Nature experiences for human wellbeing and Human-Nature Connection

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Preface

Firstly, we would like to thank our supervisor at the University of Gävle, Åsa Gren, for her expert guidance and encouragement. We would also like to thank the number of faculty members who made the time to speak with us on our research journey.

This project would not have been possible without the interviewee participants who have generously shared their time and knowledge with us. We express our gratitude for your interest in our research, and for the work that you do to bring this important topic to reality.

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Abstract

Our contact with nature is decreasing in what has been referred to as the "extinction of experience". Consequences of the loss of nature experiences are far-reaching and involve not only changes in health and wellbeing, but also changes emotions, attitudes, and behaviour towards nature. This research aims to fill a knowledge gap in understanding specific characteristics of nature experiences in relation to both a) generating human wellbeing, and b) improving Human-Nature Connection (HNC), defined as how people relate to nature. The aim is to increase our understanding of the characteristics of nature experiences that can achieve both of these positive outcomes. Furthermore, this research explores an organisational perspective through interviewing organisations that are currently incorporating or thinking to implement practices that include nature experiences. To address the main aim, an integrative literature review was conducted, and the results revealed that intentional contact, active engagement (specifically appreciative outdoor activities, cognitive engagement, cues, and direct earth contact), and biodiversity and wildness to be significant characteristics that positively impact human beings. Moreover, appreciative outdoor activities and cognitive engagement have been shown to be beneficial even when passive. In addition, there is some evidence that there is a link between HNC and wellbeing, which suggests that improving HNC would increase the wellbeing effects experienced by an individual during a nature experience. This knowledge is crucial for designing nature experiences that are able to more efficiently improve wellbeing, as well as improve HNC. Regarding the organisational perspective, a barrier that needs to be overcome is reaching an understanding of the benefits of such experiences, not only for the employees but for the business. One major opportunity identified is the hybrid working model, which allows employees to work remotely, and the possibility for the company to actively encourage its employees to experience nature.

Keywords: Human wellbeing, Human-Nature Connection, HNC, Nature experience, Characteristics of nature experience, Organisations

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1. Introduction

Our contact with nature is decreasing in what has been referred to as the "extinction of experience" (Pyle, 2011). This refers to the progressive loss of people's interactions with nature (Gaston & Soga, 2020). Today, more than 50% of the population of the world live in urban areas, a figure that is steadily climbing each year (Schiebel et al., 2022). The concentration of the population and human activity in urban areas (Soga & Gaston, 2016) along with other factors such as the availability of virtual indoor recreation options (Kesebir & Kesebir, 2017) have resulted in a reduction of opportunities for people to engage with nature.

While nature is widely known to have positive effects on human health and wellbeing (A. E. van den Berg et al., 2018), urban areas can be associated with mental illness such as depression (Hidaka, 2012; Sundquist et al., 2004) and low physical activity (Lee et al., 2012; Sallis et al., 2016). At the same time, nature in urban areas, referred to as urban green areas, has the potential to provide several health benefits such as improved mental health and reduced cardiovascular morbidity (Alcock et al., 2014; Hartig et al., 2014; Hunter et al., 2015; M. van den Berg et al., 2015; WHO Regional Office for Europe, 2016). However, Hartig et al. (2014) emphasise that contact with nature does not automatically nor consistently lead to health benefits. The specific characteristics of nature experiences, when they take place, and the individuals who are engaging in them play crucial roles in determining their impact (Hartig et al., 2014).

The consequences of the loss of nature experiences extend beyond health and wellbeing. It also encompasses alterations in emotions, attitudes, and behaviours towards nature, forming interconnected feedback loops (Soga & Gaston, 2016). Loss of nature experiences is proposed to be a fundamental obstacle in the struggle to fight environmental degradation (Soga & Gaston, 2016). Human welfare depends on a functioning environment and ecosystem services, which are aspects of ecosystems that are employed for producing human wellbeing; therefore, fighting environmental degradation is connected to human survival (B. Fisher et al., 2009). Soga and Gaston (2016) see the need to increase opportunities to experience nature and to increase orientation, namely emotional affinity with nature. It is widely recognised that people's sense of nature connectedness is

linked to their engagement in pro-environmental behaviours (Barragan-Jason et al., 2023; Martin et al., 2020; Sheffield et al., 2022). Given the implications, improving the connection or relation between people and nature is highly important and may indirectly benefit humans. In this paper, different concepts covering people's relation with nature are included under the umbrella concept, human-nature connection (HNC), following how it has been used in previous works (Giusti et al., 2018; Ives et al., 2017). It has been highlighted that there still exists a need for further research, for example on what type of experiences are best suited for increasing wellbeing (Hartig et al., 2014) as well as to improve HNC within people's daily lives (C. Rosa & Collado, 2019).

1.1. Exploring an organisational perspective

The average person spends one third of their life working, accounting for approximately 90,000 hours (Gettysburg College, n.d.). Sedentary lifestyles are on the rise, and one cause is the increase in occupational sedentary behaviours (Park et al., 2020). The researchers see a great potential in exploring the loss of nature contact from the organisational perspective, as this would address individuals where they are required to spend time as well as support the organisations' sustainability efforts. Additionally, if efforts are being made at the organisational level, the researchers believe that there is potential to reach a greater number of people in comparison to when the focus is directed at the individual level.

There is increasing attention being paid to sustainability topics in business (Winston, 2021), and this has led to more disclosure of corporate environmental, social, and governance (ESG) practices (Conca et al., 2021). Corporations are under scrutiny for their perceived negative impacts on society and the environment (Lozano, 2012). Furthermore, companies increasingly recognise the usefulness of being socially responsible and its benefits, such as improved productivity, reputation, and motivation (Gorgenyi-Hegyes et al., 2021). Businesses are also more aware that a holistic approach to corporate sustainability involves the entire workforce, and that it would improve not only the sustainability and performance of the business, but positively influence the employees in a beneficial way to the business (Schröder et al., 2022).

Moreover, Sheffield et al. (2022) have stated that helping people foster their nature connection should be a focus for all organisations or policies that attempt to increase human and natural wellbeing. It has also been noted that research must move past its focus on individuals and explore groups of people, initiatives, and organisations and their connection to nature (Ives et al., 2017). Therefore, this research not only examines the characteristics of nature experiences that improve both human wellbeing and HNC for individuals, but also explores an organisational perspective on the topic.

1.2. Previous studies and central terms

1.2.1. Nature and nature experiences

Defining nature can be challenging, as what is considered to be "natural" depends on the time, space, and the people who are engaged in the process of definition (Bratman et al., 2012). Nature can be seen as "places, landscapes and ecosystems that are not completely dominated by people, but also include non-human organisms, species and habitats" (Ives et al., 2017, p. 106). Another definition of nature that takes into account the broadness of what people consider to be natural is: "areas containing elements of living systems that include plants and nonhuman animals across 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 can be expected from the broadness of what people consider to be nature, nature experiences also consist of diverse activities. Working from the broad definition they developed, as quoted in the previous paragraph, Bratman et al. (2012, p. 122) define nature experience as "time spent being physically present within, or viewing from afar, landscapes (or images of these landscapes) that contain elements from the above category". Nature experiences can also consist of auditory or imagined experiences (Arbuthnott et al., 2022; Spendrup et al., 2016). There are different elements to consider regarding nature experiences such as the type of contact (Keniger et al., 2013), quality of engagement (Sheffield et al., 2022), and aspects such as frequency, duration, quality and quantity of nature (Shanahan et al., 2015).

1.2.2. Nature and human wellbeing

There is no universal definition of wellbeing (Brown & Westaway, 2011). In their literature review of child wellbeing, Pollard and Lee (2003) found that there are five domains to wellbeing: psychological (e.g. emotions, mental health), physical, cognitive (e.g. intellectual), economic and social. Wellbeing is not simply the absence of illness or diseases, and it has both subjective and objective dimensions (Brown & Westaway, 2011). In measuring wellbeing, the psychological domain often measures deficit indicators (e.g. stress, depression) whereas the other dimensions use more positive indicators (Pollard & Lee, 2003).

The positive connection between nature and human health and wellbeing is widely noted and increasingly studied (A. E. van den Berg et al., 2018). The mere presence of plants in a hospital room has the potential to shorten a hospital stay and decrease the need for postoperative pain medication. Some linkages for this positive connection include air quality, physical activity, social cohesion and stress reduction. The restorative potential of nature when it comes to stress is well-established and the most unequivocally supported of the aforementioned (A. E. van den Berg et al., 2018). It further constitutes an important factor given that several preventable diseases connect to people's ability to handle stress (Shortt et al., 2014). This is also the case for physical activity, where low physical activity is connected to preventable diseases, to the extent that it is considered a global health issue comparable to smoking and obesity (Lee et al., 2012).

Urban green spaces as a topic has been greatly researched due to the large potential in improving public health (Grahn & Stigsdotter, 2010; Rostang et al., 2021; WHO Regional Office for Europe, 2016). In their report, the World Health Organisation (2016) comprehensively outlines evidence for the benefits on health that urban green spaces offer. During the Covid-19 pandemic, availability of green-blue infrastructure was shown to be positively connected to urban resilience (Fagerholm et al., 2022). Furthermore, it is important to note that not only is nature itself linked to health and wellbeing, but the sense of connectedness to nature is also closely associated with psychological wellbeing. Research has shown that a decrease in the sense of connectedness to nature corresponds to a decrease in psychological wellbeing (Sheffield et al., 2022).

1.2.3. Human-Nature Connection (HNC)

As mentioned previously, HNC is used as an umbrella term and understood as people's relation with nature (Giusti et al., 2018; Ives et al., 2017). Connectedness with nature is defined by Zylstra et al. (2014, p. 126) as "a stable state of consciousness comprising symbiotic cognitive, affective, and experiential traits that reflect, through consistent attitudes and behaviours, a sustained awareness of the interrelatedness between one's self and the rest of nature". Lengieza and Swim (2021b, p. 2) define connectedness to nature as "psychological joining of nature and the self, which manifests as a sense of oneness with nature". Nature Relatedness, as defined by Nisbet et al. (2009) describes an individual's level of connectedness to nature, which goes beyond aesthetically pleasing aspects of nature, but understanding that all aspects are of importance. Thus, connection or relatedness to nature can be understood to be a deep awareness and understanding of humans as interrelated or as one with nature.

In the research area of improving or fostering HNC, Sheffield et al. (2022) have conducted a comprehensive review on studies regarding nature contact in adults. The authors found that repeated interventions with elements such as noticing or engaging nature and practising mindfulness resulted in sustained benefits. Lengieza and Swim (2021b) have also conducted a literature review on the antecedents or the path to connectedness to nature. The authors identified aspects that influence connectedness, such as situational contexts, individual differences, and internal psychological states. Furthermore, Giusti et al. (2018) proposed a framework to assess nature-connecting situations for children. They were able to identify different aspects, both quantitative and qualitative, to address in an assessment of environments. In their multidisciplinary review on HNC, Ives et al. (2017) identified the need for future research to focus on the characteristics of nature that people feel a connection towards.

Moreover, improving HNC has been found to be related to individuals' behaviour regarding the environment (C. Rosa & Collado, 2019; Sheffield et al., 2022). In a study conducted on conservation volunteers and their connection to nature, Guiney and Oberhauser (2009) found that a connection to nature contributed to the volunteers' desire to do volunteering work and benefit the environment.

Through testing the Nature Relatedness scale, Nisbet et al. (2009) found that it can predict both attitudes and behaviour, and therefore increasing Nature Relatedness could close the gap between an individual's environmental attitudes and their behaviour. In the same vein, Zylstra et al. (2014) have found that Connectedness with Nature can be a reliable predictor and motivation for environmentally-responsible behaviour.

1.3. Aim and Research Questions (RQ)

The initial phase for this project has revealed that there is a knowledge gap in understanding characteristics of nature experiences in relation to both a) generating human wellbeing, and b) improving HNC. The main aim of this research is to increase our understanding of the characteristics of nature experiences that can achieve both of these positive outcomes.

> **RQ1**. What are the characteristics of nature experiences that lead to both wellbeing and HNC benefits for human beings?

As an exploratory objective, the findings from RQ1 are used to examine how such multifunctional nature experiences could be incorporated into organisational practices in the workplace.

> **RQ2**. How are organisations currently incorporating or thinking to implement practices that include nature experiences, that have the potential to improve employee wellbeing and HNC?

2. Methodology

2.1. Research approach and structure

The study was designed and conducted with a mixed methods approach in order to acknowledge the complexity of the studied theme (Creswell & Creswell, 2018, p. 4). Mixed methods research is often used to provide a more complete understanding of a research problem (Creswell & Creswell, 2018, p. 216). Firstly, an integrative literature review that focused on the main objective (RQ1) was performed. This provided the state of the art of the research on characteristics of nature experiences that improve human wellbeing and HNC. As the literature review collected both qualitative and quantitative data simultaneously, it is considered a convergent mixed methods design (Creswell & Creswell, 2018, p. 218). Following the literature review and based on its findings, an interview guide was designed and qualitative interviews conducted to address the exploratory objective (RQ2) regarding organisations.

2.1.1. Literature review

As RQ1 could not be answered with a limited number of studies, it was decided that it would be suitable to address it with a literature review on the state of the art on this topic. In general, a well-executed literature review provides a comprehensive overview of relevant research already conducted, aligning with the research aim, and presents this information in a clear and coherent manner, ensuring that the reader gains a thorough understanding of the topic. It includes an in-depth critical evaluation and highlights pertinent issues, while citing relevant and varied sources (Biggam, 2015, pp. 110–111). Using a literature review as a research methodology requires following structured steps to ensure the accuracy and validity of the review (Snyder, 2019).

As the objective of the literature review stage of this research was to identify and assess the characteristics of nature experiences that improve human wellbeing and HNC, an integrative review was considered to be the most appropriate. Integrative reviews are used for assessing, critiquing, and synthesising academic literature to support the emergence of new theoretical frameworks and perspectives (Snyder, 2019). Unlike the systematic review, integrative reviews do not cover all articles

that have been published, but aim to combine insights from various fields and traditions. Integrative reviews are considered challenging, and require skills and transparency (Snyder, 2019). Designing the review process carefully was crucial, and included a search strategy: selection of search terms, databases, as well as an inclusion and exclusion criteria. In order to avoid bias, the two researchers conducted the review using the same process.

<u>2.1.1.1. Data collection</u>

A literature search was conducted using Scopus, using a combination of keywords such as "nature experience*", "natur* situation*", "human well?being", "human health", "life satisfaction", "human nature connect*", "connect* to nature", "inclusion of nature in the self" applied to the title, abstract, and keywords. Searches were restricted to journal articles published from 2010 to 2023 in English. Further limitations were applied in subject area and keywords. The search returned 2097 articles on 7th February 2023.

