Connection to nature

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Foreword

Natural England commission a range of reports from external contractors to provide evidence and advice to assist us in delivering our duties. The views in this report are those of the authors and do not necessarily represent those of Natural England.

Contents

Purpose of briefing

This briefing note is one of a series that summarises evidence of the links between the natural environment and a range of outcomes. They are based on rapid reviews, not systematic reviews. Please refer to the Methodology (EIN069) document for further details on the method and search strategy. They build on the evidence but are not comprehensive and should be read together with the original notes:

- EIN015 Connection to Nature
- EIN018 Links between natural environments and mental health
- EIN019 Links between natural environments and physical activity
- EIN020 Links between natural environments and physiological health
- EIN021 Links between natural environments and obesity

This briefing focuses on the evidence for connection to nature. This is an update of EIN015 (2016): Dr Rebecca Lovell, University of Exeter. The notes are aimed at: policy makers, practitioners, practice enablers (including Natural England), local decision makers, and the wider research community. They highlight some of the implications for future policy, service delivery and research. It is intended that this note will help to inform practitioner planning, targeting and rationales, but not the identification of solutions or the design of interventions. Barriers to access or use of natural environments are not considered in this note. The notes consider evidence of specific relevance to the UK and outcomes for both adults and children. Please see EIN069 for methodology and glossary. Words marked with an asterisk are defined in the glossary.

Extent of the issue

- There is concern that significant proportions of the population (particularly children and young people) are 'disconnected' (whether physically, spiritually, or emotionally) from the natural world.[1] This disconnection from nature is argued to be detrimental to health and wellbeing.[2]
- Contact and connection to nature*, health and wellbeing, and pro-environmental* behaviours are inter-related with possible additional impacts on environmental outcomes, such as climate change goals.[3,4]
- It is thought the types of factors which influence 'disconnection from nature' range from increasing urbanisation and a loss of respect, humility, and empathy with nature to the relative attractions of indoor sedentary entertainment.[5]
- The Covid 19 pandemic and the resulting changes in behaviour and lifestyle[6] may have caused people to reassess their relationship with nature and how it impacts health, wellbeing*, and society. This worldwide event has caused non-government organisations, Natural England and a host of large and small organisations (including charities such as The Wildlife Trusts, RSPB, The National Trust) to provide new programmes of support to improve people's emotional or cognitive

connection to nature. It is important that these interventions are grounded in the best available evidence.

Summary statement

This evidence summary focuses on the literature around people's connection to nature (CTN). Two other evidence summaries in this series assess the association between nature and mental and physical health. Please note that these other summaries do also present some evidence around CTN, but most of this research evidence comes from *contact with* nature, rather than *connection to* nature. There is a distinct difference: *contact with* nature describes the process of spending time in nature, whereas *connection to* nature is a psychological concept looking at an individual's feeling and attachment to the nature around them, and its subsequent health and wellbeing impact. For more evidence on the benefits of nature on mental and physical health see EIN065 and EIN066. There are other approaches to conceptualising and measuring people's connection to nature, derived from disciplines other than psychology. For example, the concept of 'relational values' from human geography and sociological thinking about nature and self. This report looks mostly at the psychological literature, but scoped evidence from wider disciplines also.

CTN is an umbrella term that encompasses a set of constructs, for example 'nature relatedness'. Nature relatedness refers to an individual's subjective sense of their "relationship with the natural world".[7] As a concept CTN has received substantial amounts of research attention in the last few years. CTN research is different to the research carried out assessing people's experiences of contact with, or exposure to nature (the latter is looked at in terms of proximity, time spent in nature or quality of experience).

There is emerging evidence that CTN is correlated* with certain wellbeing, educational outcomes, pro-environmental and pro-conservation* behaviours which have important implications for society's action for climate change, the biodiversity crisis, or other environmental challenges. A variety of factors may have a role in the development of connection to nature including contact with the natural world, childhood experiences, the geographical area somebody lives in, socioeconomic status, and lifestyle.

