culture*. Cambridge, MA: MIT Press.
- Kahn, P.H. (2011). *Technological Nature: Adaptation and the Future of Human Life*. Cambridge, MA: MIT Press.
- Kahn, P.H. & Hasbach, J.H. (2012). *Ecopsychology: Science, Totems and the Technological Species*. U.S.A: MIT Press.
- Kaplan, S. (1995). The restorative benefits of nature: Towards an integrative framework. *Journal of Environmental Psychology*, 15: 169-182.
- Kellert, S.H. & Wilson, E.O. (1993). *The Biophilia Hypothesis*. Washington D.C: Island.
- Kellert, S.H. (1993). "The biological basis for human values of nature", in S.H. Kellert & E.O. Wilson (Eds.), *The Biophilia Hypothesis*. Washington D.C: Island.
- Kidd, P.S. & Parshall, M.B. (2000). Getting the focus and the group: Enhancing analytical rigour in focus group research. *Qualitative Health Research*, 10: 293-308.
- Kjellgren, A., & Buhrkall, H. (2010). A comparison of the restorative effect of a natural environment with that of a simulated natural environment. *Journal of Environmental Psychology*, 30: 464-472.
- Lambert, S.D. & Loiselle, C.G. (2007). Health information-seeking behaviour. *Qualitative Health Research*, 17: 1006-1019.
- Lehoux, P., Poland, B. & Daudelin, G. (2006). Focus group research and "the patient's view". *Social Science & Medicine*, 63: 2091-104.
- Light, A. (2000). What is an ecological identity? *Environmental Politics*, 9: 37-41.
- Lumber, R., Richardson, M., & Sheffield, D. (2017). Beyond knowing nature: Contact, emotion, compassion, meaning, and beauty are pathways to nature connection. *PLoS ONE* 12, e0177186.
- Macy, J. (2007). *World as Lover, World as Self: Courage for Global Justice and Ecological Renewal*. California, CA: Parallax Press
- Maller, C., Townsend, M., Leger, L.S., Henderson-Wilson, C., Pryor, A., Prosser, L., & Moore, M. (2009). Healthy Parks, Healthy People : The Health Benefits of Contact with Nature in a Park Context. *The George Wright Forum*, 26: 51-83.
- Martin, P. (2004). Outdoor adventure in promoting relationships with nature. *Australian Journal of Outdoor Education*, 8: 20-28.
- Mayer, F.S. & Frantz, C.M. (2004). The connectedness to nature scale: A measure of individuals' feeling in community with nature. *Journal of Environmental Psychology*, 24: 503-515.
- Mayer, F.S., Frantz, C.M., Bruehlman-Senecal, E. & Dolliver, K. (2009). Why is nature beneficial? The role of connectedness to nature. *Environment and Behaviour*, 41: 607-643.
- Muller, M.M., Kals, E. & Pansa, R. (2009). Adolescents' emotional affinity to nature: A cross-societal study. *The Journal of Developmental Processes*, 4: 59-69.
- Naess, A. (2007). *The Selected Works of Arne Naess Volumes 1-10*. Springer: Netherlands.
- Nisbet, E.K. & Zelenski, J.M. (2011). Underestimating nearby nature: affective forecasting errors obscure the happy path to sustainability. *Psychological Science*, 22: 1101-1106.
- Nisbet, E.K. & Zelenski, J.M. (2013). The NR-6: a new brief measure of nature relatedness. *Frontiers in Psychology*, 4: 813.
- Nisbet, E.K., Zelenski, J.M. & Murphy, S.A. (2008). The nature relatedness scale: linking individuals' connection with nature to environmental concern and behaviour. *Environment and Behaviour*, 41: 715-740.
- Nisbet, E.K., Zelenski, J.M. & Murphy, S.A. (2011). Happiness is in our nature: Exploring nature relatedness as a contributor to subjective well-being. *Journal of Happiness Studies*, 12: 303-322.
- Olivos, P., Aragonés, J.I. & Amerigo, M. (2011). The connectedness to nature scale and its relationship with environmental beliefs and identity. *International Journal of Hispanic Psychology*, 4: 5-19.