All article titles were thoroughly reviewed by both authors, and in cases where necessary, the abstracts were also examined. Each author made a selection of the most relevant articles based on the inclusion and exclusion criteria. The selections were then compared to check for consistency, and subsequent discussions were held to narrow down the selection further to the most relevant articles for the research questions posed. Additional articles were identified through analysing papers that were studied during the background research phase (see Figure 1).

In order to find pertinent articles to answer RQ1, some exclusion criteria such as specific diagnoses or events were introduced to ensure that the results would focus on a healthy adult population. Moreover, articles concerning merely potential exposure (e.g. living near residential or neighbourhood green/blue space) were excluded in order to find articles focusing on nature experiences. See Table 1 for a description of inclusion and exclusion criteria.
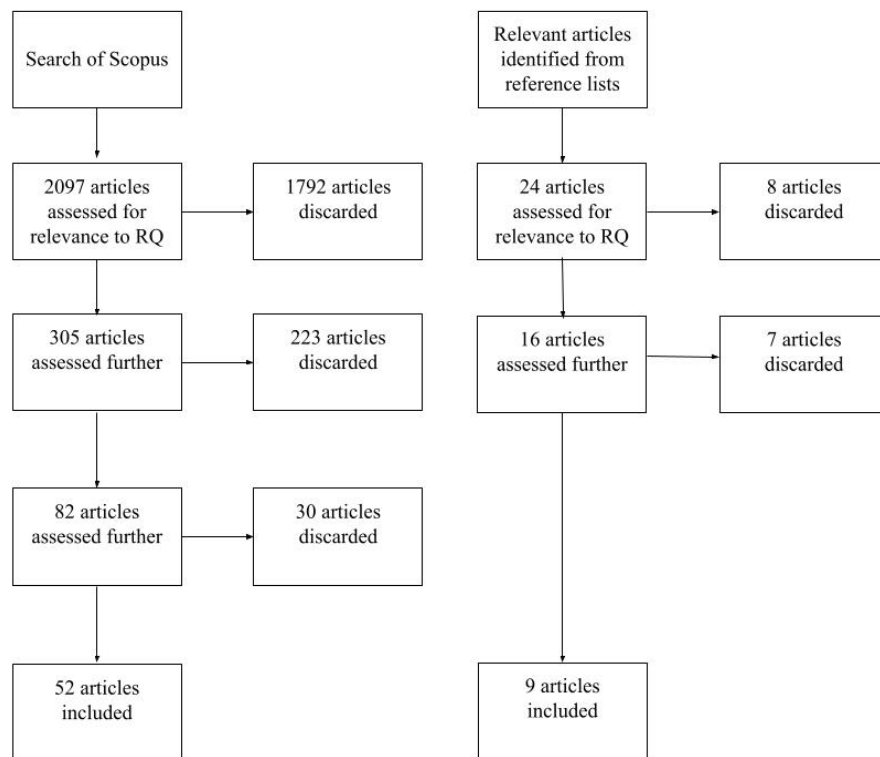
Figure 1

Flowchart of literature search

Table 1
Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
Published between 2010 and 2023	Published prior to 2010
Published in English	Published in language other than English
Peer reviewed articles published in academic journal	Book chapters or non academic articles
Involving contact with nature - actual nature, viewing images of nature, immersive contact, imagined contact	Related to wellbeing or HNC regarding children or older people
Related to wellbeing or HNC predominantly regarding people between the ages 18-70	Related to very specific contexts, situations or group
Related to characteristics of nature experiences	Not related to characteristics of nature experiences
Related to the link between characteristics of nature experiences and wellbeing or HNC	No link between characteristics of nature experiences and wellbeing or HNC

In the analysis phase, all the data was hand-coded in Excel. The researchers used a two-step approach to extract information in a standardised way. The first step entailed summarising general information, such as: aim, design, main findings and limitations for each article. The second step entailed extracting experiences from the articles. Some articles included several experiences while others only included one. Each experience was synthesised thematically, with regards to type of contact, quality of engagement, environmental type, intensity of nature exposure, and frequency and duration. The selection of themes included was done iteratively, as some themes such as type of contact were evident from the background research phase of the project, and some became more pronounced as more studies were reviewed. See Table 2 and the below section for the description of different themes, characteristics, and sub-characteristics that belong within each theme. In the third step, the findings were analysed by both of the researchers through finding patterns using the characteristics and sub-characteristics.

Table 2
Summary of themes, characteristics and sub-characteristics

Theme	Characteristics	Sub-characteristics
Type of contact	**Indirect contact**: nature experience not being physically present in nature	
	Incidental contact: nature experience as a by-product of a separate activity	
	Intentional contact: nature experience in nature intentionally	
Quality of engagement	**Active engagement**: when people were aware of nature or appreciated nature	Appreciative outdoor activity, Conservation, Consumptive outdoor recreation, Cues, Digital, Direct earth contact, Cognitive engagement, Motorised outdoor recreation, VR, Window view

	Passive engagement: when there was no psychological engagement with nature	Appreciative outdoor activity, Digital, Cognitive engagement, Nature as a by-product, VR, Window view
Environment type	Green space, blue space and urban green space, etc.	
Intensity of nature exposure	**Quantity:** e.g. vegetation cover or the number of trees	
	Quality (biodiversity and wildness): e.g. richness of bird species or number of habitats	Actual attributes, Perceived attributes, Actual & perceived attributes
Frequency and duration	**Frequency**: how often an individual is exposed to nature or pattern of exposure	
	Duration: measures the time of exposure	

2.1.1.2.1. Type of contact

The type of contact with nature was coded for each experience following the categorisation described by Keniger et al. (2013). Indirect contact involves a nature experience that does not entail being physically present in nature (e.g. viewing a picture of nature), incidental contact is a nature experience that occurs as a by-product of a separate activity (e.g. walking to work and encountering nature), and intentional contact is a nature experience that involves being in nature intentionally (e.g. hiking, camping, conservation volunteering) (Keniger et al., 2013). Type of contact can also be described as direct or indirect (Sheffield et al., 2022), however, the researchers believed that it would be beneficial to differentiate direct contact into the two categories of incidental and intentional as done by Keniger et al. (2013) as it considers the intention of the subject.

2.1.1.2.2. Quality of engagement

The quality of engagement with nature was coded for each experience based on the description provided by Sheffield et al. (2022). The authors categorised nature engagement as active when people were aware of nature or appreciated nature (e.g. attention to sensory qualities or nature's beauty) and passive when there was

no psychological engagement with nature (e.g. going for a walk without specific awareness or appreciation).

Within this theme, the following sub-characteristics were identified: Appreciative outdoor activity refers to activities in nature where nature is enjoyed without being altered (Dunlap & Hefferman, 1975), as opposed to consumptive outdoor recreation where nature is altered, for example through hunting or fishing (Wolsko & Lindberg, 2013). Low consumptive outdoor activities are, for example, zoos and animal parks (Duffus & Dearden, 1990). Motorised outdoor recreation refers to activities where nature is enjoyed with mechanical mediation such as motorised transportation (Wolsko & Lindberg, 2013). Cognitive engagement includes activities with some sort of heightened engagement such as mindfulness or other directed engagement (Macaulay, Johnson, et al., 2022), whereas "cues" is a more precise version of this where the participant receives prompts to engage in nature. Direct earth contact has been referred to situations when the barefoot feet are in contact with the surface of the Earth (Harvey et al, 2016), however, in this research activities where the hands are in direct contact with the soil have also been included. Window view, virtual reality (VR), digital and nature as a by-product simply summarise the form of the experience.

2.1.1.2.3. Environment type
The type of environment that the nature experience occurs in was coded and then aggregated into umbrella categories in an iterative process. The codes were predominantly green space, blue space and urban green space, as these are concepts widely used in the literature (for example Fagerholm et al., 2022; Sheffield et al., 2022; M. van den Berg et al., 2015).

2.1.1.2.4 Intensity of nature exposure
Quality and quantity of nature are often used to measure the intensity of nature exposure – quantity can be measured in various ways such as vegetation cover or the number of trees and quality can refer to richness of bird species or the number of habitats (Shanahan et al., 2015). In this research, "biodiversity and wildness" has been considered synonymous with quality.

Within the characteristic of biodiversity and wildness, sub-characteristics were identified: Perceived attributes include experiences where the participants were

estimating the level of biodiversity or wildness, and actual attributes include experiences where the attributes were somehow verified, as in a protected area or quantified through species counting (see for example Southon et al., 2018).

2.1.1.2.5. Frequency and duration
Frequency refers to how often an individual is exposed to nature during a time frame or the pattern of exposure, whereas duration measures the time of exposure (Shanahan et al., 2015). When articles mentioned aspects of frequency or duration, they were noted (see Appendix A).

2.1.2. Interviews

In order to explore how the findings of the literature review would apply to organisations, three semi-structured interviews were conducted using the results of RQ1 as a foundation for the interview questions (see Appendix B for interview guide). This method was chosen as it allowed the researchers to gain insights on the status of organisations' existing activities and where there is potential to incorporate nature experiences that could improve human wellbeing and HNC. The interview began with questions regarding an initiative by the respective organisation that the researchers pre-identified and believed to be relevant, then continued with the characteristics of nature experiences that have been identified through the literature review to improve both wellbeing and HNC, and how this could be applicable to organisations. This included biodiversity and wildness, active engagement, direct earth contact, and cognitive engagement in the form of mindfulness or meditation.

Interviews come with certain limitations such as the researcher's presence affecting the responses, and the subjectivity of the information obtained as it will be the perspective of the participants (Creswell & Creswell, 2018, p. 188). Despite these limitations, interviews were considered to be the most fitting method to address RQ2 as it would allow the researchers to discuss the findings of RQ1 with the selected organisations, and access information that may be hard to find in other ways. Semi-structured interviews give the researcher control over the interview flow such as asking follow-up questions (Creswell & Creswell, 2018, p. 188). As the topic at hand is complex, questionnaires wouldn't have captured the nuances of the data. Furthermore, while it takes time to conduct an interview, it

was considered to be more effective than questionnaires for interacting with people from organisations that would generally have many surveys directed at them.

2.1.2.1. Selection of participants

To obtain exploratory insights on how organisations can potentially incorporate nature experiences to improve human wellbeing and HNC, it was decided that companies in the private sector that are already implementing some sustainability initiatives would be best suited. This is because companies in the private sector are under pressure to work on their corporate sustainability initiatives (Conca et al., 2021; Lozano, 2012), and are becoming more aware of the positive returns for the company that sustainability initiatives contribute to (Gorgenyi-Hegyes et al., 2021). The researchers consulted sustainability rankings and networks for sustainable businesses and reached out in their personal networks to gather information. The researchers then contacted several potential participants working in relevant areas identified through various sources. In order to answer the questions during the interview, the respondents had to have both knowledge of the opportunities and barriers regarding the topics. Therefore, the respondents needed to have expertise on topics related to sustainability or ESG and be in managerial positions or above. Three participants were identified representing two companies: a multinational corporation within the travel IT sector, and a multinational financial software company. One interview was conducted with two participants simultaneously to ensure coverage of the topics being discussed as it spread across two different roles. In addition to experts in the private sector, a non-profit organisation working with companies was identified through the researchers' personal networks. As the initiative run by the non-profit was highly relevant, an interview was conducted with the founder to complement the case studies.

2.1.2.2. Data collection and analysis

The interviews were semi-structured and consisted of open-ended questions (Creswell & Creswell, 2018, p. 190). An interview guide (see Appendix B) was developed and used, which contained basic information about the study and the interview, an introduction, and closing instructions in addition to the questions.

This ensured that the interviews were similar between the two researchers performing the interviews. The interviews were recorded and subsequently transcribed by hand (Creswell & Creswell, 2018, p. 190).

The interviews focused both on what is already currently occurring as well as on what can be incorporated in the future. Based on the findings from the literature review, questions were designed to investigate the opportunities and barriers for organisations. The interviews were conducted on Zoom as it provided a convenient way to connect with participants regardless of their location. The participants were informed prior to the interview regarding the process, and reminded at the beginning of the interview. The interviews were recorded to allow for transcription and analysis.

The data was analysed systematically through hand coding, and subsequently the codes were divided into broad themes (Creswell & Creswell, 2018, p. 219). The data was coded using Tesch's Eight Steps (Creswell & Creswell, 2018, pp. 192–196). These steps were performed in parallel by two people, separately, as a way to secure validity. The results from each analysis were then compared. The analysis proceeded simultaneously with the data collection and the structuring of the final report. Further, the data was "winnowed", meaning that some data were highlighted while other parts discarded for the report, as this is common procedure within qualitative research. Sequential steps were followed, involving several levels of analysis (Creswell & Creswell, 2018, pp. 192–196).

2.1.2.3. Ethical considerations

The participants of the interviews were briefed beforehand regarding the interview process, and their written consents were obtained. Although conducting the interviews anonymously was not feasible, precautions were taken to ensure confidentiality. The interviews were recorded, but sensitive and identifiable information regarding both the individual and the organisation was treated with strict confidentiality. In this thesis, information was included without reference to the name of the organisation or the individual. Since the questions focused on organisational matters rather than personal or private topics, there was no inclusion of sensitive information, resulting in a reduced need for ethical considerations. Furthermore, as some of the participants interviewed had

connections to one of the researchers, the interviews with those participants were conducted by the other researcher. No ethical review was needed according to the chair of the university review board.

3. Results

3.1. Literature review

3.1.1. Included studies and derived experiences

In total, 61 studies were included in the final selection (see Appendix A). The initial literature search yielded a greater number of studies focused on wellbeing, compared to studies on HNC. This pattern persisted in the final selection, where only a third of the included studies focused on nature experiences and their effect on HNC. There was also a case where HNC was studied, but in relation to wellbeing and not to nature experience (White et al., 2021).

Regarding geographical locations, studies in Europe made up almost half of the selection with North America and Asia Pacific as the next dominant regions (see Table 3).

Table 3

Geographical locations of studies

Region	Number of studies*
Europe	30
Asia Pacific	15
North America	15
South America	2
Middle East	1

* One study had a presence in three regions

The included studies used a variety of designs as well as scales. Regarding the study design, questionnaires, interviews, and experiments were some common methodologies. While some studies focus on reported or recalled nature experiences, about 75% of them are in situ or experimental studies, measuring effects in direct connection to actual activities or experiences. Popular scales used to measure human wellbeing were the Positive and Negative Affect Schedules (PANAS) and the Profile of Mood States (POMS). For measuring HNC, popular scales included Nature Relatedness (NR), Inclusion of Nature in Self (INS) and Connectedness to Nature (CNS).