The impact of the recent global Covid-19 pandemic and climate change may also be changing how and why people contact or connect to nature. The evidence base is growing, likely due to the relatively recent interest in assessing and understanding connection to nature. In recent years there have been good quality systematic reviews* and meta-analyses* adding to the evidence base. However, much of the existing research is drawn from the types of studies which cannot reveal direction of effect* and causality*. Some of the new evidence has attempted to understand and adjust for potential confounders. However, there is still a lack of research which considers longer-term health and wellbeing outcomes, and inclusion of atypical sample populations. Further robust research is needed to inform potential delivery and intervention options.

Review of the evidence

What is connection to nature?

According to the biophilia hypothesis[8], humans have an instinctive biological predisposition and attraction to nature. CTN is one of a set of concepts which refer to an individual's subjective sense of their relationship with the natural world.[9] CTN relates to a person's sense of their interconnectedness* with nature or their sense of inclusion in nature. It is hypothesised that CTN may mediate health and wellbeing gains from exposure to or use of the natural environment and may play a role in pro-environmental and pro-conservation attitudes and behaviours. The research literature refers to the concept of CTN as both a trait, in that stable differences between individuals and groups of people can be observed, but also as a state, reflecting the point that it is thought to vary in the short term according to exposures, experiences or contexts.[9,10] A model of five pathways to nature connectedness has been proposed as a framework for mapping how CTN occurs.[11] The five pathways include: Contact, Beauty, Meaning, Emotion and Compassion.

Measuring connection to nature

Researchers have developed several ways to assess CTN, some have used qualitative* approaches[12] and others have developed or used quantitative* approaches and associated methods such as questionnaires. Examples of quantitative tools developed to measure CTN include Connectedness to Nature Scale,[10] Connection to Nature Index,[13] Nature Relatedness Scale (NR-6) [14] and Inclusion of Nature in Self scale (INS) [15]. These different quantitative tools typically use self-reporting and aim to measure different aspects of CTN. There are ongoing efforts to further establish the reliability* and construct validity* of such tools and to test their application, for example with different groups of people and different analysis techniques.[16]

What factors influence connection to nature?

How CTN develops or is maintained is not yet fully understood. It is hypothesised that contact with or exposure to the natural world, childhood experience, and socio-cultural factors may be important. Intentional (rather than passive) interactions with nature are also argued to be important.[17,18] However, in the last few years evidence is emerging which explores how CTN is developed and maintained and how this is moderated by other factors.

- A review looking at the predictors of CTN showed that three mechanisms may be at work: (i) situational, (ii) individual differences such as demographics e.g., geographic location or socioeconomic status, personality or beliefs (iii) internal psychological state*. [20]

- One study found that the amount of time people spent outdoors was a predictor of levels of CTN, [21] however other studies have found no relationship.[5,22]
- The Wildlife Trusts report[23] showed that time spent on outdoor activities increased children's CTN and wellbeing. Contextual data (not about nature connectedness) about time spent in nature from the English Monitor of Engagement with the Natural Environment Survey (MENE) 2019[24] show that time spent outside in nature declines as children get older with the lowest time spent outdoors dipping in the teenage years; and that children from minority ethnic groups are less likely to spend time outdoors and time outdoors varies by region. Therefore, older children are, in general, less likely to be benefiting from CTN.
- A large UK survey[25] found that respondents recalled greater connectedness to nature following visits to rural and coastal locations compared with urban green space.
- A large English survey[4,11] looking at CTN found that specific types of nature contact (e.g. engagement with beauty), as well as individual differences (e.g. age, gender) were associated with nature connectedness.
- Neuropsychology modelling* has suggested that environmental exposure (not CTN) may lead to changes in limbic responses* in the brain, leading to stress reduction. It would be beneficial if further research explored whether CTN has a similar effect.

Does connection to nature influence environmental and conservation behaviours?

