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Exploring the benefits of volunteering in nature on  
mental health and wellbeing in the context of  
mental health related sick leave: A literature review  
for Lincolnshire Police

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February 2023

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Executive summary: Overview of questions posed for the review

**What is the evidence for nature exposure benefiting health?**

*This can be found in the introduction*

Key benefits: attention restoration, stress reduction, encouraging physical activity and social facilitation.

**Are there any examples of projects utilising nature-based volunteering for mental health benefits?**

*This can be found in the findings*

No studies directly investigating the use of nature-based volunteering as a return-to-work strategy for mental health related staff sickness were found.

**How is the impact of nature-based interventions on mental health measured?**

*This can be found in the findings*

Most studies did not include outcome measures, and interviews were the main method of data collection. Most did not include pre and post measures.

Outcome measures used:

- Wellbeing
  - General Well-Being Scale (GWBS)
  - Warwick Edinburgh Mental Wellbeing Scale (WEMWBS)
- Depression and anxiety
  - The Depression Anxiety Stress Scale (DASS21)

**What is the evidence of different activities eliciting different effects?**

*This can be found in the findings*

Not enough reporting details in the studies to compare the effects of different activities.

**Is there evidence that outdoor activities are more beneficial than indoor activities?**

*This can be found throughout the review*

Some evidence for improved stress reduction in an outdoor setting. Not enough evidence to compare indoor vs outdoor volunteering.

**What are the potential risk factors of nature-based therapeutic interventions?**

*This can be found in the conclusion*

No significant risk factors were identified.

**What are the barriers to engagement in nature based therapeutic interventions?**

*This can be found in the introduction*

Structural and attitudinal barriers exist to engaging in interventions.

## Introduction

### **The problem of poor mental health and wellbeing**

Common mental health disorders such as depression and anxiety carry a high social and economic cost. The most recent adult psychiatric morbidity survey of England suggests that around one in six (17%) adults are affected by common mental health disorders at any one time (McManus et al., 2016). With a global prevalence of greater than 10%, mental health disorders are the third leading cause of years lived with disability (YLD) in the world (James et al., 2017). The Office for National Statistics 2021 survey identified mental health conditions as one of the main causes of staff sickness in the United Kingdom (UK), with 9.8% of staff sickness attributed to mental health problems. The economic burden of mental ill health in the UK is estimated to be £117.9 billion annually, and this represents 5% of the UK Gross Domestic Product (GDP) and is greater than the cost of the National Health Service (NHS) (McLaid and A-La Park, 2022). Given this high economic and social burden of mental ill health, the demand for providing effective and evidence-based treatments has been growing over recent years.

It is estimated that around 37.3% of people with a common mental health disorder will receive treatment for their condition, a figure which has been rising in recent years (McManus et al., 2016). Barriers to treatment seeking can be categorised as structural (e.g., access to resources) or attitudinal (e.g., not perceiving oneself as in need of treatment) (Andrade et al., 2014). As of 2014, the most used treatment method for mental health conditions in the UK is psychotropic medication, with around 10.4% of the UK population reporting having received medication for mental ill health (McManus, 2016). Other common treatments include psychological therapies, with 3% of the UK population reporting using psychological therapies such as Cognitive Behavioural Therapy (CBT), counselling and psychotherapy (McManus, 2016). Due to long waiting lists for psychological therapies (Mind, 2013), adjunctive treatments should be explored to improve the mental health and wellbeing of the nation. This article reviews the evidence on the benefits of nature-based volunteering on mental health and wellbeing in the context of staff sickness due to mental ill health.

The mental health and wellbeing of people working for police forces is a growing concern. It has been suggested that due to the exposure to trauma that police staff face, mental health concerns are more likely than in other occupations (Demou et al., 2020; Kyron et al., 2020). The annual morale survey of police officers by the Police Federation (2022) found that 82% of respondents had felt stressed, low in mood, anxious, or had other difficulties with their mental health in the past 12 months, and 92% believed their work had made this worse. Of the respondents who had taken sick leave (59%), 29% of these said it was due to depression, anxiety, or stress, and 42% said they had used annual leave to manage their mental health and wellbeing. More worryingly, 67% said they had continued to go to work even when they felt they should have been off due to their mental health. Consequently, 72% of those who were looking to leave the force were doing so due to the impact on their mental health and wellbeing. This demonstrates the need to understand and respond to the mental health and wellbeing of police staff to enable effective solutions to reduce the impact of this, both on the individual and the service.