From the total of 61 articles, 128 experiences were derived. The 128 experiences were not unique, meaning that many experiences, such as walking, were repeated across studies. Wellbeing was a reported result for more than a hundred experiences whereas HNC was reported for sixty experiences. Table 4 presents the breakdown of the number of experiences and their effects on wellbeing and HNC.

Table 4
Summary of included experiences and their effects on wellbeing and HNC

Category	Number of experiences
Provided both wellbeing and HNC benefits	29
Reported negative or non-significant results for both wellbeing and HNC	1
Reported just wellbeing benefits	65
Reported just negative or non-significant wellbeing results	3
Reported just HNC benefits	15
Reported just negative or non-significant HNC results	9
Provided wellbeing benefits but not HNC benefits	2
Provided HNC benefits but not wellbeing benefits	4
Total	**128**

The experiences were coded into different themes (see section 2.1.1.2. for description of the themes and characteristics). The full list of experiences and coding is presented in Appendix A. Within "type of contact" the majority of the reviewed experiences were coded as intentional (105), while there were 20 indirect experiences and three incidental. For "quality of engagement", 42 were coded active and 86 passive. The most common type of environment found in the included literature was green space (>50) including urban, rural, and virtual green spaces. There were about thirty experiences linked to blue spaces including urban and virtual experiences. Other environments included among others non-specified nature, wilderness, and wildlife parks. There were experiences that featured both green space and blue space. Among the "intensity of nature experience" category, 23 experiences specifically referred to biodiversity, protected area or related

topics, while approximately ninety experiences focused on frequency and duration. However, the variation within the latter theme was big and only a few experiences drew conclusions based on frequency/duration.

3.1.2. Characteristics that lead to both human wellbeing and HNC benefits

The analysis of the 128 experiences revealed patterns that indicate that some characteristics such as intentional contact, active engagement with nature, and biodiversity and wildness tend to be more effective in leading to positive outcomes for human beings. Table 5 presents an extract of experiences from the full list of experiences presented in Appendix A, and includes those 29 experiences extracted from studies that reported benefits for both wellbeing and HNC. All the experiences listed are intentional contact, and many of them fell either into active engagement or biodiversity and wildness while there were five passive engagement experiences and one experience (Dobson et al., 2021) falling into two characteristics.

Table 5

Experiences from studies with reported wellbeing and HNC benefits and their characteristics

In the wellbeing and HNC columns, green indicates positive outcomes, while yellow indicates lesser/ambiguous, but still positive outcomes.

Theme	Character.	Sub-character.	Experience	Citation	Well-being	HNC
Quality of engagement	Active engagement	Appreciative outdoor activity	Outdoor song for nature workshop in National Wildlife Area	Arbuthnott and Sutter (2019)	green	green
			Science camp in remote natural setting (observing animal behaviour)	Arbuthnott and Sutter (2019)	green	green
			Outdoor Song for Nature workshop in provincial park and beach	Arbuthnott et al. (2022)	green	green
			Nature placemaking activities (farming, sketching, etc.)	Benjumea et al. (2022)	yellow	green
			Self-organised ocean swimming in groups	Costello et al. (2019)	green	yellow
			Sea-kayaking (Guided group activity)	Kronsted Lund et al. (2022)	green	green
			Freshwater wild swimming	McDougall, Foley et al. (2022)	green	green
			Taking part in blue exercise (kayaking, canoeing, etc.)	Thompson and Wilkie (2021)	green	yellow
		Direct earth contact	Going barefoot	Harvey et al. (2016)	green	green
			Walking barefoot at a beach	Rickard and White (2021)	green	green
			Walking barefoot at a garden	Rickard and White (2021)	green	green
		Cues	Visiting green spaces with cues to experience nature	Colléony et al. (2020)	green	green
			Visiting urban nature, app prompting to notice good things in nature	Dobson et al. (2021)	green	green
			Participating in 30 days wild	Richardson et al. (2016)	green	green
			Participating in 30 days wild	Richardson et al. (2018)	green	green
		Cognitive engagement	Mindful walk in nature: activities to focus on nature	Lumber et al. (2017)	green	green
			Work break in green space	Macaulay, Lee et al. (2022)	yellow	yellow
			Mindful walk in nature	Nisbet et al. (2019)	green	green
	Passive engagement	Cognitive engagement	Walk in nature (alone)	Lengieza and Swim (2021)	yellow	green
			Mindful engagement in nature during work break (internal focus)	Macaulay, Johnson et al.(2022)	green	green
		Appreciative outdoor activity	Walk in nature	Nisbet et al. (2019)	green	green
			Visiting coastal location (various activities)	Wyles et al (2019)	green	green
			Visiting rural location (various activities)	Wyles et al (2019)	green	green

Intensity of nature exposure	Biodiversity & wildness	Actual attributes	Visiting urban nature, app prompting to notice good things in nature	Dobson et al. (2021)		
			Visiting coastal location with PDA status (protected / designated area)	Wyles et al (2019)		
			Visiting rural location with PDA status (protected / designated area)	Wyles et al (2019)		
			Visiting urban location with PDA status (protected /designated area)	Wyles et al (2019)		
		Perceived attributes	A walk in a landscape park (individual, led)	Samus et al. (2022)		
			A walk in an urban forest (individual, led)	Samus et al. (2022)		
			Visiting a meadow/meadow creation in park	Southon et al. (2018)		

3.2. Interviews exploring organisational perspective

Three participants with professional roles within ESG topics were interviewed (see chapter 2.1.2. for more details). They provided insights into two different companies - a multinational corporation within the travel IT sector, and a multinational financial software company. Both companies have a global presence with a highly educated workforce. In addition, the founder of a non-profit organisation based in South America was interviewed as they had a highly relevant program with perspectives on working with organisations in nature experiences.

3.2.1. Current practices that include nature experiences

Table 6 presents the nature experiences mentioned by the participants that have been conducted by or for organisations. It highlights aspects related to wellbeing, HNC, and organisational benefits, as mentioned by the interviewees. When experiences are repeated across organisations, they have been synthesised into one experience.

Table 6

Current practices involving nature experiences that have the potential to improve employee wellbeing and HNC

Nature experience	Description	Characteristics of nature experience	Wellbeing/HNC aspects mentioned	Organisational benefits mentioned
Environmental awareness campaign and movement	Encouraged employees to make sustainable changes (e.g. grow own vegetable) and share ideas on company social platform	- Intentional / Indirect - Active / Passive	- Wellbeing: social (community)	- Normative change (sustainable measures in company use name of movement)
Grounding	Importance of being barefoot for mental and physical wellbeing	- Intentional - Active (direct earth contact)	- Wellbeing: mental, physical - HNC: connect to earth	
Home garden	Sent seeds to employees to grow at home	- Intentional / Indirect - Active (direct earth contact, appreciative outdoor activity)	- Wellbeing: financial wellbeing (growing own food)	
Beach/forest cleanups	Collected and recycled rubbish at a beach/forest	- Intentional - Active / Passive - Biodiversity & wildness	- Wellbeing: social (human connection)	
Meditative activities in nature	Yoga/mindfulness/tai chi in nature	- Intentional - Active / Passive (cognitive engagement)	- Wellbeing: mental, physical - HNC: embedding environmental connection	

Tree planting (employees)	Trees planted by employees	- Intentional - Active (direct earth contact)	- HNC: culture of love for Earth	- Carbon sequestration - Popular with employees
Tree planting (for employees)	Trees planted on behalf of employees by organisations	- Indirect (e.g. pictures)	- Feeling good by doing good	- Carbon sequestration - Brand equity - Employees engaged
Walking (steps counted to plant trees)	Steps walked converted into trees planted. Employees were able to walk anywhere but included nature walks	- Intentional / Incidental - Active / Passive	- Wellbeing: social (walk in groups together), physical activity in nature, break from laptop	- Increase in productivity - People felt better - New ideas, innovation
Retreat in the Amazon forest	3 to 5 night retreat in the Amazon including visiting indigenous communities, nature sightseeing, meditation, etc.	- Intentional - Active (appreciative outdoor experience, cognitive engagement) - Biodiversity & wildness	- Wellbeing: spiritual, health, social (meaningful connection) - HNC: feeling of connectedness	- Marketing - Employee welfare - Productivity and efficiency
Volunteering at wildlife sanctuary	Volunteered at wildlife sanctuary working with elephants	- Intentional - Active - Biodiversity & wildness		

3.2.2. Opportunities and barriers for future implementation

Table 7 presents opportunities and barriers mentioned by the interviewees, for implementing nature experiences with characteristics identified in the literature review that could have both wellbeing and HNC benefits. Most opportunities and barriers applied to nature experiences in general, but those that were specific to a characteristic are included in the appropriate row.

Table 7
Opportunities and barriers for incorporating nature experiences, mentioned in interviews

	Opportunities	**Barriers**
General	- Linking investments to business purpose - Hybrid working model: working away from the office and urban settings. - Exploring actively encouraging seeking nature experiences, promoting projects - Adapting to changing circumstances: reaching people at home rather than around the office - Maximising existing or future activities' impact: combining elements e.g. yoga for employees + being in nature, something that's good for environment is good for community and employee wellbeing - Cooperation, e.g. partnership with external actors (NGO, volunteers)	- Logistics: offices in urban settings far away from biodiversity - Time availability: for company if on working hours, for employee if on free time/weekends - Budget / funding: need to make sure it's part of corporate strategy and make business sense - Human resources/efficiency: prioritising dealing with direct impact of work on employee wellbeing - Employees' social anxiety after Covid-19 - Employees working more from home during and after Covid-19 - Lack of awareness of the benefits of nature when creating activities - Engagement and communication requires effort from the planner of the event and for the participants
Biodiversity & wildness	- Making more meaningful connection with people who are different from you easier in these types of experiences	- Considerations must be given to work-life balance. Activities may take time away from family, especially if over weekend - Often requires time and money, therefore not accessible to everyone - Top management needs to understand it's not just employee welfare but also organisational benefits (productivity, creativity, innovation)

		- Risk of exploiting nature and communities that live in nature
Active engagement with nature	- Volunteering opportunities (e.g. cleanups) can include this element - Can take place at home or at work - A garden could be collective property at work	- Top management needs to understand it's not just employee welfare but also organisational benefits (productivity, creativity, innovation) - Individual preferences
Cognitive engagement (i.e. mindfulness and meditation)		- Individual/cultural background may interfere with acceptance of activity and being connected to nature - Organisation may see it contradicts their priorities

4. Discussion

4.1. Improving wellbeing and HNC: characteristics in common

This section discusses the characteristics that were presented in Chapter 3.1.2. that were shown to be effective for improving both wellbeing and HNC. As mentioned earlier, intentional contact emerged as the most consistent type of contact for improving both wellbeing and HNC. Therefore, all the experiences mentioned in Table 5 are intentional, which is why this theme is not presented in a separate section. Quality of engagement and intensity of nature exposure are further discussed in the respective sections below.

4.1.1. Theme: Quality of engagement

4.1.1.1. Characteristic: active and passive engagement

Within the theme quality of engagement, 42 experiences were active and 86 passive engagement with nature. There were 18 active engagement experiences included in Table 5 and they represented the four following sub-characteristics: appreciative outdoor activity (8), direct earth contact (3), cues (4), and cognitive engagement (3). On the other hand, the passive engagement characteristic comprised of five experiences, categorised into the sub-characteristics of cognitive engagement (2) and appreciative outdoor activity (3). It is worth noting that six out of seven experiences listed in the characteristic biodiversity and wildness are also passive, although experiences with passive engagement that improve both wellbeing and HNC are often influenced by other factors such as biodiversity and wildness. This is supported by findings from Wyles et al. (2019) that have shown that even though visiting various natural environments can have positive outcomes, more biodiverse protected areas often increase both recalled restorativeness and recalled connectedness to nature.

There is evidence suggesting that active engagement is an important factor in improving HNC, especially with intentional contact. This supports the perspective offered by Richardson et al. (2020), which highlights the importance of pathways to nature connectedness, including emotion, meaning, sensory contact, beauty, and compassion. Within these pathways, emotion (feelings for nature) and meaning (cultural relationship with nature) provide deep leverage that increases

the sensory contact, and in turn compassion (care for nature) and beauty (noticing beauty of nature). Performing simple nature activities for a prolonged time (e.g. 30 days) resulted in sustained increases in nature connection (Richardson et al., 2016, 2018). Moreover, the use of cues to engage with nature was found to be a promising method to induce temporary nature relatedness (Colléony et al., 2020), and receiving a prompt through an app to notice good things in nature increased connectedness with nature (Dobson et al., 2021). Furthermore, direct earth contact through walking barefoot was also shown to be effective in improving HNC with results indicating that participants in the barefoot condition had higher connectedness than those in the control group with shoes (Rickard & White, 2021) and barefootedness being positively associated with connection to nature and feelings of nature immersion (Harvey et al., 2016).

Additionally, there were studies directly pointing to active engagement also positively influencing wellbeing outcomes. For example, Colléony et al. (2020) found that participants who received cues to interact with nature in ways that brought them psychologically closer (e.g. to smell the flowers) reported more positive affect compared to those who received cues that did not bring them psychologically closer (e.g. walk slower, turn off the phone). Similarly, Nisbet et al. (2019) concluded that mood is improved through simply being in nature (passive), but greater decreases in negative moods are related to being mindful of the surroundings (active). In the aforementioned experiment where Rickard and White (2021) compared walking barefoot with walking with shoes at a garden and a beach, in both locations those who walked barefoot reported higher restoration.

4.1.1.1.1. Sub-characteristic: Cognitive engagement

The sub-characteristic 'cognitive engagement', which spread over both active and passive engagement and included being mindful or aware of the environment, was shown to sometimes improve both wellbeing and HNC. Lumber et al. (2017) compared walking in nature (passive), mindful walking in nature (active) and mindful walking indoors (control condition). While no difference in wellbeing outcomes was observed among the three conditions, the active condition of mindful walking in nature resulted in higher levels of nature connectedness than the other conditions. Macaulay, Johnson, et al. (2022) examined the effect of

actively engaging in nature during a work break and found an indirect positive effect on HNC, through increased state-mindfulness. However, in this case, the two passive engagement conditions (mindful engagement and letting the mind wander), provided the same result on HNC (Macaulay, Johnson, et al., 2022). Macaulay, Lee, et al. (2022) showed that participants' individual engagement was important, with those engaging in heightened sensory stimulation or mindful engagement experiencing higher nature connection, as well as a break from work thoughts and calmness. Participants that had an acceptance towards the environment they experienced, had some increases in HNC, whereas those who had a negative judgement towards the environment, and those who let the mind wander, experienced low nature connection (Macaulay, Lee, et al., 2022).