There is emerging evidence (mostly from surveys) showing that connection to nature is correlated with environmental behaviours and views. Pro-environmental behaviour (e.g., recycling) is defined as the intensity of current individual behaviours to reduce energy use related to daily life housing, transport, consumption. Pro-conservation behaviour (e.g., volunteering for a nature organisation to maintain local environment) has also been investigated by some literature in relation to CTN.

Pro-Environmental behaviours, values and CTN

- A study in Mexico showed a significant relationship between CTN and environmentally sustainable behaviours in children in association with perceived happiness.[26]
- A meta-analysis* showed a significant positive relationship between mindfulness and CTN (this was strongest for older people)[27] Furthermore, a cohort study from the US[28] provides evidence that CTN indirectly affects the relationship between mindfulness and pro-environmental behaviour.
- A UK evaluation of 'learning about nature' and 'learning within nature' events from The Wildlife Trusts[23] showed that both CTN and agreement with pro-environmental values statements increased for primary school aged children after taking part in an event. Future research could look into whether this correlation is causative in either direction.

- Horticulture and care farming were associated with improved? physical and mental health, pro-environmental behaviour and improved? CTN.[29]
- A recent large survey[4] of over four thousand people in England found correlations between nature contact, nature connectedness, health, and eudemonic wellbeing*, and pro-environmental behaviours.

Pro-Conservation behaviour and CTN

- A UK study using the Nature in Self Scale found that engaging in simple nature activities (which is related to CTN) was correlated with pro-nature conservation behaviour.[3]
- The Wildlife Trusts[30] found evidence that volunteering in nature, with potential CTN for the volunteer, was associated with pro-conservation behaviour.

Is there an association between connection to nature and health, wellbeing, developmental and educational outcomes?

There is increasing evidence to suggest that higher levels of CTN are positively correlated with outcomes such as better wellbeing, quality of life and educational performance. However, again the research base is small, and a proportion is not peer-reviewed* (grey literature*). There are also limitations related to research design and lack of adjustment for confounding factors. Therefore, our understanding of whether CTN actually causes (directly or indirectly) any of the health, wellbeing, developmental and educational outcomes, or is itself potentially caused by health, wellbeing, developmental and education outcomes is limited. There may be bi-directional effects in which both of the statements are true – they could cause each other. If there were a causal relationship, the strength of association* is not yet known. There could also not be any causal relationship behind the associations found.

CTN and health and wellbeing outcomes

- The Wildlife Trusts' '30 days Wild' project[31] found an increase in CTN, pro-nature conservation behaviours, wellbeing, and happiness after the completion of the programme (although they did not test whether these outcomes were linked).
- A review of volunteering with The Wildlife Trusts[30] found that volunteering was positively associated with CTN. Volunteering also improved physical and mental health, increased pro-environmental behaviour and levels of physical activity.

CTN and wellbeing outcomes

- A meta-analysis[32] from 2019 collating over 4,500 data points from 20 questionnaire studies dating between 2004 to 2016 looking at the relationship between CTN and

eudemonic wellbeing* showed that people with greater CTN tended also to have greater eudemonic wellbeing and higher levels of self-reported personal growth.
- A study[33] investigated the relationship between anxiety and CTN. The qualitative results revealed seven themes explaining the nature-anxiety relationship: relaxation, time out, enjoyment, connection, expanse, sensory engagement, and a healthy perspective. Further results indicated that CTN was significantly related to lower levels of anxiety. The authors suggest that CTN may reduce “unhelpful anxiety”.
- A cross-sectional* study[34] in Canadian adolescents with nearly 30,000 responses showed that perception of CTN as 'important' was associated with a 25% reduction in the prevalence of high psychosomatic symptoms. This shows the potential importance of adolescent engagement with nature as protective for their psychological wellbeing.