A recent study by Newell et al. (2022) explored barriers to police staff seeking help for their mental health and found that concerns around confidentiality and the stigma of needing help prevented staff accessing it, as well as the parallels respondents drew between the work they do supporting people with mental ill health, and then finding that they require help too. They also found differences between the experiences of officers and other police staff, with police staff feeling there is a stigma attached to them seeking help as they are not “front-line” and therefore, not as exposed to trauma as officers, although previous research has evidenced the vicarious trauma they experience (Kyron et al., 2020). This highlights the need to work on reducing barriers to accessing support, ensuring there is a focus on all members of staff working in police forces due to the impact it can have, even if this is not always recognised which has been highlighted in previous research (Ricciardelli et al., 2019).

### **Benefits of nature on health and wellbeing**

Recent research has explored the impact of being in nature on both physical and mental health. Living in environments close to nature is associated with lower rates of antidepressant use (Helbich et al., 2018), cognitive improvement (Cassarino et al., 2015), improved sleep (Astell-Burt et al., 2020), reduced risk of common mental

health disorders such as anxiety and depression (Jimenez et al., 2021), as well as better physical and mental health (Hartig et al., 2014). Whilst the emphasis in this paper was on the mental health benefits of nature exposure, it is worth noting the effects of nature exposure on markers of physical health, given the considerable crossover between physical and mental health (Ohrnberger et al., 2017). A systematic review of epidemiology studies by van den Berg (2015) found an association between access to greenspace and lower all-cause mortality. Other health outcomes that have been found to be associated with greenspace exposure include decreased salivary cortisol and improved markers of cardiovascular health such as blood pressure (Twohig-Bennett and Jones, 2018). It should be noted that the correlational data between health markers and access to nature do not necessarily imply causation due to the complexity of the factors that may affect this, such as economically deprived areas tending to have less access to greenspace (Dai, 2011).

There is some controversy over how researchers define exposure to the natural environment and a general lack of consistency in the literature around the type, dosage, and frequency of nature exposure required to elicit mental health benefits (Hartig et al., 2014). Different types of exposure to the natural environment include immersive exposure (such as being in a woodland), ambient exposure (such as house plants) and virtual exposure (including virtual reality and pictures/videos of nature). In terms of frequency of exposure, there is some evidence that regular exposure to nature (weekly visits) are associated with higher levels of eudemonic wellbeing (White et al., 2017) although more research is needed to establish a minimum effective frequency and dosage of exposure to significantly influence mental health outcomes.

The mechanisms by which nature exposure may benefit mental health can be categorised into either restorative capacities or building capacities (see figure 1) (Markevych et al., 2017).

Figure 1: Mechanisms by which exposure to nature can benefit mental health and wellbeing (adapted from Markevych et al., 2017)



## Restoring capacities

### Stress reduction

Measurements of stress include perceived stress (measured using a self-report scale such as the perceived stress scale (Cohen et al., 1983)) as well as physiologic stress (measured using physiological tests such as salivary cortisol, skin conductance, heart rate variability, blood pressure and fMRI of various brain regions). A systematic review by Shuda et al. (2020) found an inverse relationship between exposure to nature and both perceived and physiologic measures of stress, indicating that exposure to nature may have a stress reducing effect. It is unclear whether this effect is due to a departure from an urban environment or the exposure to the natural environment. When looking at the effect of nature exposure on acute stress, exposure to photos of natural environments has been shown to increase activity of the parasympathetic nervous system when shown to participants

immediately following an acute stress induction protocol, suggesting a beneficial effect on stress recovery (van de Berg et al., 2015). Care should be taken when extrapolating these findings to a real world setting due to the low ecological validity of this study. When looking at chronic stress levels, there is evidence that exposure to greenspace is associated with lower levels of stress, with males displaying greater stress reduction from nature exposure, on average, than females (Trigeuro-Mas et al., 2017; Roe et al., 2013). One of the mediating factors that may influence the effectiveness of nature exposure to stress levels is the role of mindfulness. Mindfulness practices that utilise outdoor environments such as shinrin-yoku (forest bathing) have been found to have positive effects on mental health (Kotera et al., 2022). Modern techniques used in psychotherapy such as mindfulness-based stress reduction (MBSR) have shown enhanced effectiveness when performed in an outdoor setting (Chloe et al., 2020).

#### Attention restoration

The concept of exposure to the natural environment restoring the capacity for attention is based on attention restoration theory (ART) (Kaplan and Kaplan, 1989). This theory states that urban environments are very cognitively stimulating and therefore, active attention is needed to overcome this stimulation (referred to as “hard fascination”). Natural environments, on the other hand, provide scenery that naturally captures attention without the need for cognitive effort (referred to as “soft fascination”). Whilst ART has been criticised for providing vague theoretical terms that are difficult to operationalise (Joye and Dewitte, 2018), there is some evidence that exposure to nature can improve ability in attention demanding tasks (Berman et al., 2008). Tests of attention such as the Digit Span Forward and Digit Span Backward as well as the Trail Making Test have been found to be improved when participants are exposed to natural environments (Ohly et al., 2016). Immersion in virtual reality environments that emulate natural scenery have been found to significantly improve restoration of directed attention compared to urban settings (Dillon and Caj, 2022). Whilst using virtual reality may help in terms of accessing the attention restoration benefits of a natural environment in an urban setting, there is some evidence that real environments provide a greater benefit (Stevenson et al., 2018). The difficulty when assessing the effect of natural environments on attention is the multifaceted nature of attention itself and difficulty isolating attention as a cognitive faculty. Additional factors such as the duration of exposure to the natural



environment, the effect on different mental health conditions, and individual differences may also have an impact on attention restoration.