- Perkins, H.E. (2010). Measuring love and care for nature. *Journal of Environmental Psychology*, 30: 455-

463.

- Ratcliffe, E., Gatersleben, B. & Sowden, P.T. (2013). Bird sounds and their contributions to perceived attention restoration and stress recovery. *Journal of Environmental Psychology*, 36: 221-228.
- Richardson, M., Hallam, J. & Lumber, R. (2015). One thousand good things in nature: Aspects of nearby nature associated with improved connection to nature. *Environmental Values*, 24: 603-619.
- Roszak, T. (1995). *Ecopsychology: Restoring the Earth, Healing the Mind*. San Francisco, CA: Sierra Books.
- Roulston, K. (2001). Data analysis and theorising as ideology. *Qualitative Research*, 1: 279-302.
- Scannell, L. & Gifford, R. (2010a). Defining place attachment: A tripartite organising framework. *Journal of Environmental Psychology*, 30: 1-10.
- Scannell, L. & Gifford, R. (2010b). The relations between natural and civic place attachment and pro-environmental behaviour. *Journal of Environmental Psychology*, 30: 289-297.
- Schultz, P.W. (2001). The structure of environmental concern: Concern for self, other people, and the biosphere. *Journal of Environmental Psychology*, 21: 327-339.
- Schultz, P.W., Shriver, C., Tabanico, J.J. & Khazian, A.M. (2004). Implicit connections with nature. *Journal of Environmental Psychology*, 24: 31-42.
- Simaika, J.P. & Samways, M.J. (2010). Biophilia as a universal ethic for conserving biodiversity. *Conservation Biology: The Journal of the Society for Conservation Biology*, 24: 903-906.
- Shaw, A., Miller, K. & Wescott, G. (2012). Wildlife gardening and connectedness to nature: Engaging the unengaged. *Environmental Values*, 22: 483-502.
- Stokes, D.L. (2006). Things we like: Human preferences among similar organisms and implications for conservation. *Human Ecology*, 35: 361-369.
- Sullivan, C.F. (2003). Gendered cybersupport: a thematic analysis of two online cancer support groups. *Journal of Health Psychology*, 8: 83-104.
- Tam, K.-P. (2013). Concepts and measures related to connection to nature: Similarities and differences. *Journal of Environmental Psychology*, 34: 64-78.
- Tam, K.-P., Lee, S.-L. & Chao, M.M. (2013). Saving Mr. Nature: Anthropomorphism enhances connectedness to and protectiveness toward nature. *Journal of Experimental Social Psychology*, 49: 514-521.
- Ulrich, R.S. (1984). View through a window may influence recovery from surgery. *Science*, 224: 420-421.
- Vining, J., Kellert, S., Myers, G. & Saunders, C. (2003). The connection to other animals and caring for nature. *Research in Human Ecology*, 10: 87-99.
- Vining, J., Merrick, M.S., & Price, E.A. (2008). The distinction between humans and nature : Human perceptions of connectedness to nature and elements of the natural and unnatural. *Research in Human Ecology*, 15: 1-11.
- Wells, N.M., & Lekies, K.S. (2006). Nature and the life course: Pathways from childhood nature experiences. *Children, Youth and Environments*, 16: 1-25.
- Wilson, E.O. (1993). "Biophilia and the conservation ethic", in S.R. Kellert & E.O. Wilson (Eds.), *The Biophilia Hypothesis*. Washington D. C: Island.
- Wilson, E.O. (2002). *The Future of Life*. New York, NY: Alfred A. Knopf.
- Windhager, S., Atzwanger, K., Bookstein, F.L. & Schaefer, K. (2011). Fish in a mall aquarium—An ethological investigation of biophilia. *Landscape and Urban Planning*, 99: 23-30.
- Zelenski, J.M. & Nisbet, E.K. (2012). Happiness and feeling connected: The distinct role of nature relatedness. *Environment and Behaviour*, 46: 3-23.
- Zhang, J.W., Howell, R.T., & Iyer, R. (2014). Engagement with natural beauty moderates the positive relation between connectedness with nature and psychological well-being. *Journal of Environmental Psychology*, 38: 55-63.