Other studies that examined cognitive engagement but did not report results for both wellbeing and HNC (see Appendix A) include Unsworth et al. (2016) who compared a three-day nature trip to a similar condition with mindfulness. While the engagement with nature was passive in this case, the mindfulness condition significantly increased participants' self-nature interconnectedness compared to the control condition and participants were more likely to emphasise nature in their memories (Unsworth et al., 2016). Additionally, Beery et al. (2013) connected mindfulness and meditation to increases in connectedness to nature. Mindfulness and meditation, when considered within the context of cognitive engagement, could potentially explain why certain forms of passive engagement lead to improved HNC. An alternative explanation may lie in individual differences as previously mentioned (Macaulay, Lee, et al, 2022).

In fact, mindfulness has been discussed as a way for tackling different topics regarding sustainability in other research. In a study on mindfulness and climate change by Wang et al. (2019), an intervention with mindfulness showed that it could increase belief in climate change, and connectedness with nature mediated this relationship. Practising nature-based mindfulness has also been highlighted as one aspect that benefits the development of values and behaviours for promoting nature conservation and for improving human health in the review by Barragan-Jason et al. (2023). Further, Ray et al. (2021) studied a four week meditation programme with either nature sounds or relaxing sounds and music. They conclude that meditation in general resulted in improved mindfulness, nature

connection and pro-environmental behaviours, although the nature condition had higher improvements in nature connectedness in comparison to the relaxing sound condition (Ray et al., 2021). In regards to wellbeing, mindfulness has been proven to improve mood (Broderick, 2005) and reduce depression and anxiety (Hofmann et al., 2010) amongst other wellbeing aspects.

4.1.1.1.2. Sub-characteristic: Appreciative outdoor activities

Appreciative outdoor activities, such as canoeing or hiking, which involve enjoying and observing nature without altering the environment or use substantial technology for the experience (Wolsko & Lindberg, 2013, p. 82) also straddle across active and passive engagement with nature. They are also proven to improve wellbeing and HNC (Wolsko & Lindberg, 2013). Examples of these activities include song for nature workshop (Arbuthnott et al., 2022; Arbuthnott & Sutter, 2019), the non-motorised blue activities such as fresh-water swimming, kayaking, canoeing, paddle boarding and surfing (McDougall, Foley, et al., 2022; Thompson & Wilkie, 2021), as well as science camp (Arbuthnott & Sutter, 2019) and placemaking activities (Benjumea et al., 2022). In addition, the passive engagement experiences of walking in nature (Nisbet et al., 2019) and visiting coastal and rural locations (Wyles et al., 2019), could also be defined as such activities. Appreciative outdoor activities have further been more strongly connected to pro-environmentalism in comparison to consumptive and mechanised (or motorised) activities (Berns & Simpson, 2009).

4.1.1.1.3. Experiences with negative or non-significant results

It is relevant to note that not all the literature was pointing to active experiences having a positive effect on wellbeing and/or HNC. However, there are very few that go against this trend. Only one out of eight experiences that had a negative or non-significant result for wellbeing was active engagement, and it was from the Macaulay, Johnson et al. (2022) study that was previously mentioned. Out of the 12 instances where an experience had a negative or non-significant result for HNC, three were active engagement experiences. One was an online song for nature workshop (Arbuthnott et al., 2022), which was indirect contact (see 4.2. for further discussion). Whereas two were intentional contact: waterskiing/wakeboarding (Beery, 2013) and spending time in

zoo/wildlife/park/botanic garden (Hatty et al., 2022). One explanation could be linked to the difference between appreciative outdoor activities, mechanised activities, and consumptive activities (Berns & Simpson, 2009). Motorised activities, which waterskiing and wakeboarding are part of, have been connected to lower nature connectedness in comparison to doing outdoor activities of a more appreciative character (Wolsko & Lindberg, 2013). This is also the case for consumptive outdoor recreation. Spending time in zoos or wildlife parks could be considered to be low-level consumptive outdoor recreation (Duffus & Dearden, 1990).

4.1.2. Theme: Intensity of nature exposure

Within the theme intensity of nature exposure, 23 experiences included attributes such as wilderness, naturalness, national parks, protected areas, and animal- and plant biodiversity. These experiences were thus coded into biodiversity and wildness and further into actual attributes and perceived attributes depending on the design of the experience. In ten cases the attributes were perceived, while in eleven they were actual, and in two cases the attributes were both perceived and actual. Though both perceived and actual attributes were proven beneficial for wellbeing, five cases concluded that the perceived attributes were more strongly associated with wellbeing than actual attributes (Cameron et al., 2020; Schebella et al., 2019).

Seven experiences within this characteristic were drawn from studies exploring, and finding benefits, for both wellbeing and HNC, and are subsequently presented in Table 5. One additional experience showed HNC benefits, and the remaining 17 experiences were connected to wellbeing benefits. However, two of these experiences could not connect the wellbeing benefits to the characteristics of biodiversity (J. C. Fisher, Bicknell, et al., 2021).

4.1.2.1. Characteristic: Biodiversity and wildness - actual attributes

"Biodiversity and wildness" was shown to be a significant characteristic for both wellbeing and HNC. Dobson (2021) concluded that an urban green space with actual attributes in the form of more wildlife diversity made the participants respond more positively to the green space. They also found HNC benefits, however not specifically associated with biodiversity. As previously mentioned,

Wyles et al. (2019) found that participants reported higher recalled restorativeness and recalled connectedness to nature when visiting coastal or urban locations with PDA (protected or designated area) status, than visiting similar environments without the status. For rural green space, the PDA status only affected recalled restorativeness.

In addition, there are several studies that investigate wellbeing and one study that examines HNC that finds experiences supporting the pattern of actual attributes being beneficial (see Appendix A). Hatty et al. (2022) noted that participants who spent more time in wilderness or protected areas had increases in connectedness to nature, whereas attributes such as biodiversity (Wood et al., 2018), higher plant biodiversity (Adjei & Agyei, 2015) and birdsongs (Zhu et al., 2020) were proven to affect wellbeing positively. This is interesting as a review by Barragan-Jason et al. (2023) revealed that high biodiversity is one aspect that supports the development of values and behaviours that are pro-nature conservation and improve human health.

4.1.2.2. Characteristic: Biodiversity and wildness - perceived attributes

Looking at perceived attributes, two studies explore both wellbeing and HNC, hence being presented in Table 5. Samus et al. (2022) concluded that perceived wildness could increase the wellbeing benefit gained from a nature experience. On the other hand, perceived wildness did not differ in the two conditions with varying actual wildness, and there was no difference in the results for HNC between the two conditions. However, Southon et al. (2018) connects perceived biodiversity to HNC and not specifically to the measured wellbeing benefits. They further conclude that colourfulness, amount of vegetation, and evenness of plant community are all important attributes when the biodiversity level is perceived.

Further support for the importance of perceived biodiversity & wildness on wellbeing benefits come from an additional ten experiences (Adjei & Agyei, 2015; Cameron et al., 2020; Ferraro et al., 2020; J. C. Fisher, Irvine, et al., 2021; Samus et al., 2022; Schebella et al., 2019), as shown in Appendix A. For example, J.C. Fisher, Irvine et al. (2021) found that participants thought that an urban blue or a green space was restorative if they perceived them to be species-rich and natural, and that this view that a site is restorative led to better wellbeing.

Similarly, in a study by Ferraro et al. (2020) that examined hikers and used digital phantom chorus of birdsong, found that phantom birdsong affected perceptions of biodiversity on one hiking trail which linked to increased restorative effects. Moreover, Schebella et al. (2019) found that perceived attributes such as naturalness, biodiversity and canopy cover to be more associated with improved wellbeing than actual attributes. This is also noted by Cameron et al. (2020) who have stated that positive emotions are reported in spaces where there is perceived to be high wildlife even if the actual level does not match the perception. Southon et al. (2018) found that perceived biodiversity was positively related to connection to nature, specifically noting the importance of attributes such as the amount of vegetation, evenness of the plant community and the colourfulness when perceiving biodiversity levels .

4.1.2.3. Experiences with negative or non-significant results

Two experiences contradict the otherwise clear evidence. They both stem from the same study by J. C. Fisher, Bicknell, et al. (2021), and concerns visits to a coast in a city and visits to a city park in a neotropical city (Georgetown, Guyana). They found that although green space/blue space contributes to increased wellbeing, avian biodiversity does not. The authors discuss this disparity with other research in, amongst other things, terms of setting, where in the city of study concerns for personal safety could explain the high negative affect. Moreover, another point of discussion is the importance of perceived wildness (J. C. Fisher, Bicknell, et al., 2021) as noted above. The same authors have published another study from the same neotropical city, where they concluded that a greater perceived species richness was in fact connected to improved wellbeing, when a site was perceived as restorative (J. C. Fisher, Irvine, et al., 2021).

4.1.3. Additional insights concerning characteristics that improve both wellbeing and HNC

Referring back to studies mentioned in the previous section, some evidence points towards active engagement being even more beneficial for participants when in a biodiverse or wild space. Cameron (2020) and Dobson (2021) both investigated the use of prompts to notice things in nature. Cameron (2020) found that greater avian biodiversity and a larger variety in habitats positively related to improvements in happiness, whereas Dobson (2021) observed that greater wildlife

diversity made participants respond more positively to the urban green space, and that noticing good things in nature also increased HNC.

Additionally, according to Samus et al (2022), individuals with higher connectedness to nature are more likely to perceive higher levels of wilderness, suggesting a possible link between HNC, positive affect, and perceived wilderness. A positive relation between HNC and wellbeing is also noted by Dobson et al. (2021), stating that increased nature connectedness predicted increased wellbeing and Kanelli et al (2021), noting that a higher environmental profile is related to lower levels of stress. These conclusions are in accordance with Sheffield et al. (2022), that also ties connectedness to nature to psychological wellbeing. It further relates to what Giusti and Samuelsson (2020) concluded regarding regenerative compatibility, where healthy ecosystems and positive environmental attitudes increased the likelihood of people having restorative experiences in nature.

4.2. Further discussion on characteristics of nature experiences

4.2.1. Type of contact with nature

Indirect contact can positively affect human wellbeing although there was some variance. For example, being able to view nearby nature from a window has a positive relationship with life satisfaction (Chang et al., 2020) while looking at green space through a window of a high-rise building has been associated with stress reduction, better mood, and positive feelings in comparison to looking at an urban view (Elsadek et al., 2020). Digital experiences such as an online workshop that involved writing songs for nature improved positive and elevating emotions (Arbuthnott et al., 2022) while watching videos of nature was better for recovery in negative mood than videos of built urban space (A.E. Van den Berg et al., 2014). Virtual reality seems particularly effective for improving wellbeing with studies indicating increased happiness and relaxation and reduced heart rate after exploring a virtual meadow (Adhyaru & Kemp, 2022), increased positive affect and decreased negative effect with VR forest-bathing (Reese et al., 2022), as well as reduced stress and negative affect after a 360° VR experience (Anderson et al., 2017). However, it should be noted that Soliman et al. (2017) did not find a difference in effect on mood between built and nature conditions through videos

nor immersive virtual reality, and Spendrup et al. (2016) also did not find support for nature sound having had effect on mood in their food retailer experiment.

When it comes to the effect of indirect contact on HNC, the results were more varied. The online song for nature workshop mentioned previously did not have a significant effect on nature connection, while the outdoor version (intentional contact) had increased nature connection (Arbuthnott et al., 2022). Spendrup et al. (2016) also did not observe any effect on nature connectedness through their experiment. Soliman et al. (2017) discovered that participants' connectedness to nature increased in both video and VR conditions, with no significant difference between the mediums. However, Ahn et al. (2016) found that immersive VR experiences, particularly those accompanied by haptic feedback, were associated with a higher level of Inclusion of Nature in Self compared to video conditions.

Three experiences, including walking through a green pedestrian street (Honey-Rosés and Zapaata, 2023), and engaging in outdoor pool and waterpark swimming, and skateboarding experiences (Beery, 2013), were classified as incidental. The impact of these experiences varied, with the green pedestrian street showing better mood when there were fewer people present, especially for women (Honey-Rosés and Zapaata, 2023). For both examples from Beery (2013) environmental connectedness was negatively related to both of the experiences. However, due to the limited number of experiences in this category, it is difficult to draw definitive conclusions.

4.2.2. Quality of engagement with nature

There is not an abundance of evidence in the reviewed literature that indirect active contact is effective in improving HNC. Despite the fact that it is active, the online format of the song for nature workshop did not significantly increase nature connection as stated previously (Arbuthnott et al., 2022). In comparing different active and passive engagement through the use of VR and video, Ahn et al. (2016) found that immersive VR with haptic feedback (active) in which participants embodied a cow or a coral resulted in greater Inclusion of Nature in Self than in the video condition (passive). However, due to the limited number of experiences included in the review, reliable conclusions cannot be reached concerning indirect active contact.

Regarding intentional passive contact, Lengieza and Swim (2021a) studied walking in urban green space, where the participant was encouraged to decrease their public self-awareness, and concluded that this had the potential to increase the effect of nature contact on explicit connectedness to nature. Lumber et al. (2017) studied walking for 20 minutes in three different conditions, where the passive engagement condition (walk in nature without mindfulness) resulted in increased wellbeing but not HNC. Contrary to this, Beery et al. (2013) connected HNC improvements to walking, and also to the passive engagement activity of nature picnic and grilling.

4.2.3. Environment type

There is mixed evidence regarding whether green space or blue space offer the same wellbeing or HNC effect. J. C. Fisher, Irvine et al. (2021) compared visiting a waterway site, a green site, and a dense urban site, and found that the waterway site resulted in lower negative affect than the urban site, while the green site was perceived to be the most restorative among the three sites. Furthermore, the green site also resulted in greater positive affect and lesser negative affect than dense urban sites and lower anxiety levels than the other two sites (J. C. Fisher, Irvine, et al., 2021). Another study by J.C. Fisher, Bicknell et al. (2021) found that negative affect was lower in a green area compared to a coastal area. Green space during summer was found to promote physical activity and affect mental restoration directly whereas blue space in summer inhibited physical activity and did not promote mental health (Zhou et al., 2022). Kajosaari and Pasanen (2021) suggested that doing physical activity in large green spaces and in blue spaces comes with supplementary restorative benefits when compared to physical activity in built environments. Although the study did not measure HNC, they noted that nature enjoyment was connected to natural environments regardless of size (Kajosaari & Pasanen, 2021). Additionally, Marselle et al. (2013) compared group walks in different settings, noting that some green spaces (farmland) and green/blue spaces (green corridor such as along a river) resulted in wellbeing improvements, whereas other settings, both blue space (coastal area) and green space (for example urban green spaces, natural and semi-natural areas), did not when compared to a control condition in an urban setting (Marselle et al., 2013).