## **Building capacities**

### Encourage physical activity

The concept of 'green exercise' refers to exercise performed in an outdoor setting. There is evidence that even a small dosage (5 minutes) of low intensity green exercise can significantly improve self-esteem and mood (Barlton et al., 2010). When comparing the effects of indoor vs outdoor exercise, outdoor exercise has been shown to be slightly more effective than indoor exercise in reducing symptoms of anxiety (Mackay and Neil, 2010) and depression (Fruhauf et al., 2016). Outdoor exercise has been shown to facilitate greater social interaction compared to indoor exercise and positively influence future intentions to exercise (Rogerson et al., 2016). A systematic review by Thompson et al. (2011) found that outdoor exercise was associated with better mental health outcomes (increased engagement and feelings of revitalisation as well as reduced depression and anger) compared to indoor exercise. However, it should be noted the studies included in this review were generally of poor methodological quality and displayed heterogeneity of outcome measures used. There is also conflicting evidence that suggests the exercise environment does not significantly alter psychological health outcomes (Rogerson et al., 2016) or health markers such as cortisol and blood pressure (Bowler et al., 2010). One of the mediating factors between exercise and psychological benefits may be the pleasantness of the environment. A study by Pretty et al (2005) found that participants who viewed pleasant images of both rural and urban landscapes whilst exercising reported better mood and self-esteem compared to participants that viewed unpleasant rural and urban landscapes. This indicates that it may not just be the exposure to nature that is beneficial to wellbeing but also the quality of that environment.

### Social facilitation

Nature exposure provides an opportunity for social contact and increasing social connectedness with others (Hartig et al., 2014). Access to urban greenspace is associated with greater social cohesion (Jennings and Bamkole, 2019). Exposure to natural environments may also act as a buffer to reduce the impact of social isolation on psychological wellbeing. For example, Cartwright et al. (2018) found that individuals with low social connectedness who accessed nature regularly had greater

levels of wellbeing compared to participants with low social connectedness who did not regularly access nature. This may be at least in part explained by the biophilia hypothesis, which states that people have an innate drive to connect with the natural environment (Wilson, 1990), although it should be noted that this hypothesis is largely theoretical rather than empirically based (Joye and De Block, 2011). It is worth mentioning that these mechanisms of social facilitation, physical activity, stress reduction and attention restoration are interconnected. For example, higher stress levels are associated with social withdrawal for many individuals (Sandi and Haller, 2015) and thus lowering stress levels may influence social facilitation (De Vibe et al., 2012). Similarly, exercising with others has been found to elicit greater feelings of post-exercise calmness compared to exercising alone (Plante et al., 2011). Other mechanisms by which nature exposure may influence mental health and wellbeing include environmental factors such as improved air quality and escaping urban noise pollution (Markeyvych et al., 2017).

### **Benefits of volunteering on health and wellbeing**

Research around the health benefits of volunteering suggests a beneficial effect of volunteering on psychological health outcomes such as life satisfaction, lower rates of depression, improved eudemonic wellbeing, and social wellbeing, (Jenkinson et al., 2013; Musick and Wilson, 2000; Choi and Kim, 2011). Furthermore, there is some evidence that these benefits on wellbeing are causal rather than just correlational (Lawton et al., 2021). A meta-analysis by Okun et al. (2013) found a 47% lower mortality risk for people that volunteered regularly. However, this effect may be mediated by factors such as the motives for volunteering, for example people volunteering for self-orientated reasons have been found to have similar mortality risk to non-volunteers (Konrath et al., 2012). Longitudinal studies have found an association between self-reported health and volunteering (Choi and Kim, 2011; Lum and Lightfoot, 2005). People who volunteer for more than 200 hours in a 12-month period, may also be less likely to develop hypertension (Sneed and Cohen, 2013). However, it should be noted that the benefits of volunteering on physical health are generally not well supported by high quality studies (Jenkinson et al., 2013).