CTN and developmental and educational outcomes

- A questionnaire-based cohort study with preschool children in Hong Kong[36] provided evidence that increased CTN relates to less distress, hyperactivity, behaviour and peer and emotional difficulties, and increased prosocial behaviour.
- A cross-sectional questionnaire-based[37] study investigated the effect of taking part in a nature-based environmental education programme in Germany. Results showed that increased participation in nature-based environmental education resulted in more pro-environmental behaviour, and this was mediated by CTN and nature knowledge.
- A longitudinal* cohort* study in Scotland[35] found that mothers' perceived distance from home to green/open spaces was associated with child's viewing TV time length, at 5.9 years of age. Perceived distance to green/open spaces is not equivalent to CTN, but the study may suggest the opportunity for future research exploring the relationship between CTN and children’s screentime.

Does connection to, or contact with, nature vary according to social demographic group?

A small amount of evidence exists which addresses whether and how rates of CTN may differ amongst or between different population groups. The evidence is drawn from small scale studies, national surveys and emerging grey literature, and it may not be comparable and should not be pooled (due to variation in method and tools used). More research is needed to understand whether CTN is able to adequately capture how different population groups feel, experience and think about nature or whether it only accurately reflects this for certain groups.

- One study assessing CTN and pro-environmental behaviour found that women have higher levels of emotional connectedness to nature than men. Rural participants reported significantly lower levels of pro-environmental behaviour

compared to urban participants, but not levels of emotional connectedness to nature[38].

- Research carried out on data from the MENE survey for England[48] found that CTN was consistent across different adult population groups and the only variation were that those from a lower socio-economic groups and adult males tended to have lower CTN than their counterparts. In this study ethnicity was seen to have little or no relationship to a person's CTN.
- During the Covid-19 pandemic, CTN was highlighted in the media and the role of nature was discussed widely. However, access to nature, and therefore opportunities for CTN, are not distributed equally due to a lack of suitable, good-quality local provision and more complex societal barriers.[24,39,41] Furthermore, there have been fluctuations and differences in accessing nature during the pandemic.[42] Given this inequality in access and contact withnature, there exists a gap in evidence regarding equality to the benefits of CTN across different population groups.
- A survey of nature-based activity with 1,000 people from Southeast Asia in 2020 found that older people, those with lower incomes, and without degrees were less likely to visit most types of outdoor space and engage with most types of nature-related activities.[39]
- Recent UK data show that time outside in nature (and therefore the potential to develop CTN) declines as children get older and that children from minority ethnic groups are less likely to spend time outdoors.[24]
- Grey literature from the UK, published by The Wildlife Trust written in the context of Covid-19 impact and recovery,[40] states that CTN is essential for health, but that access to nature is deeply unequal in the UK.

Implications for policy, service delivery and research

Policy and service delivery

- The emerging evidence that CTN may have a role in mediating the wellbeing effects of the natural environment could be considered in intervention design.[43]
- The assumed impact of Covid-19 on people's CTN has stimulated nature organisations to create more engagement programmes to encourage people to visit the natural environment. Further investigation into how the designs of these interventions affect benefits received, including CTN, and how this connects to the needs of specific communities could be investigated.
- There is emerging evidence that CTN correlates with pro-environmental and pro-conservation behaviour and wellbeing. Given more evidence for a causal link, policy could utilise this to encourage action for climate change and nature recovery.