The study by Wyles et al. (2019) that investigates blue spaces and green spaces with different levels of naturalness found that respondents recalled higher restorativeness and connectedness to nature in a coastal location than urban green locations. Another study looking at the restorative quality of nature paths and birdsongs found paths with wetlands and waterfront to be more restorative than open space paths in forests (Zhu et al., 2020). A large study concerning several countries around the world saw that the wellbeing benefits of visits to green or blue spaces increased with higher frequency of visits, and that this was relatively consistent across both countries and seasons for green space but more varied for blue space (White et al., 2021). Rickard and White (2021) did not find any difference between green space (garden) and blue space (beach) in their experiment of walking barefoot for levels of restoration nor levels of connectedness to nature.

4.2.4. Frequency and duration

Several studies have indicated that frequency and/or duration of nature visits can affect both wellbeing and HNC. Shanahan et al. (2016) found that visiting green spaces for thirty minutes or more per week could lower depression and high blood pressure. Hong et al. (2019) noted a connection between life satisfaction and frequency of visits to green space but not for duration of visits. Frequent visits to the zoo were connected to better psychological and/or physiological benefits (Coolman et al., 2020), while frequency also resulted in lower stress levels for recreational fishing (Pita et al., 2022). Chang et al. (2020) reported that spending over an hour in natural spaces weekly was linked to higher life satisfaction, but this connection was only relevant for those with a stronger connection with nature. Spending more time in nature at least on a monthly basis over one year resulted in increases in connectedness to nature (Hatty et al., 2022). Furthermore, participating in thirty days wild daily led to both sustained benefits of health and happiness as well as nature connection (Richardson et al., 2016, 2018). Moreover, the large international study by White et al. (2021) noted that with higher frequency of visits to green or blue space, came both increases in wellbeing as well as decreases in mental distress. This was consistent across countries but also over seasons, however only for green spaces. For blue spaces there was more variance (White et al., 2021).

4.3. Organisational perspective

4.3.1. Current practices mentioned in the interviews

The nature experiences raised in the interviews were of a wide range in terms of the characteristics of the experiences, as well as the complexity for organising the activities. The interviews revealed that both of the companies have evolved from a Corporate Social Responsibility strategy to an Environmental, Social, Governance strategy, and the activities that were discussed were part of this strategy. For the non-profit, the main aim of the initiatives conducted related to their theory of change, which involved empowering indigenous communities to safeguard their territories as well as to exchange knowledge to safeguard the Earth.

Some low-complexity initiatives mentioned include encouraging home gardening, practising grounding (being barefoot in nature), and environmental awareness campaigns. These initiatives aim to create awareness and enable employees to take action, providing intentional or indirect experiences with active or passive engagement with nature. Direct earth contact in the form of garden work (Beery, 2013) and being or walking barefoot (Harvey et al, 2016; Rickard and White, 2021), which the literature review demonstrated to have positive outcomes for human beings.

Tree planting, beach or forest cleanups, and meditative activities in nature require more effort and coordination to organise. Tree planting was the most mentioned activity across the interviews, both being conducted by the employees directly, and for the employees by non-profit organisations. It could also be linked to other activities such as awareness campaigns, physical wellbeing initiatives, and social responsibility projects. Out of the different variations for tree planting discussed, employees directly planting trees or walking to convert steps into trees planted have potential to be more effective in improving both wellbeing and HNC, as they can be intentional experiences with active engagement with nature. Both tree planting and cleanups can be considered environmental volunteering, or conservation, which has been found to increase wellbeing (O'Brien et al., 2010). One interviewee mentioned engaging in activities such as yoga and tai chi in nature, while another mentioned meditation and mindfulness in nature. The benefits of meditative activities in nature have been highlighted in the literature

review, through various studies, both in terms of active engagement (Hung et al, 2021; Ibes et al., 2018; Kanelli et al., 2021; Lumber et al., 2017; Macaulay, Johnson et al., 2022; Nisbet et al., 2019) and passive engagement (Beery, 2013; Macaulay, Johnson et al., 2022; Unsworth et al., 2016), sorted under the sub-characteristics of cognitive engagement. The measured benefits concern both wellbeing and HNC.

At the other end of the implementation complexity, activities that require more resources can be found. Such activities take place outside of the office and during several days, such as volunteering at a wildlife sanctuary or participating in a retreat in the Amazon forest. While the effectiveness of such initiatives depends on the activities included, the retreat in the Amazon forest covered all characteristics that were found to lead to positive outcomes for humans.

4.3.2. Opportunities and barriers

In discussing the opportunities and barriers for implementing nature experiences that have positive outcomes for human beings at an organisation, there were differences as well as overlaps mentioned by the interviewees. The barriers mentioned were of a practical nature and included logistics, human and financial resource availability, time and prioritisation, as well as lack of awareness of benefits of such experiences, especially in the top management. The opportunities ranged from strategic ones to changes in the working model. The following section details what was deemed to be the main takeaway regarding opportunities and barriers.

A major opportunity that was mentioned in one interview was the flexibility offered, for example through the adoption of a hybrid working model that allows employees to work away from the office. One participant described an initiative where the employees were encouraged to take calls during walks when they did not need to be at their laptops. The participant explained how the initiative was being introduced for the wellbeing of the employees, but ended up having co-benefits such as productivity, and in the form of people discussing creative new ideas during a group walk. Moreover, secondary benefits were mentioned by another participant, who described how the company's hybrid working model initially was launched as a wellbeing initiative allowing employees to work from

home, but it ended up having secondary benefits when employees sought out nature experiences. The flexibility gave some employees the possibility to move away from urban to rural areas to be more in contact with nature, while others were able to spend weekends in remote natural areas. One aspect that emerged from the interviews was the possibility of exploring how to actively encourage employees to seek nature experiences, within the frames of hybrid work. In light of barriers mentioned such as time, financial investments, and effort required when organising an activity out of the office, actively encouraging employees to use existing opportunities is mentioned as something that has potential. This is further related to the opportunity to adapt to changing circumstances.

The possibility to actively encourage employees to engage in nature is also mentioned as an opportunity to implement nature experiences into the work culture. Further, activities aimed at creating awareness and to educate employees on climate change, environmental problems and possible solutions, are mentioned as an opportunity to create a culture of care for the environment. Another opportunity mentioned was to maximise the impact of current or future activities. One participant explained how a holistic view and a combination of elements and expertise from the ESG team has helped them to tailor activities to have greater impact than the initial proposal. For example, yoga and tai chi sessions for wellbeing could be expanded to include elements of nature through moving the activity to a nearby park. Another example is walking in nature to convert steps into planted trees. This could be interesting to consider bearing in mind what has been suggested by C. D. Rosa and Collado (2020) regarding Active-PEB, defined as a combination of outdoor physical activities (OPA) and pro-environmental behaviour (PEB), where PEB refers to behaviours with a minimum or even positive impact on the environment (C. D. Rosa & Collado, 2020). Yet another possible opportunity is to cooperate with external actors, such as NGOs or local communities. All of the participants described such co-operations as being beneficial in several ways.

A major barrier identified was regarding understanding the benefits of these types of experiences. While they are understood to be positive for employee welfare, what seems to be lacking is the understanding that they also bring organisational benefits such as productivity, creativity, and innovation. The interviews and the

barriers mentioned revealed that while ESG is considered to be of strategic importance to corporations, these types of initiatives that include nature experience and employee engagement are still considered costly as the full benefits such as employee attraction and retention, productivity, creativity, innovation, and having meaningful work are not considered into the equation. One participant expressed that employees of different seniority and backgrounds must be exposed to these types of initiatives, while another emphasised the importance of not only engaging from top-down but also bottom-up, which is in line with the holistic approach to corporate sustainability that Schröder et al. (2022) mention, involving the whole workforce.

4.4. Limitations

There are a number of limitations in the current research for both the literature review and the semi-structured interviews. In the literature review, the original search resulted in a plethora of articles. While the selection of articles was made with thoroughness and care, the research could not cover all articles and the most pertinent studies had to be selected based on the exclusion criteria. This research focused on characteristics of nature experiences, and therefore individual and cultural differences were not in scope, although relevant.

While the studies selected provided insight into the topic, they are not without limitations themselves. One common limitation mentioned in the articles was that the study sample was small or selective, meaning that it was not generalisable (e.g. Reese et al., 2022; Benjumea et al., 2022; Costello et al., 2019). Another limitation was that several of the studies employed self-reported data, meaning they could be prone to several biases (Bauhoff, 2011). Furthermore, it was noted as a limitation in some of the studies (e.g. Marselle et al, 2013; Kajosaari and Pasanen, 2021) that the design of the research did not allow for causality to be established. In addition, only a few studies take place in low-middle income countries, or subtropical regions. This could be partially due to the inclusion and exclusion criteria, as only studies in English were included.

Studies on seasonal differences or weather were in minority in the original search and only two studies added seasons as a focus (White et al., 2021; Zhou et al., 2022) passed the exclusion criterias to the final review sample. No study

examining the effects of nature activities specific to winter, such as skiing or skating, was found, pointing towards a gap in the literature.

Regarding the interview phase of the study, one limitation is the number of interviewed organisations. While the purpose was not to provide generalisations and to provide case studies, the research would have benefited from more perspectives. However, it was difficult to have organisations agree to an interview as it is an emerging topic, and relevant stakeholders were not always available. Another limitation was that the interviews took place on Zoom due to geographical distances, with the risk of technical issues and increased psychological distance between the interviewer and the interviewees.

5. Conclusions and future direction

This work has contributed to research that aims to understand the characteristics of nature experiences that lead to positive outcomes for human beings. The literature review revealed that intentional contact, active engagement, and biodiversity and wildness to be significant characteristics that positively impact human beings through wellbeing and HNC. All of the experiences presented in Table 5 that reported results that improve both wellbeing and HNC were intentional contact. Active engagement with nature, specifically appreciative outdoor activities, cognitive engagement, cues, and direct earth contact, seem particularly effective in improving wellbeing and HNC. Moreover, appreciative outdoor activities and cognitive engagement have been shown to be beneficial even when passive. Evidence suggests that mindfulness, a form of cognitive engagement, may be beneficial in both active and passive forms of engagement. Furthermore, both perceived and actual biodiversity and wildness seem to lead to positive outcomes for human beings, though perceived attributes may tend to be an even stronger predictor of wellbeing and HNC, than actual attributes. In addition, there are some indications that active engagement can be even more beneficial when taking place in a biodiverse or wild space. There is also some evidence that there is a link between HNC and wellbeing, which suggests that improving HNC would increase the wellbeing effects experienced by an individual during a nature experience. This knowledge is crucial for designing nature experiences that are able to more efficiently improve wellbeing, as well as improve HNC, which has been linked to pro-environmental behaviours (Barragan-Jason et al., 2023; Sheffield et al., 2022).

The research also discussed other characteristics of nature experiences that had inconclusive evidence. For example, indirect contact may positively affect human wellbeing, while there was more variance on whether this type of contact could improve HNC. Furthermore, there was not an abundance of evidence that indirect active contact could improve HNC, despite it being active engagement with nature. Regarding the environment type, there was a mix of evidence whether green or blue space could offer the same wellbeing or HNC effect, while there was some evidence from the literature review suggesting that frequency and/or duration affect both wellbeing and HNC.

Furthermore, the exploratory aim of this thesis was to examine an organisational perspective through interviewing organisations that are currently incorporating or thinking to implement practices that include nature experiences with the potential to improve employee wellbeing and HNC. The interviews showed that the initiatives organized by the organisations ranged in the characteristics of the experiences, as well as the complexity for implementation. A barrier that needs to be overcome is reaching an understanding of the benefits of such experiences, not only for the employees but for the business. Productivity, creativity, and innovation were mentioned as secondary benefits when initiatives were organised with wellbeing in mind. One major opportunity identified is the hybrid working model, which allows employees to work remotely, and the possibility for the company to actively encourage its employees to experience nature. This could possibly be combined with an effort to create awareness about the environmental challenges and subsequent possible actions, as well as about the beneficial aspect of nature among the employees.

An interesting direction for future research would be to leverage the characteristics of nature experiences, and the opportunities and barriers for organisations that have been identified through this work. One direction could be to elaborate further on opportunities and barriers, in order to better understand and design experiences that are catered for organisations that include the characteristics that have been found to be particularly beneficial for humans. As it has been identified that flexibility and hybrid working are seen to be opportunities for organisations and that it can be further utilised to promote nature experiences, an intervention including an awareness campaign to promote such opportunities within the organisation could be an interesting direction for future research.