In terms of the mechanisms by which volunteering improves health and wellbeing, some of the main mediating variables include increased social connectedness

(Creaven et al., 2018) and higher levels of physical activity compared to non-volunteers (Sneed and Cohen, 2013). Top-down processes such as having a sense of purpose, perceiving oneself to have a meaningful life, and fulfilling a role-identity may also be implicated in the health and wellbeing improvements (Thoits et al., 2012). Much of the research on volunteering has focused on older adults and those who are retired. There is some evidence to suggest that volunteering has differential effects across the lifespan with older adults experiencing greater satisfaction and wellbeing from volunteering than young adults (Van Willingham, 2000; Tabassum et al., 2016). Therefore, care should be taken when applying this research to younger adults and those of working age. There is a lack of research around the use of volunteering for mental health related staff sickness and the use of volunteering as a means of helping people return to work. Little is understood about the effect of the type, setting, frequency and dosage of volunteering that is required to obtain the associated health effects and whether these health effects carry over to after the period of volunteering has ended.

## Method

### Aim

The aim of the literature review was to answer the question “what are the benefits of volunteering in nature on mental health and wellbeing?” Additionally, the review aimed to explore the evidence relating to

- Examples of projects utilising nature-based volunteering for mental health benefits
- The measurement of impact of nature-based interventions on mental health
- Different activities eliciting different effects
- Difference between the effects of outdoor activities compared to indoor activities
- Potential risk factors of nature-based therapeutic interventions
- Barriers to engagement in nature based therapeutic interventions

### Search strategy

A literature search was undertaken using the EBSCO host platform which searches databases including CINAHL complete, Medline, AMED, and PsychArticles. Search terms are shown in figure 2.

**Figure 2: Search terms for the literature review**

<b>Setting</b>	Nature OR Natural environment OR Greenspace OR Outdoors OR Outside OR Wildlife OR Environment*
<b>Activity</b>	Volunteer* OR Conservation OR Activities
<b>Outcome</b>	Mental health OR Mental wellbeing OR Anxiety OR Depression OR

	Stress OR Psychiatric OR Mood
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### Selection of articles

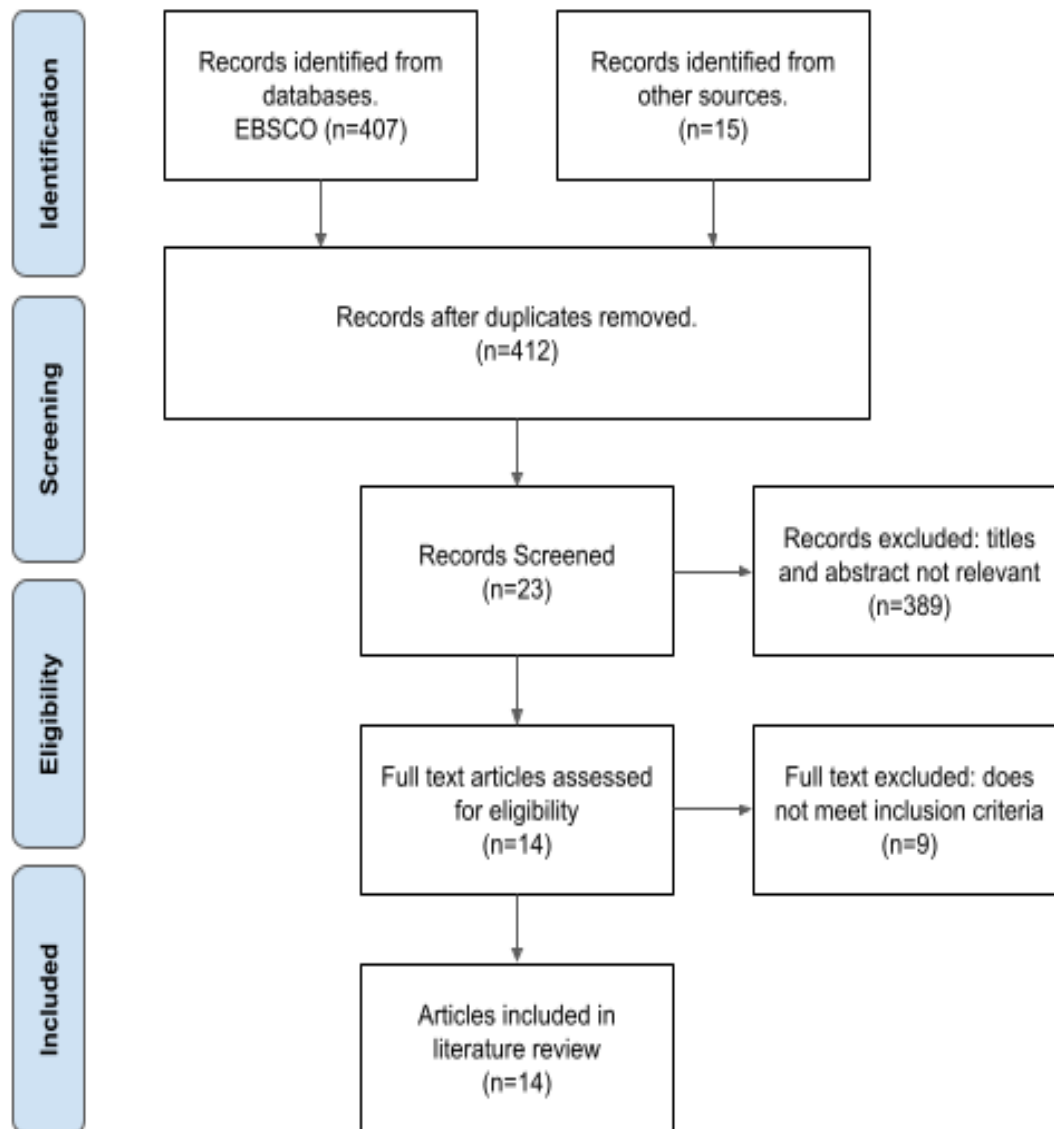
Inclusion criteria, which can be found in figure 3, stated the articles must be published in the last 10 years to ensure relevancy, and in the English language.