Research

- Further research should be carried out to see the impact of “eco-anxiety” on CTN.
- Future studies on the health, wellbeing, and developmental impacts of exposure to nature and in relation to pro-environmental behaviours could investigate CTN as a potential explanatory mechanism or mediating factor.[12,31,44] Where relevant, future quantitative studies should seek to adjust models for confounding factors. This work should build on the findings of recent research indicating that CTN is correlated with pro-environmental behaviour [4] and explore causality.
- A range of tools for measuring CTN exist. More clarity on the appropriate use of tools for different audiences (children, adults, older people with cognitive decline) would be helpful. Clarity on how the tools can be used in different contexts should also be obtained (e.g., type of intervention being evaluated, time scale, geographic scale, data required). The construct validity and reliability of existing and new tools should be tested further.[10,22] Researchers could explore the potential of using implicit approaches (i.e., assessing CTN without requiring individuals self-report their own subjective assessment of their CTN) in new tools.
- Further research could seek to explain the many ways in which humans interact with nature (including artistic and other types of representations of nature, spiritual, social, and cultural interactions), how these change through time, and the subsequent impact on CTN [21,22,31] and whether alternative, complementary constructs or concepts can improve the utility of CTN when used together. For example, the use of qualitative and other methodologies could be used to explore the richness, depth, and implications of CTN Human interaction with nature.[45,46]
- There is a need for research which explores how CTN can inform environmental planning and conservation strategies for the purposes of future urban planning and citizen wellbeing.[47]
- Applied research (with outcomes assessed over longer time periods) could help guide the development of interventions to increase CTN or nature-based interventions which seek to use CTN as a pathway to other outcomes[5] Improving our understanding of how CTN develops through childhood, and whether and how CTN is, or is not, maintained through to adulthood would help identify key intervention points.
- Research should further explore the longitudinal impacts of Covid 19 on CTN and its interaction with health and wellbeing.

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Glossary

Please see EIN069 for full glossary

Causality	When something has an actual effect on something else- and is not simply correlated with it
Cohort	Cohort studies are a type of longitudinal study—an approach that follows research participants over a period of time (often many years)
Connection to nature	The term 'connection to nature' is frequently used to describe our enduring relationship with nature, including emotions, attitudes and behaviour. Research shows that people with a greater connection to nature are more likely to behave positively towards the environment, wildlife and habitats.
Cross-sectional	A cross-sectional study involves looking at data from a population at one specific point in time.
Direction of effect	This refers to whether there is a positive or negative association between two variables
Eudemonia	Eudemonic wellbeing refers to the type of happiness or contentment that is achieved through self-actualisation and having meaningful purpose in one's life.
Grey literature	Literature, such as a report, which is not peer reviewed*
Interconnectedness	See Connection to nature*
Limbic responses	The limbic system is the part of the brain involved in our behavioural and emotional responses, especially when it comes to behaviours we need for survival: feeding, reproduction and caring for our young, and fight or flight responses
Longitudinal	A long term study in which as Cohort* is visited at different time points to get a long-term understanding of an effect
Neuropsychology modelling	A neuropsychological model is a computerised or mathematical representation of an individuals or group of individuals brain or thought patterns
Peer reviewed	A study which goes through a process of fact checking by several experts in the field

Pro-conservation	Pro-conservation behaviour refers to behaviours in which individuals engage in environmental, animal, marine or human conservation - including natural resources, forests, wildlife, plants and biodiversity.
Pro-environmental	Pro-environmental behaviour, also known as green-, sustainable-, or environmentally-friendly (eco-friendly) behaviour, is defined as behaviours in which individuals take protective actions toward the environment.
Qualitative	Qualitative data describes qualities or characteristics. It is collected using questionnaires, interviews, or observation, and frequently appears in narrative form. For example, it could be notes taken during a focus group, or responses from an open-ended questionnaire
Quantitative	Quantitative data is data that includes numbers and figures. These can include scores on tests, number of hours of study, or weight of a subject. These data can be open to statistical interpretation. Qualitative data is not expressed as a number.
Reliability	Data reliability means that data is complete and accurate
Strength of association	The extent to which two variables are closely or loosely aligned or correlated with each other
Systematic review	A systematic review is a summary of all of the literature on a particular topic, that meets pre-defined eligibility criteria
Validity	Data validity means that data is complete and accurate
Wellbeing	The extent to which a person is in a state of being comfortable, healthy or happy

About Natural England

Natural England is here to secure a healthy natural environment for people to enjoy, where wildlife is protected and England's traditional landscapes are safeguarded for future generations.

Further Information

This report can be downloaded from the Natural England Access to Evidence Catalogue. For information on Natural England publications or if you require an alternative format, please contact the Natural England Enquiry Service on 0300 060 3900 or email enquiries@naturalengland.org.uk.

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