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Appendix A. All studies and experiences included in the literature review, coded by theme

Note on colours: Green indicates positive outcomes; yellow indicates lesser/ambiguous, but still positive outcomes; and red no significant improvements/negative results

Citation	Aim	Cou ntry	Nature experience	Type of contact	Quality of engagement		Freq. and duration	Env. type	Intensity of nature exposure		Effect on HWB	Effect on HNC
Adhyaru and Kemp (2022)	Explore the potential of a brief virtual reality (VR) nature experience to bring about positive mood states for NHS clinicians when conducted during the workday.	UK	Exploration of a virtual meadow	Indirect	Active	VR	D: Less than 30 minutes total	Green space (VR)			Increased levels of happiness and relaxation, decreased levels of sadness, anger, anxiety. Reduction in heart rate.	
Adjei & Agyei (2015)	To explore the relationship between human well-being and the biodiversity level in an environment.	UK (Wal es)	Visiting a park	Intentional	Passive	Appreci ative outdoor activity		Green space	Biodivers ity & wildness	Perceived attributes: Park, high naturalness	Higher perceived naturalness connected to higher levels of happiness.	
			Visiting a park	Intentional	Passive	Appreci ative outdoor activity		Green space	Biodivers ity & wildness	Actual attributes: Park, high plant biodiversity	Higher plant biodiversity associated with higher level of happiness and wellness.	
			Visiting a park	Intentional	Passive	Appreci ative outdoor activity		Green space			Decreased level of happiness compared to sites with less noise and crowdedness.	
Ahn et al. (2016)	Compare effects of using immersive virtual environments (IVE) to embody	USA	Embodying a coral in immersive virtual	Indirect	Active	VR		Blue space (virtual)				No difference in INS from the video condition

animals versus watching the experience on video.		environment without haptic feedback								
		Embodying a coral in immersive virtual environment with haptic feedback	Indirect	Active	VR		Blue space (virtual)				Greater INS than in video condition
		Embodying a cow in immersive virtual environment with haptic feedback	Indirect	Active	VR		Green space (VR)				Geater INS than in video condition
		Watching a video of IVE experience of embodying a coral with haptic feedback	Indirect	Passive	Digital		Blue space (virtual)				Lesser INS than in IVE condition
		Watching a video of IVE experience of embodying a coral without haptic feedback	Indirect	Passive	Digital		Blue space (virtual)				No difference in INS from the IVE condition

Study	Aim	Country	Intervention					Duration	Space			Outcome	Outcome
			Watching a video of IVE experience of embodying a cow with haptic feedback	Indirect	Passive	Digital			Green space (VR)				Lesser INS than in IVE condition
Anderson et al. (2017)	To evaluate different natural settings in VR on their ability to reduce stress and improve mood.	USA	360° VR of remote Australian beaches	Indirect	Passive	VR		D: 15 minutes	Blue space			Connected to greater stress reductions compared to a control scene. Reduces negative affect, and increase overall mood.	
			360° VR of rural Ireland	Indirect	Passive	VR		D: 15 minutes	Green space (rural)			Connected to greater stress reductions compared to a control scene. Reduces negative affect, and increase overall mood.	
Arbuthnott and Sutter (2019)	Examine whether songwriting retreats in nature improve emotional well-being and creative reasoning as well as increase nature connectedness.	Canada	Outdoor song for nature workshop in National Wildlife Area	Intentional	Active	Appreciative outdoor activity	D: 2 full days (4 hours for song-writing, rest for nature-related activities)		Green space/ blue space			Improved positive and elevating moods.	Increased nature relatedness (increase in Perspective subscale outstanding).
			Science camp in remote	Intentional	Active	Appreciative	D: 2 full days		Green space/			Improved positive and elevating moods.	Increased nature relatedness (with the exception of the

A3

			natural setting (observing animal behaviour)			outdoor activity		blue space				Perspective subscale)
Arbuthnott et al. (2022)	Examine whether online contact with nature increases nature connection in a similar way as outdoor contact in the context of Songs for Nature workshops.	Canada	Outdoor Song for Nature workshop in provincial park and beach	Intentional	Active	Appreciative outdoor activity	D: One weekend	Green space/ blue space			Improved emotional wellbeing in several ways	Increased nature connection
			Online Song for Nature workshop	Indirect	Active	Digital	F: 4 sessions over a 2-week period D: 2.5 hours	Various (digital/ imagined)			Improved positive and elevating emotions. Did not increase hope nor decrease negative emotions.	Did not significantly increase nature connection.
Beery (2013)	To explore if there is a relationship between "friluftsliv" (nature-based outdoor recreation) and environmental connectedness, EC.	Sweden	Waterskiing/ wake boarding	Intentional	Active	Motorised outdoor recreation		Blue space				Negatively related to environmental connectedness.
			Garden work	Intentional	Active	Direct earth contact		Green space				Positively correlated to increased environmental connectedness
			Plant & animal study/bird watching	Intentional	Active	Appreciative outdoor activity		Green space				Positively connected to increased environmental connectedness.

			Meditation/yoga in nature	Intentional	Passive	Cognitive engagement		Green space						Increased environmental connectedness.
			Outdoor pool and waterpark swimming	Incidental	Passive	Nature as a by-product		Blue space						Negatively related to environmental connectedness.
			Skateboarding	Incidental	Passive	Nature as a by-product		Green space						Negatively related to environmental connectedness.
			Nature picnic and grilling	Intentional	Passive	Appreciative outdoor activity		Green space						Increased environmental connectedness.
			Walking (in the forest and country; pleasure and exercise oriented walking; dog walking; walking with poles)	Intentional	Passive	Appreciative outdoor activity		Green space						Increased environmental connectedness.
Benjumea et al. (2022)	Analyse placemaking activities conducted by a Singaporean NGO and examine frequency of interaction, time needed, and role of facilitators in building alternative values towards the natural environment.	Singapore	Nature placemaking activities led by NGO (farming, sketching, wood workshops, earth oven)	Intentional	Active	Appreciative outdoor activity	F: Various (twice a year to 250 times a year) D: Various	Green space				No direct impact demonstrated but aspects that may increase psychological wellbeing evidenced (feelings of self-efficacy, self-esteem, social cohesion, and sense of community).	Affective and collective character of the activities influenced emotional (empathy/attachment) form of nature connection. Facilitators of the programme influenced

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Author	Aim	Country	Activity					Space			Findings	
												experiential (interaction) and cognitive (knowledge and awareness) forms of nature connection.
Cameron et al. (2020)	Assess whether more positive emotions were linked to higher measured or perceived biodiversity in different urban green spaces.	UK (England)	Visiting urban green spaces with app prompting to notice things in nature	Intentional	Active	Cues		Green space (urban)	Biodiversity & wildness	Actual & perceived: Various levels of biodiversity	Greater happiness reported in spaces with greater variety of habitats and greater avian biodiversity. More positive emotions reported in spaces with perceived high wildlife (even when perception was not matching actual level of avian biodiversity)	
Carreño et al. (2020)	Assess mental health benefits of scuba diving in comparison to lying on the beach. Compare health benefits between two diving experiences to see whether diving with more eco-friendly practices is more beneficial for divers' mental health.	Spain	Scuba diving	Intentional	Active	Appreciative outdoor activity	D: Approximately 1 hour	Blue space			Reduced psychological distress after just one hour	
			Lying on the beach	Intentional	Passive	Appreciative outdoor activity	D: Approximately 1 hour	Blue space			Reduced psychological distress after just one hour	
Chang et al. (2020)	Quantify the relationship between different types of	Singapore	Visiting natural areas	Intentional	Passive	Appreciative	D: Various	Various			Visiting a diverse range of natural spaces positively	

A6

	nature experience and life satisfaction and assess whether this is influenced by how strongly the person is connected with nature.		Viewing nature from windows at home/workplace	Indirect	Passive	Windo w view	D: Various	Various			outdoor activity correlated with life satisfaction. Nearby nature view (i.e., less than 500m) has positive relationship with life satisfaction.	
Colléony et al. (2020)	Explore how the use of cues to experience nature can influence nature interactions and positive affect.	Israel	Visiting green spaces with cues to experience nature	Intentional	Active	Cues	D: 30 minutes	Green space			Participants who were given cues that brought them psychologically closer to nature interacted more with nature and reported more positive affect than participants that received other cues.	The use of cues promising for inducing state (temporary) nature relatedness.
Coolman et al. (202)	To examine health changes among zoo visitors (an immersive and naturalistic exhibit)	USA	Visiting a zoo (immersive, naturalistic exhibit)	Intentional	Active	Consu mptive outdoor recreati on (low)	D: Average 30 minutes	Green space			Reduced stress after a walk through the exhibit. Participants experienced better mood, less tension and more energy post visit.	
Costello et al. (2019)	Investigate the contribution to healthy ageing that being part of self-organised ocean swimming groups has for older women and men in Perth.	Australia	Self-organised ocean swimming in groups	Intentional	Active	Appreci ative outdoor activity	F: Daily D: Various	Blue space			Perceived by participants to be beneficial for wellbeing, social connectedness, physical and mental health.	Participants' affinity with marine mammals reflect anthropocentric view as opposed to ecocentric view. No desire for shark

												controls despite fears
Coventry et al. (2019)	To evaluate the wellbeing and health benefits that different activities, performed in different green spaces (public) in both semi-urban and urban areas.	UK (Eng land)	Doing conservation tasks in nature (creating wildlife habitats, scything, flood mitigation and pruning).	Intentional	Active	Conser vation	D: 20-30 minutes	Green space			Improved mood, reduced stress.	
			Participating in citizen science (studying trees for lichens or signs of diseases or pests).	Intentional	Active	Conser vation	D: 20-30 minutes	Green space			Improved mood, reduced stress.	
			Group walks (passive, non-interactive)	Intentional	Passive	Appreci ative outdoor activity	D: 20-30 minutes	Green space			Improved mood, reduced stress.	
Dobson et al. (2021)	Examine how urban nature mediates the relation between stressed humans and places.	UK (Eng land)	Visiting urban nature, with app prompting to notice good things in nature	Intentional	Active	Cues	D: 7 days	Urban nature	Biodivers ity & wildness	Actual attributes: Wildlife diversity	Increased mental wellbeing, sustained after one month. Participants responded more positively to urban green spaces with more wildlife diversity.	Increased connectedness with nature. Increased nature connectedness was a predictor of increased wellbeing.

A8

Elsadek et al. (2020)	To examine the role of a green window view, in a high-rise building, on psychological wellbeing	China	Green window view from a high-rise building	Indirect	Active	Window view	D: 3 minutes (actively watching)	Green space (urban)			Reduced stress, improved mood and associated to more positive feelings when compared to urban view.
Ferraro et al. (2020)	Investigate how the self-reported perceptions of biodiversity and well-being among hikers would be affected by an experimental increase in birdsong	USA	Hiking and hearing birdsong (digital phantom chorus)	Intentional	Passive	Appreciative outdoor activity	D: 7-10 minutes	Mountain park	Biodiversity & wildness	Actual & perceived: digital birdsong	Phantom chorus condition related to higher levels of restorative effects. Phantom chorus directly linked to increased restorative effects on one trail; indirectly linked to increased restorative effects on other trail through perceptions of avian biodiversity
J.C. Fisher, Irvine, et al. (2021)	Examine how perceptions of urban spaces relate to wellbeing. Test how naturalness, perceptions of sound, bird species richness, and safety concerns affect how sites are perceived as restorative.	Guyana	Visiting waterway site	Intentional	Passive	Appreciative outdoor activity		Blue space (urban)	Biodiversity & wildness	Perceived attributes: Species-rich, natural, biophonic sounds	Restorativeness of blue spaces thought to be greater if the site is perceived to be species-rich, natural, safe and if there are biophonic sounds (bird-related). This perception that a site is restorative resulted in better wellbeing

A9

						Appreciative outdoor activity		Green space (urban)	Biodiversity & wildness	Perceived attributes: Species-rich, natural, biophonic sounds	(increased positive affect, decreased negative affect and anxiety).
			Visiting green site	Intentional	Passive						Restorativeness of green spaces thought to be greater if the site is perceived to be species-rich, natural, safe and if there are biophonic sounds (bird-related). This perception that a site is restorative resulted in better wellbeing (increased positive affect, decreased negative affect and anxiety).
J.C. Fisher, Bicknell et al. (2021)	To explore the relationship between bird diversity (species richness and abundance, community composition and Shannon diversity) in green and blue (coastal) space and human wellbeing (anxiety, negative and positive affect).	Guyana	Visiting a coast in a city	Intentional	Passive	Appreciative outdoor activity	F: Various D: Various	Blue space	Biodiversity & wildness	Actual attributes: Coast (sea), with low bird diversity	Blue space, but not bird diversity, was connected to wellbeing. Study performed in a neotropical city.
			Visiting a city park	Intentional	Passive	Appreciative outdoor activity	F: Various D: Various	Green space (urban)	Biodiversity & wildness	Actual attributes: Park with high bird diversity	Green space, but not bird diversity, was connected to wellbeing. Study performed in a neotropical city.

Gatersleben and Andrews (2013)	Examine how prospect (clear field of vision) and refuge (places to hide) affect perceived and actual restoration in a country park.	UK (England)	Viewing video recordings of a walk through a country park	Indirect	Passive	Digital	D: 9 minutes and 50 seconds	Green space			More prospect and less refuge resulted in more restoration.	
			Walking through a country park	Intentional	Passive	Appreciative outdoor activity	D: 10 minutes	Green space			More prospect and less refuge resulted in more restoration. Effect of prospect and refuge on restoration of attention more strong when taking a walk outdoors than viewing a video.	
Harvey et al. (2016)	To determine 1) if barefootedness preference is connected to a feeling of HNC 2) if the level of general comfort with being barefoot, and a level of comfort with being barefoot outside are associated with a higher HNC 3) the motivations and conditions, other than athletic reasons, for going barefoot 4) people's feelings while being barefoot, including whether	USA	Going barefoot	Intentional	Active	Direct earth contact		Green space/ blue space			Connected to positive feelings such as freedom, connection and happiness. It is also connected to feeling "comfortable or relaxed or good"	Positively associated with connection to nature and can lead to a feeling of nature immersion. The higher level of comfort a person feels with going barefoot, the higher the nature connection.