Figure 3: Inclusion criteria

<b>Date</b>	Published in the last 10 years
<b>Language</b>	English
<b>Type</b>	Published research only

The search using the EBSCO platform revealed 407 articles. Additional sources were searched for using internet search engines which retrieved grey literature, and hand searching reference lists, which added 15 articles. A total of 412 articles were screened against the inclusion criteria after duplicates were removed (n=10). Title and abstract screening against the aim of the review and the inclusion criteria reduced the number of articles to 23. Full text screening against the aim of the review and the inclusion criteria reduced the number of articles to 14 which are included in this review (see figure 4).

Figure 4: PRISMA flow diagram showing the article screening process



## Findings

### Study characteristics

The literature search located four systematic reviews (Chen et al., 2022; Coventry et al., 2021; Husk et al., 2016; Lovell et al., 2015) one of which also contained a meta-analysis (Coventry et al., 2021), seven qualitative case studies of nature based volunteering projects (Benjumea et al., 2022; Christie et al., 2020; Christie, 2017; Christie and Cole, 2017; O'Brien, 2018; Molsher and Townsend, 2016; Mumaw et al., 2017), one survey (Smyth et al., 2022), one literature review (Patrick et al., 2022), and one controlled study (Vujcic et al., 2017).

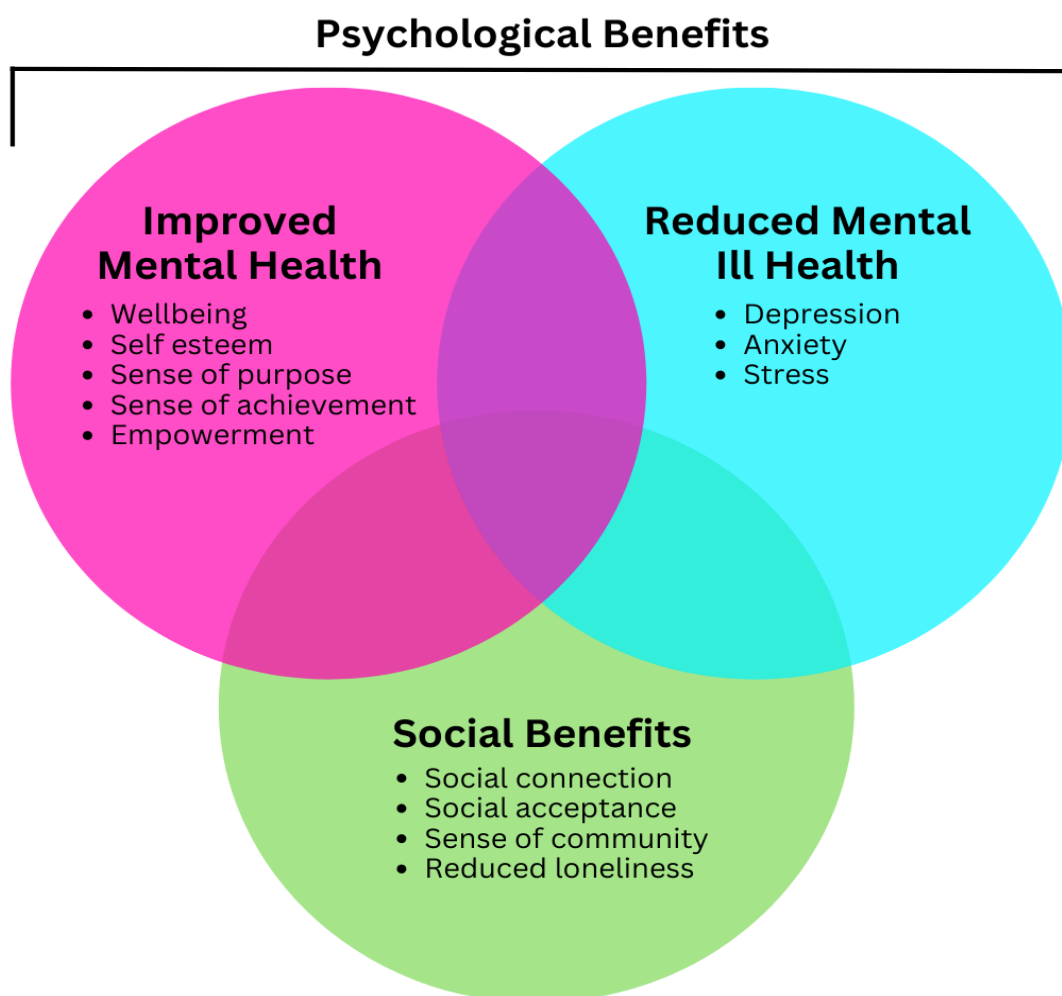
Activities included within the studies can be categorised as:

- Nature-based therapies which involved using the natural environment as a setting for undertaking psychological therapies and mindfulness techniques.
- Green exercise programs which involved using the outdoors as a setting for exercise.
- Environmental conservation which involved activities used to enhance the natural environment and wildlife.
- Horticultural activities which involved activities such as gardening and farming.
- Nature-based craft projects which involved creative projects or learning outdoor skills.

### Thematic analysis

Thematic analysis was used to analyse the literature because the bulk of the literature was qualitative in nature. Key themes were identified from the information in the articles that can be broadly grouped into two groups: psychological benefits and social benefits of nature-based volunteering projects. Psychological benefits were then subdivided into two subgroups: improved mental health and reduced mental ill health (see figure 5).

Figure 5: Themes present throughout the literature



### Psychological benefits

#### Improved mental health and wellbeing

The most identified keywords within the theme of improved mental health and wellbeing included increases in wellbeing, self-esteem, sense of purpose, sense of achievement, empowerment, and pro-environmental attitude. Improvements in mental health and wellbeing were most often established using interviews and focus groups. Christie (2017) used an ethnographic approach to study the mental health benefits of various conservation programs in the UK such as “Project Greenfingers”. These projects were mostly short term (around 6 weeks) and consisted of various horticultural activities as well as arts and crafts projects (Christie et al., 2020; Christie and Cole, 2017). The participants in these case studies varied in terms of the presence, type, and severity of mental illness. Improved psychological wellbeing was a common theme present throughout the projects as described by volunteers in interviews and focus groups. Other qualitative case studies also identified improved



wellbeing as an outcome from nature-based interventions (Benjumea et al., 2022; O'Brien, 2018; Molsher and Townsend, 2016; Mumaw et al., 2017). Whilst these case studies do provide insight into the subjective experience of volunteers, their research quality is limited by only focusing on one short term project and not providing a control group. Most of the case studies only assessed wellbeing at the end of the project rather than providing pre and post intervention measures, except for Molsher and Townsend (2016). Other limitations to the qualitative case studies were a general lack of outcome measures used and a lack of reporting detail, especially regarding the mental health status of the participants prior to taking part in the intervention. Despite these methodological limitations, the consistency with which volunteers reported improvements in mental health wellbeing throughout the case studies indicates that this is likely to be a key benefit of nature-based volunteering projects.

Outcome measures used to assess wellbeing included the General Well-Being Scale (GWBS) (Dupuy, 1978) and the Warwick Edinburgh Mental Wellbeing Scale (WEMWBS) (Tennant, 2007). These are both self-report Likert scale questionnaires that assess different aspects of mental wellbeing. The WEMWBS has demonstrated good content validity and test-retest reliability (Stewart-Brown et al., 2011), indicating that it appears to represent all facets of wellbeing and is reliable when repeated across time. The GWBS has also been found to have good validity and reliability (Nakayama et al., 2000). A systematic review and meta-analysis by Coventry et al. (2021) found increases in wellbeing, as measured by the WEMWBS, following participation in nature-based interventions. These increases in wellbeing were greater in group-based interventions and for individuals with a greater feeling of connectedness to nature. However, Coventry et al. (2021) do not provide any figures as to the extent of this increase or whether it is statistically significant. It is unclear from this review whether any one type of nature-based activity provided a greater benefit than others.