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	going barefoot is related to visual field focus-shift										
Hatty et al. (2022)	Investigate to what extent spending time in nature, and the type of nature, predicts connection with nature.	Australia	Spending time in domestic garden	Intentional	Passive	Appreciative outdoor activity	F: Various D: Various	Green space			Changes in connectedness to nature not significant.
			Spending time in zoo/wildlife park/botanic garden	Intentional	Active	Consumptive outdoor recreation (low)	F: Various D: Various	Wildlife park			Changes in connectedness to nature not significant.
			Spending time in wilderness/protected areas	Intentional	Passive	Appreciative outdoor activity	F: Various D: Various	Wilderness	Biodiversity & wildness	Actual attributes: Wilderness	Participants who spent more time in this area had increases (small) in connectedness to nature
			Spending time in lake/river/other waterway	Intentional	Passive	Appreciative outdoor activity	F: Various D: Various	Blue space			Participants who spent more time in this area had increases (small) in connectedness to nature
			Spending time on beach/coast	Intentional	Passive	Appreciative outdoor activity	F: Various D: Various	Blue space			Changes in connectedness to nature not significant.
			Spending time in nature	Intentional	Passive	Appreciative outdoor activity	F: Various D: Various	Nature (non-specified)			More time spent in nature increased CN. Spending time in nature at least on a monthly basis over a year linked to increases in

Study	Aim	Country	Activity	Direct/Indirect	Active/Passive	Type	Frequency/Duration	Setting				Findings	Findings
													connectedness to nature.
			Spending time in urban parks	Intentional	Passive	Appreciative outdoor activity	F: Various D: Various	Green space (urban)					Participants who spent more time in this area had increases (small) in connectedness to nature
Hedblom et al. (2019)	To determine potential stress induction and recovery of environments that decreases in green areas step-vise.	Sweden	Visual 360° forest view, multi sensory	Indirect	Passive	Digital	F: Once	Green space				Lower stress during induced stress period as well as during recovery period, in comparison with an urban environment.	
			Visual 360° park view, multi sensory	Indirect	Passive	Digital	F: Once	Green space				Lower stress during induced stress period as well as during recovery period, in comparison with an urban environment.	
Holt et al. (2019)	Examine frequency and type of green space interactions that are very strongly associated with health and wellbeing and investigate drivers and barriers of frequent use of green space.	USA	Passive use of university campus green space (sitting, studying, realxing with friends, meditation)	Intentional	Passive	Appreciative outdoor activity	F: Various (high use is more than/equal to 4x a week) D: 15 minutes or more	Green space				Passive use not significantly associated with indicators of health and wellbeing.	
			Active use of university campus green space	Intentional	Passive	Appreciative outdoor activity	F: Various (high use is more	Green space				Students who often engaged in active ways reported better overall	

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			(running, hiking/walking, biking)				than/equal to 4x a week) D: 15 minutes or more				mood, higher quality of life, and lower percieved stress.
Honey-Rosés and Zapaata (2023)	Measure changes in affective response and mood as a result of increased pedestrian density on a green street in residential area.	Canada	Walking through a pedestrianised green street	Incidental	Passive	Nature as a by-product		Green space (urban)			Fewer public users resulted in participants being in a better mood (particularly strong among women).
Hong et al. (2019)	Examine effect of visit frequency and time spent in urban green spaces on the subjective wellbeing of urban residents.	South Korea	Visiting an urban green space	Intentional	Passive	Appreciative outdoor activity	F: Various D: Various	Green space (urban)			Improved positive affect and life satisfaction in general while decreasing negative affect. Regular visitors (weekly/monthly basis) had higher general life satisfaction levels than non-visitors or infrequent visitors (1-3 times a year).
Hung et al. (2021)	To increase the understanding of the health benefits that the landscape can have on Qigong practitioners and to fill the knowledge gap about psychological	Taiwan	Qigong in urban park (meadows)	Intentional	Active	Appreciative outdoor activity	D: 10 minutes	Green space (urban)			Meadow landscape was related to flow experience and Qi.
			Qigong in urban park (tree-covered landscapes)	Intentional	Active	Appreciative outdoor activity	D: 10 minutes	Green space (urban)			Tree-covered landscapes are associated with flow experience, reflection, Qi,

	outcomes, Qi experience, traditional environmental Qi, amongst others in urban green spaces.										recovery and traditional environmental Qi.
			Qigong in urban park (waterscapes)	Intentional	Active	Appreciative outdoor activity	D: 10 minutes	Green/ blue space (urban)			Waterscapes are connected to traditional environmental Qi, reflection experiences and recovery.
Ibes et al. (2018)	To investigate: 1) Will people use the greenspace interventions voluntarily? Do they prefer one of the formats more? 2) Do the greenspace interventions come with a positive psychological effect? 3) If so, what are the specific psychological effects? 4) Do the greenspace interventions reduce stress?	USA	Green micro break: short, mindful nature activity (digital detox)	Intentional	Active	Appreciative outdoor activity	D: 1 minutes	Green space			A short, mindful nature activity is connected to positive psychological effects, for example stress reduction.
			Green micro break: short, mindful nature activity (mindfulness in nature trail)	Intentional	Active	Appreciative outdoor activity	D: 5 minutes	Green space			A short, mindful nature activity is connected to positive psychological effects, for example stress reduction.
Kajosaari and Pasanen (2021)	To explore restorative outcomes (perceived) of a range of physical activity outdoor environments	Finland	Doing leisure-time physical activity (LTPA) in blue space	Intentional	Passive	Appreciative outdoor activity		Blue space			LTPA in blue space connected to perceived relaxation, stress reduction and restorative outcomes, in comparison to built

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										(outdoor) environments.	
			Doing leisure-time physical activity (LTPA) in green space	Intentional	Passive	Appreciative outdoor activity		Green space			LTPA in large recreational forests connected to perceived relaxation, stress reduction, and restorative outcomes in comparison to built outdoor environments.	
			Doing leisure-time physical activity (LTPA) in large urban forest	Intentional	Passive	Appreciative outdoor activity		Green space (urban)			LTPA in large urban forests connected to restorative outcomes, in comparison to built outdoor settings.	
			Doing leisure-time physical activity (LTPA) in small urban forest	Intentional	Passive	Appreciative outdoor activity		Green space (urban)			Not connected to restorativeness.	
Kanelli et al. (2021)	To evaluate short-term responses (physiological and psychological) to exposure to urban and forest environments, and to examine which of the senses that are	Gree ce	Walking in forest (guided, in group)	Intentional	Active	Appreciative outdoor activity	D: 60 minutes	Green space			Walking in a forest comes with positive effects on mental and physical health/wellbeing. Forest walk also connected to positive reactions	

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	most engaged during those exposures.										for all five senses, with hearing being the most prominent sense.	
Kronsted Lund et al. (2022)	Explore the relationship between outdoor activities and subjective wellbeing, by investigating a sea-kayak excursion, salutogenesis, dynamic forms of vitality, and quality of life.	UK (Scotland)	Sea-kayaking (Guided group activity)	Intentional	Active	Appreciative outdoor activity	F: Daily D: 7 full days	Blue space			Connected to an increased subjective wellbeing, through embodiment and dynamic movements.	Seem to affect ecological awareness and connectedness
Lengieza and Swim (2021)	To investigate what possible effect contact with nature can have on self-relatedness and, specifically, whether a change in public self-awareness can be a mechanism behind the effect of increased connectedness to nature through nature contact.	USA	Walk in nature (alone)	Intentional	Passive	Cognitive engagement	D: 20 minutes	Green space (urban)			Nature contact related to a decrease in public self-awareness.	Outdoor activity where the participant is encouraged to decrease public self-awareness has the potential to increase the effect of nature contact on explicit connectedness to nature.
Lumber et al. (2017)	Study 1) and 2) To establish indicators of HNC and operationalise them as pathways. Study 3) Examine effectiveness of pathway activities.	Australia	Mindful walk in nature: activities to focus on nature	Intentional	Active	Cognitive engagement	D: 20 minutes	Green space (urban)			Increased vitality for mindful walk in nature, but also for the other two conditions (nature walk without mindfulness, mindful walk indoors).	Increased nature connectedness for mindful walk in nature in comparison to both nature walk without mindfulness activities and an

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													indoor walk with mindfulness activities.
			Walk in nature	Intentional	Passive	Appreciative outdoor activity	D: 20 minutes	Green space (urban)				Increased vitality for all three conditions; nature walk without mindfulness, mindful walk in nature, mindful walk indoors.	No change in nature connectedness from a 20 minute walk in nature.
Macaulay, Johnson et al. (2022)	Compare 3 engagement interventions set in nature, and their effectiveness on psychological outcomes, and a control condition.	Australia	Directed engagement in nature during work break (focus on environment)	Intentional	Active	Cognitive engagement	D: 20 minutes	Nature (non-specified)				No significant difference on affect in comparison to control group.	Indirect effect on nature connection, through higher state of experienced state-mindfulness.
			Mindful engagement in nature during work break (internal focus)	Intentional	Passive	Cognitive engagement	D: 20 minutes	Nature (non-specified)				Indirect influence on affect (positive and negative) through increased experienced state mindfulness, in comparison to control group. Those who performed mindfulness reported the lowest negative affect at post test.	Indirect effect on nature connection, through higher state of experienced state-mindfulness.
			Engagement in nature during work	Intentional	Passive	Cognitive engagement	D: 20 minutes	Nature (non-specified)				No significant difference on affect in comparison to control group.	Indirect effect on nature connection, through higher state of

			break; mind wandering									experienced state-mindfulness.
Macaulay, Lee et al. (2022)	To explore the associations between different forms of cognitive engagement during nature experiences and psychological benefits, and how personal and environmental circumstances may affect the associations.	Australia	Work break in green space	Intentional	Active	Cognitive engagement	D: 20 minutes	Green space (urban)			Calmness, distance from work and relaxation mentioned by participants. Different ways the individuals engaged in the task affected the results.	Higher nature connection experienced by those who engaged in heightened sensory stimulation, did mindful engagement. Different ways the individuals engaged in the task affected the results.
Marselle et al. (2013)	Explore whether different environments have an impact on wellbeing from group walks.	UK (England)	Group walk, guided	Intentional	Passive	Appreciative outdoor activity	F: Once a week (at the least) D: Various	Blue space			Effect on mental wellbeing, affect and depression, however no difference in comparison to walk in urban public spaces.	
			Group walk, guided	Intentional	Passive	Appreciative outdoor activity	F: Once a week (at the least) D: Various	Green space			Effect on mental wellbeing, affect and depression, however no difference in comparison to walk in urban public spaces.	
			Group walk, guided	Intentional	Passive	Appreciative outdoor activity	F: Once a week (at the least) D: Various	Green space			Effect on mental wellbeing, affect and depression, however no difference in	

											comparison to walk in urban public spaces.	
			Group walk, guided	Intentional	Passive	Appreciative outdoor activity	F: Once a week (at the least) D: Various	Green space				Less negative affect and perceived stress, and greater mental wellbeing (in comparison to walking in urban public spaces)	
			Group walk, guided	Intentional	Passive	Appreciative outdoor activity	F: Once a week (at the least) D: Various	Green space (urban)				Effect on mental wellbeing, affect and depression, however no difference in comparison to walk in urban public spaces.	
			Group walk, guided	Intentional	Passive	Appreciative outdoor activity	F: Once a week (at the least) D: Various	Green space/ blue space				Higher emotional and mental wellbeing (in comparison to walking in urban public spaces)	
McDougall, Foley et al. (2022)	To map the impacts that swimming in lakes might have on health and well-being, and to establish the importance of risk- and place perceptions connected to this.	UK (Scotland)	Freshwater wild swimming	Intentional	Active	Appreciative outdoor activity	F: Varied between once a day/once a week/once every 2 weeks D: Various	Blue space				Connected to mental-, social- and physical health and wellbeing.	An increased connection to nature.

McDougall, Hanley et al. (2022)	To quantify connections between several metrics of exposure (self-reported) to freshwater blue space and mental wellbeing and general health, for a adults in Scotland.	UK (Scotland)	Visiting a river or a canal	Intentional	Passive	Appreciative outdoor activity	F: More than twice a month D: Various	Blue space			Higher reported mental wellbeing compared to respondents that did not visit canals or rivers.	
			Visiting green space	Intentional	Passive	Appreciative outdoor activity	F: At least once a month D: More than two hours	Green space			Higher reported overall health compared to those who visited green space less than 2 hours/month	
Nisbet et al. (2019)	To test if being mindful in a natural environment can increase mood and connectedness to a greater extent than mere exposure to nature.	Canada	Mindful walk in nature	Intentional	Active	Cognitive engagement	F: Once D: 20 minutes	Green space (urban)			Being in nature is connected to improved mood, but being mindful to the surroundings is related to even greater decreases in negative moods.	Being in nature is connected to increased state nature relatedness-feelings, but being mindful to the surroundings is related to even greater connectedness with nature.
			Walk in nature	Intentional	Passive	Appreciative outdoor activity	F: Once D: 20 minutes	Green space (urban)			A walk in nature can increase moods even in a brief visit to "unspectacular urban nature".	A walk in nature can enhance state nature relatedness-feelings even in a brief visit to "unspectacular urban nature".
O'Brien et al. (2010)	Explore the well-being benefits (physical, social and mental) from environmental	UK (northern England &	Environmental volounteering	Intentional	Active	Conservation	F: 8-33(+) hours per month D: Various	Green space/ green space (urban)			Associated with increased positive emotions. It also leads to physical-, social- and mental-wellbeing benefits.	

	volunteering activities.	Scotland)									
Pita et al. (2022)	To evaluate the connections between recreational fishing (marine) and stress, sleep quality and seafood consumption.	Spain	Recreational fishing	Intentional	Active	Consumptive outdoor recreation	F: avg 57,9 hours a month	Blue space		Recreational fishing is associated with reduced stress (perceived).	
Reese et al. (2022)	Compare the effects on wellbeing outcomes of walking in an urban forest to VR nature walk	Germany	Physical forest-bathing (shinrin-yoku)	Intentional	Passive	Appreciative outdoor activity	D: Average 5.7 minutes	Green space (urban)		Increased positive and decreased negative affect. Perceived subjective vitality increased slightly and perceived daily stress decreased slightly.	
			Virtual reality forest-bathing (shinrin-yoku)	Indirect	Passive	VR	D: Average 6.93 minutes	Green space (urban, VR)		Increased positive and decreased negative affect. Perceived subjective vitality increased slightly and perceived daily stress decreased slightly.	
Richardson et al. (2016)	To outline the development of a mass engagement campaign called 30 Days Wild, before introducing the evaluation results of the impact of taking part of the campaign.	UK	Participating in 30 days wild	Intentional	Active	Cues	F: Daily D: 25-30 days	Green space (various)		Sustained benefits of health and happiness. The health improvement was predicted by happiness improvement, and this relationship	Sustained increases in nature connection and pro-nature behaviours. Change in connection to nature mediated the relationship between improvements in

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											mediated nature connection-change.	happiness and health (health improvement predicted by happiness improvement).
Richardson et al. (2018)	To discuss the issue of the campaign 30 Days Wild as an accessible, cost-effective, large-scale intervention to increase wellbeing through nature engagement.	UK	Participating in 30 days wild	Intentional	Active	Cues	F: Daily D: 25-30 days	Green space (various)			Sustained benefits of health and happiness.	Sustained increases in nature connection and conservation behaviours. Participants that were older and those with high scores in conservation behaviours at baseline, were most likely to have sustained engagement.
Rickard and White (2021)	Explore role of experiences of touch on nature connectedness and restoration through walking barefoot	UK (England)	Walking barefoot at a beach	Intentional	Active	Direct earth contact	D: 10 minutes	Blue space			Walking barefoot resulted in higher restoration than control group with shoes.	Walking barefoot resulted in higher connectedness than control group with shoes.
			Walking barefoot at a garden	Intentional	Active	Direct earth contact	D: 10 minutes	Green space			Walking barefoot resulted in higher restoration than control group with shoes.	Walking barefoot resulted in higher connectedness than control group with shoes.
Samus et al. (2022)	1) To achieve improved understanding of the effects that urban green spaces wildness	Germany	A walk in a landscape park (individual, led)	Intentional	Passive	Appreciative outdoor activity	D: 40 minutes	Green space	Biodiversity & wildness	Perceived attributes: Wildness	Connected to increased positive- and decreased negative affect, and improved restored	No difference noted in state nature connectedness when comparing

	have on people's temporary experience of state nature connectedness. 2) To explore the role of state nature connectedness in the relationship (expected positive) between wellbeing and nature exposure.											attention capacity. Perceived wildness influences the wellbeing benefits that exposure to nature brings.	walks in forest and walks in field.
			A walk in an urban forest (individual, led)	Intentional	Passive	Appreciative outdoor activity	D: 40 minutes	Green space	Biodiversity & wildness	Perceived attributes: Wildness	Increased positive- and decreased negative affect, and improved restored attention capacity. Perceived wildness influences the wellbeing benefits that exposure to nature brings.	No difference noted in state nature connectedness when comparing walks in forest and walks in field. Walkers who experienced higher connection with nature were more likely to rate the perceived wilderness as high; connection with nature might be a link between perceived wilderness and higher positive affect.
Schebella et al. (2019)	To deepen the understanding of the nuanced connection between wellbeing and nature exposures with different kind of ecological attributes.	Australia	Visiting a pocket park	Intentional	Passive	Appreciative outdoor activity		Green space (urban)	Biodiversity & wildness	Perceived attributes: Naturalness, biodiversity, canopy cover	Perceived attributes: naturalness, biodiversity and canopy cover more strongly associated with wellbeing benefits, than actual attributes.	