Similar increases in wellbeing as measured by the short form WEMWBS were found in a survey by Smyth et al. (2022) based on the "Green Gym" initiative. This is an outdoor group-based initiative that includes various outdoor activities such as planting trees and managing woodland environments as well as educational sessions on different species and habitats. A survey of 892 participants who had

engaged with the Green Gym project revealed significant increases in S-WEMWBS scores 4.5 months after the completion of the project compared to baseline. Large increases in wellbeing scores were found for individuals with lower baseline wellbeing scores prior to completing the initiative. Sustained improvements were found on follow ups 8.5 and 13 months later. The researchers did not provide information on whether those who sustained improvements in wellbeing continued to engage in environmental volunteering. A case study by Molsher and Townsend (2015) used the GWBS to assess the effect of an Australian environmental volunteering initiative (the “Get dirty, feel good” program) on participants' wellbeing. They found that average wellbeing scores significantly increased from the distress category at the start of the programme to the positive wellbeing category at the end of the programme. However, on a three month follow up it was found that these benefits were only sustained if the participant went on to join a volunteering group or obtained work, otherwise wellbeing scores dropped to baseline. This suggests limited carryover of wellbeing effects after the period of volunteering has ended. The difference between the sustainability of wellbeing improvements in the survey by Smyth et al. (2022) and the case study by Molsher and Townsend (2016) may be related to continuity of volunteering or it may be influenced by the participants' severity of mental ill health. Molsher and Townsend (2016) used a sample with a high severity of mental ill health at baseline whereas Smyth et al. (2022) do not provide information on pre intervention mental ill health severity.

#### Reduced mental ill health

The most identified keywords within the theme of reduced mental ill health included reductions in depression, anxiety, and stress. Reduced symptoms of anxiety and depression were found in several of the studies (Vujicic et al., 2017; Patrick et al., 2022; Coventry et al., 2021). A controlled study by Vujicic et al. (2017) compared the effectiveness of a four-week horticultural therapy intervention with a control group who completed occupational art therapy. The participants (n=30) were Serbian psychiatric patients with a variety of mental health diagnoses. The Depression Anxiety Stress Scale (DASS21) was used to assess participants' mental health before and after the intervention, and this includes the subdomains of depression, anxiety, and stress. The researchers found a significant interaction between the study group and DASS21 scores with a greater decrease in DASS21 scores for the group completing the horticultural therapy programme. However, this was attributed

to decreases in the subscale of stress with no other subscales being significantly influenced. This indicates that the main method by which nature-based activities can reduce mental ill health is via reductions in stress. It should be noted that there are several methodological limitations to this study that undermine its ability to extrapolate findings to a broader population. This study was short term and consisted of a relatively small sample size that was predominantly female (70%) with a lack of reporting detail around the severity of the participants' mental ill health at baseline. The activities of the control group are not clearly explained and there are several confounding variables that may influence the effectiveness of the horticultural therapy programme. For example, most participants were also completing conventional therapy and pharmacotherapy at the same time as the horticultural therapy programme. The horticulture therapy programme also included a substantial amount of mindfulness-based activities such as meditation and teaching relaxation techniques. It is unclear how much of the effects on the stress subscale can be attributed to increasing mindfulness alone, regardless of exposure to nature.

Interestingly, in the study by Vujcic et al. (2017), anxiety levels of participants were actually found to have increased following nature-based activities. This finding was also reported by Husk et al. (2016) in a systematic review of qualitative and quantitative studies examining the influence of conservation volunteering on health and wellbeing. Conflicting evidence of reduced anxiety following nature-based activities, as measured by the generalised anxiety disorder scale (GAD-7), was found in a systematic review by Coventry et al. (2021). One of the mediating variables influencing the effect of nature-based activities on anxiety levels may be the type of mental health problem that participants have. For example, if the participant has social anxiety disorder, then it is reasonable to assume that group-based activities will lead to increases in anxiety. It is unclear whether these increases in anxiety are short term, for example when trying a new activity for the first time and joining a new social group, or sustained over a longer period of time. Given the short-term nature of most of the interventions included in the systematic reviews, along with lack of reporting detail and high risk of bias, it is difficult to draw conclusions as to whether nature-based interventions have a beneficial effect on anxiety. Despite these uncertainties around the effect on anxiety, reduced symptoms of depression and stress following nature-based activities were frequently reported

throughout the qualitative case studies, the literature review by Patrick et al. (2022) and the systematic review by Coventry et al. (2021).

### **Social benefits**

Examples of social benefits associated with group-based interventions were found throughout the literature and were closely tied to the psychological benefits outlined above. One of the main themes throughout the literature was increased social connection from the volunteering programme. Participant interviews in the qualitative case studies frequently mention increased social connection as well as reduced social isolation following nature-based group activities. For example, Molsher and Townsend (2016) found that 61% of participants reported social benefits to be the main benefit of an environmental volunteering programme. There is a general lack of outcome measures throughout the available literature on social connection and levels of loneliness pre and post intervention. It is unclear whether the participants' level of social connection prior to the intervention influences the participants' response to the social benefits of the intervention, due to a lack of reporting in this area. More research is needed to assess whether the benefits to social connection are enhanced in nature-based activities compared to activities in an urban setting.

There is evidence that the amount of time spent together can influence the social benefits of nature-based activities. Coventry et al. (2021) reported that the greatest benefits from nature-based activities were associated with interventions that were 8-12 weeks in duration with a dosage of 20-90 minutes. Time spent as a group is likely to be a major variable influencing social connectedness as more time provides more opportunities to socially connect, although it may also be influenced by type of activity and dynamics within the group. The group size varied considerably between the studies; more research is needed to establish whether there is an optimal group size for nature-based activities. Common interests may also be an influential factor in terms of social connection. For example, Patrick et al. (2022) reported social connection and belonging as a key theme when interviewing a sample of environmental volunteers. It is unclear how much of an influence having shared interests prior to participating in volunteering influences feelings of social connectedness when volunteering as part of a group.

Other social benefits found within the literature include feelings of social acceptance and a sense of community. Many of the studies included participants from marginalised social groups. For example, O'Brien et al. (2018) used a qualitative approach to examine the effect of the Westonbirt Community Project (a UK conservation project) on the mental health and behaviour of vulnerable adults (n=5) and youths (n=5). This included adults from drug and rehabilitation programmes and those with mental psychosis. Interviews revealed feelings of social acceptance to be one of the most significant benefits to volunteers from marginalised groups. Participants cited being in a non-judgmental atmosphere as being the main driver of feelings of inclusion. The importance of a non-judgemental atmosphere was also highlighted in other case studies (Benjurnea et al, 2020; Christie, 2017; Christie and Cole, 2017).

Sense of community was another key theme throughout the literature, especially in longer term projects (Christie, 2017) and projects where participants were deeply involved in some kind of environmental volunteering group (Mumaw et al., 2017; Patrick et al., 2022). More information is needed to assess whether the type of activity performed increased the feeling of a sense of community. For example, comparing whether performing a group task with a shared goal increased the participants' feelings of a sense of community compared to performing individual tasks. In the case study by O'Brien et al (2018), facilitators who were trained in youth work and mental health supported the participants throughout the duration of the project. Other case studies mention the presence of facilitators, such as Christie and Cole (2017), although most studies did not include information on whether facilitators were present. More research is needed to establish whether the presence of facilitators mediates the social and psychological benefits of nature-based activities and the impact of facilitator profession and training.

## Gaps in the literature

There are several gaps in the existing literature that require further research and elaboration (see figure 6).

Figure 6: Current gaps in the literature

Gaps in the literature
<ul style="list-style-type: none"><li>● Effect of different outdoor activities on mental health outcomes</li><li>● Comparison of different volunteering environments on mental health outcomes</li><li>● The role of mediating variables</li><li>● Influence of individual differences and preferences</li><li>● The impact of facilitation</li><li>● Post intervention success and return to work</li><li>● Barriers to engagement</li><li>● Impact of type and severity of mental health illness</li></ul>

There is a lack of a consensus around the impact of the type of activity being performed, the setting or environment in which that activity is being performed as well as the influence of frequency and dosage of volunteering needed in order to obtain mental health benefits. More research in this area would allow for more specific recommendations, such as those that currently exist for physical activity, when utilising green social prescribing. The role of individual differences, such as gender, preferences for nature, or socioeconomic status on mental health outcomes following nature-based activities are not well understood. There is a lack of research and reporting on the influence of the severity and type of mental health illness on the effectiveness of nature-based interventions. The role of mediating variables on the success of nature-based outdoor interventions need further research. Potential mediating variables include the impact of mindfulness, participant expectations, and the role of facilitators. The application of nature-based interventions on return to work show some promising effects (Molsher and Townsend, 2016), however there is a need for further research in this area to assess the viability of nature-based interventions for helping those with mental ill health to return to work.

## Conclusion and Recommendations

In conclusion, this literature review explored the effect of nature-based volunteering on mental health and wellbeing. A mixture of qualitative and quantitative studies were identified from the literature and were included in the literature review. Several benefits of nature-based activities were explored including psychological benefits such as improved mental health and reduced mental ill health, as well as social benefits such as increased social connection and feelings of acceptance. Despite a lack of high-quality studies and the gaps in the current literature, nature-based volunteering appears to present an opportunity for those with mental health related issues that have affected their employment. Given the lack of risk factors and the low economic cost of the interventions, along with the secondary environmental benefits of conservation, nature-based volunteering could be provided as an option for those on mental health related sick leave. This can be considered under the umbrella of green social prescribing, although more research is needed to identify those who would benefit the most from this type of intervention. It is recommended that outcome measures such as the WEMWBS should be used to assess the effectiveness of this as an intervention due to the current lack of outcome measure data on the effectiveness of nature-based volunteering on mental health.

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