										Vegetation cover strongest single predictor of stress reduction.	
		Visiting a community park	Intentional	Passive	Appreciative outdoor activity		Green space (urban)	Biodiversity & wildness	Perceived attributes: Naturalness, biodiversity, canopy cover	Perceived attributes: naturalness, biodiversity and canopy cover more strongly associated with wellbeing benefits, than actual attributes. Vegetation cover strongest single predictor of stress reduction.	
		Visiting a nature park	Intentional	Passive	Appreciative outdoor activity		Green space (urban)	Biodiversity & wildness	Perceived attributes: Naturalness, biodiversity, canopy cover.	Perceived attributes: naturalness, biodiversity and canopy cover more strongly associated with wellbeing benefits, than actual attributes. Vegetation cover strongest single predictor of stress reduction	
		Visiting a sports park	Intentional	Passive	Appreciative outdoor activity		Green space (urban)	Biodiversity & wildness	Perceived attributes: Naturalness, biodiversity, canopy cover.	Perceived attributes: naturalness, biodiversity and canopy cover more strongly associated	

											with wellbeing benefits, than actual attributes. Vegetation cover strongest single predictor of stress reduction.	
Shanahan et al. (2016)	Quantify relationship between nature experiences (measured by intensity, frequency and duration) and health outcomes.	Australia	Visiting a green space	Intentional	Passive	Appreciative outdoor activity	F: Various D: Various	Green space			Duration: Visiting green spaces for longer duration associated with lower rates of depression and high blood pressure. Frequency: Visiting green spaces more often predictor of more social cohesion. Green space visits of 30 minutes or more in a week could lower depression and high blood pressure prevalence in the population.	
Soliman et al. (2017)	Examine the capability of immersive technology in enhancing nature connection and pro-environmental behaviour through nature-related videos	Canada	Watching nature-videos on computer screen	Indirect	Passive	Digital	D: 4 minutes	Various			Null effect on mood (no difference between nature vs built videos watched)	Increased participants' connectedness to nature more than watching video of built environments.
			Watching nature-	Indirect	Passive	Digital	D: 4 minutes	Various			Null effect on mood (no	Increased participants'

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Study	Aim	Country	Activity					Space		Attributes	Outcome	Outcome
			videos through immersive technology								difference between nature vs. built videos watched)	connectedness to nature more than watching video of built environments.
Southon et al. (2018)	To explore if meadow creation and biodiversity (perceived) are connected to health and well-being and to investigate potential well-being moderators such as HNC. It is also to explore if people can assess biodiversity accurately, and identify factors that affect that ability.	UK (England)	Visiting a meadow/meadow creation in park	Intentional	Passive	Appreciative outdoor activity	F: Typically between 8-12 times/fortnight. D: 20 - 60 min	Green space	Biodiversity & wildness	Perceived attributes: Biodiversity	High frequency of visits connected to "feeling greater continuity with the past", a psychological state linked better positive self regard and contribute to meaning to life. High frequency of visits also related to higher perceived mental health.	Connection to nature positively related to perceived biodiversity (total plant species richness and species richness). Colourfulness, evenness of plant community and amount of vegetation are important attributes when perceiving biodiversity level.
Spendrup et al. (2016)	Measure how playing a nature sound (birdsong) would impact customers at a food retailer.	Sweden	Hearing nature sound (birdsong) at a food retailer	Indirect	Passive	Appreciative outdoor activity	D: 2 to 20 minutes	Nature sound			No support for influencing mood.	No support for influencing connectedness to nature.
Sudimac et al. (2022)	Examine how exposure to natural vs. urban environments affect stress-related brain regions.	Germany	Walking in a forest	Intentional	Passive	Appreciative outdoor activity	D: 60 minutes	Forest (urban)			Walk in nature can have salutogenic effects on stress-related brain regions.	
Thompson and Wilkie (2021)	Explore relationship between wellbeing and blue exercise and whether it had unique benefits.	UK (England)	Taking part in blue exercise (kayaking, canoeing, paddle	Intentional	Active	Appreciative outdoor activity		Blue space			Sense of outdoors as a therapeutic landscape; restorative potential;	Respect for water and overcoming fear.

			boarding, surfing, open-water swimming)									relaxation and reduced stress.	
Unsworth et al. (2016)	Investigate how mindful meditation and nature exposure influence perceived connectedness to nature.	USA	3-day nature trip with outdoor guiding program with meditation	Intentional	Passive	Cognitive engagement	D: 3 days (15 minute meditation every morning and additional sessions encouraged)	Nature (non-specified)					Significant increases in self-nature interconnectedness, more than in no-meditation condition. More likely to emphasise nature in their memories than other aspects (foregrounding nature) than no-meditation condition.
			3-day nature trip with outdoor guiding program without meditation	Intentional	Passive	Appreciative outdoor activity	D: 3 days	Nature (non-specified)					Inrceases in self-nature interconnectedness did not reach statistical significance.
A.E. Van den Berg et al. (2014)	Assess whether varying levels of naturalness in urban public spaces result in different restorative impact	UK (England)	Watching a photo/video presentation simulating a nature walk	Indirect	Passive	Digital	D: 6 minutes 40 seconds	Green space (urban)				Compared to viewing video of built urban space, urban green spaces resulted in stronger recovery in negative mood, restorative state, and vitality.	

White et al (2021)	To explore connections between mental health and exposures to a) different natural settings and b) nature connectedness, across country and season.	18 coun tries	Visiting coastal location	Intentional	Passive	Appreci ative outdoor activity	F: At least once in the last month	Blue space			Increases in frequency of visiting coastal blue space is connected to increases in wellbeing and decreases in mental distress	
			Visiting inland water	Intentional	Passive	Appreci ative outdoor activity	F: At least once in the last month	Blue space			Increases in frequency of visiting inland-blue space is connected to increases in wellbeing and decreases in mental distress.	
			Visiting green space	Intentional	Passive	Appreci ative outdoor activity	F: At least once in the last month	Green space			Increases in frequency of visiting green space is connected to increases in wellbeing and decreases in mental distress, also connected to lower likelihood og depression medication use.	
Wood et al. (2018)	Examine the relationship between site facilities (cleanliness, amenities), biodiversity and self-reported	UK (Eng land)	Visiting a park	Intentional	Passive	Appreciative outdoor activity		Green space (urban)	Biodivers ity & wildness	Actual attributes: Various biodiversity	Biodiversity predicts restorative benefit and the effect was unrelated to age, gender, ethnic background.	

			psychological restoration.									
Wyles et al (2019)	Examine whether type and quality of a natural environment affect connectedness to nature and psychological restoration as well as to see the relationship between the two.	UK (England)	Visiting coastal location with PDA status (protected or designated area), various activities	Intentional	Passive	Appreciative outdoor activity	D: Various	Blue space	Biodiversity & wildness	Actual attributes: PDA status	Higher recalled restorativeness than that from visiting urban green location. Higher recalled restorativeness than that from visiting similar environments without PDA status.	Higher recalled connectedness to nature than from visiting urban green location. Higher recalled connectedness to nature than from visiting similar environments without PDA status.
			Visiting rural location with PDA status (protected or designated area), various activities	Intentional	Passive	Appreciative outdoor activity	D: Various	Green space (rural)	Biodiversity & wildness	Actual attributes: PDA status	Higher recalled restorativeness than from visiting urban green location. Higher recalled restorativeness than from visiting similar environments without PDA status.	Higher recalled connectedness to nature than from visiting urban green location.
			Visiting urban location with PDA status (protected or designated area), various activities	Intentional	Passive	Appreciative outdoor activity	D: Various	Green space (urban)	Biodiversity & wildness	Actual attributes: PDA status	Higher recalled restorativeness than from visiting similar environments without PDA status.	Higher recalled connectedness to nature than from visiting similar environments without PDA status,
			Visiting coastal	Intentional	Passive	Appreciative	D: Various	Blue space			Higher recalled restorativeness than	Higher recalled connectedness to

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Author	Aim	Country	Activity					Space			Result	Result
			location (various activities)			outdoor activity					visiting urban green location.	nature than visiting urban green location. Visits longer than 30 minutes associated with greater connectedness.
			Visiting rural location (various activities)	Intentional	Passive	Appreciative outdoor activity	D: Various	Green space (rural)			Higher recalled restorativeness than visiting urban green location	Higher recalled connectedness to nature than visiting urban green location. Visits longer than 30 minutes associated with greater connectedness.
			Visiting urban location (various activities)	Intentional	Passive	Appreciative outdoor activity	D: Various	Green space (urban)				Visits longer than 30 minutes associated with greater connectedness.
Zhou et al. (2022)	Examine the dynamic link between mental restoration and blue-green space, and provide guidelines for how to construct restorative environments	China	Visiting a blue space, in summer	Intentional	Passive	Appreciative outdoor activity		Blue space			In summer blue space inhibited physical activity. No direct promotion of of mental health seen from blue space, but it improved social interaction.	
			Visiting a blue space, in winter	Intentional	Passive	Appreciative outdoor activity		Blue space			No direct promotion of of mental health seen from blue space, but it improved social interaction.	

			Visiting a green space, in summer	Intentional	Passive	Appreciative outdoor activity		Green space			In summer, green space promoted physical activity and directly affected mental restoration.	
			Visiting a green space, in winter	Intentional	Passive	Appreciative outdoor activity		Green space			In winter, green space did not significantly promote physical activity nor directly affect mental restoration.	
Zhu et al. (2020)	Examine whether hearing birdsongs and viewing green spaces can relieve stress and promote attention recovery effectively.	China	Looking at nature paths and hearing birdsongs	Intentional	Passive	Appreciative outdoor activity		Blue space	Biodiversity & wildness	Actual attributes: Digital birdsongs	Park paths can be restorative and those with water bodies and tall trees promote perceived restorative effects. Birdsongs increased perceived restorative effect. Wetland path's restorative effect was the highest among paths when birdsongs introduced.	
			Looking at nature paths and hearing birdsongs	Intentional	Passive	Appreciative outdoor activity		Green space	Biodiversity & wildness	Actual attributes: Digital birdsongs	Park paths can be restorative and those with water bodies and tall trees promote perceived restorative effects.	

										Birdsongs increased perceived restorative effect.	

Appendix B. Interview Guide

Date and time	Location	Name of interviewer	Name(s) of interviewee

Introduction to the study
- Short introduction about researchers
- Explain purpose of the study: to identify the characteristics of nature experiences that improve human wellbeing and human-nature connection (HNC). The research also aims to address how to potentially incorporate these types of experiences into organisational practices
  - Human-nature connection - Umbrella term and understood as people's relation with nature.
- How the information will be treated
  - The information you provide will be treated securely so that no unauthorised person will have access to it. The reporting of the results will be done in a way so that no individual or workplace can be identified. No other person than the two students and their supervisor will be aware of your participation in the study.
  - We will record the interview so that we can focus on your answers and use it for transcription later on.
  - The result will be presented in the form of an oral presentation to other students and in the form of a thesis. When the degree project is finished and approved, it will be in a database at the University of Gävle. The recordings and the transcribed text will be destroyed when the thesis is approved. A copy of the finished thesis will be sent to you so that you will have access to it.
  - Participation is voluntary and you can withdraw your participation at any time without further justification.
- Structure of the interview
  - Maximum one hour, semi-structured
- Do you have any questions before we begin?
- Reminder for the signed copy of the consent form if not received yet

Questions
1. Can you tell me a little bit about your roles in the company?
2. We have read about (initiative by organisation) as an initiative that you have conducted that included employee engagement. I'm now going to ask you some questions - you can answer them based on this initiative, but feel free to mention other similar initiatives.
   1. What was the aim of the initiative(s)?
   2. Could you describe the initiative(s)?
   3. Did the initiative(s) include activities in nature? Can you describe these activities and their settings (e.g., green space - forests, urban parks, etc.; blue space - rivers, lakes, oceans, etc.)?
   4. Did the initiative(s) involve nature in any form without physically being in nature (e.g., parts of nature, pictures, plants etc.)?

5. Do you think that the included activities improved employee wellbeing? Please elaborate.
6. Do you think that the included activities improved employees' connection or relation to nature? Please elaborate.
3. I'm now going to ask you a series of questions based on characteristics of nature experiences that we know improve wellbeing and connection or relation to nature. Your answers do not need to be restricted to the initiative discussed in the previous question.
   1. Have there been/are there activities in places with "wild" nature (e.g., protected areas, relatively untouched nature), high degrees of biodiversity (animals/birds, different plants/trees), or similar?
      - If not, what are the opportunities and barriers for implementing such activities within your organisation?
   b. Have there been/are there activities with active engagement with nature, such as activities where the participants are prompted to notice, be aware of, or appreciate, nature?
      - If not, what are the opportunities and barriers for implementing such activities within your organisation?
   c. Have there been/are there activities that involve having direct earth contact (e.g., being able to walk barefoot, work with the hands in the soil)
      - If not, what are the opportunities and barriers for implementing such activities within your organisation?
   d. Have there been/are there activities such as mindfulness or meditation in nature?
      - If not, what are the opportunities and barriers for implementing such activities within your organisation?
4. Is there anything that has not been mentioned yet, but you think would be relevant that you'd like to comment on?

Prompts
- Can you tell me more?
- Can you describe that further?
- Please elaborate
- I don't understand X. Could you explain it to me?

Finalising the interview
- Thank the participants
- Ask if they have any questions
- Reminder that the information will be handled in a confidential manner
- Reminder that the thesis will be shared after it has been finalised