

Green spaces for mental disorders

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Structured abstract

Purpose of review: Mental illness is a global challenge, exacerbated by the coronavirus pandemic. Research suggests access to local green spaces is associated with better mental health, yet access is not always equitable. Evaluation of how nature-based interventions protect and support mental health is therefore required.

Recent findings: Accessible local green spaces are associated with better mental health. They encourage active behaviours and social interaction, reduce loneliness and stress. Green views from the home are associated with increased self-esteem, life satisfaction and happiness, and reduced depression, anxiety, and loneliness. Nature-based interventions and green social prescriptions effectively target vulnerable groups, resulting in significant reductions in depression, anxiety, and anger alongside positive mental health outcomes.

Summary: Although existing evidence is encouraging, robust, high-quality research that strengthens the evidence base and informs future clinical practice and policy decision making is needed. Evidence of the long-term effectiveness in individuals with diagnosed mental illness is also required to ascertain the potential social and wider returns on investment. Barriers to use of green social prescriptions such as mental health symptoms, and geographical accessibility need to be overcome to increase accessibility and uptake of green social prescriptions for the prevention and treatment of mental illness.

Keywords: Green space, mental health, nature-based interventions, green social prescribing, wellbeing

Introduction

Poor mental health and mental illness are increasing worldwide [1]. Mental health is defined as *“a state of well-being in which every individual realises their own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community”* [2]. A mental illness or disorder is characterized by a clinically significant disturbance in an individual’s cognition, emotional regulation, or behaviour, that is associated with distress or impairment in important areas of functioning, such as work, daily activities, or personal relationships [1]. Globally in 2019, one in eight people were living with a mental illness. The number of individuals living with clinically diagnosed anxiety or depression rose in 2020 as a result of the global coronavirus pandemic and continues on an upward trajectory [1]. Globally, mental illness is amongst the top ten causes of disease burden worldwide, with 125.3million years lived with disability being attributable to mental illness [3]. Mental illness is projected to cost the world economy \$6 trillion by 2030 [4].

There is growing evidence to indicate that exposure to nature and green space provides benefits for mental health [5**, 6*, 7**]. Green space is broadly defined as any vegetated land or water, often found within an urban area, including parks, gardens, allotments, playing fields, grassed areas, green corridors like paths, disused railway lines, rivers and canals. It also includes other natural areas, such as woodlands, forests and wilderness areas. Research into the benefits of green spaces has increased since the turn of the century but has become more focused since the pandemic [8]. Whilst some public health surveys indicated increased use of green space during the pandemic [9], others reported reductions in time spent visiting green space [5**]. The pandemic has also increased inequality in access to green space, further disadvantaging the most deprived and vulnerable groups in society [5**, 9]. In light of the growing concerns over the increasing rates of mental illness and the importance of access to green space for health highlighted by the coronavirus pandemic, the UK Government announced a £5.77million cross-government investment in green social prescribing [10]; a means by which third sector organisations provide non-medical sources of support to address mental, psychosocial, and socioeconomic needs through exposure to, and interaction with natural environments [11].

This review presents research findings relating to the impact and importance of nature and green space exposure for mental health and illness. We will provide an overview of the psychosocial mechanisms by which green space exposure may enhance mental health and discuss the importance of accessible green space for improving mental health outcomes. We will also discuss how nature-based interventions can be used

for the prevention and treatment of mental illness, with reference to the emerging green social prescribing literature.

Mechanisms explaining the green space and mental health relationship

Urbanisation is increasing and by 2030 it is estimated that 60% of people will be living in urban areas [12]. Individuals living in urbanised areas often have less access to green space, with regular access to green space being associated with reduced all cause-mortality, increased loneliness, stress, and poor mental health [5**]. Urbanisation also exposes individuals to environmental stressors such as air, light and noise pollution [13], so one mechanism by which urban green space might impact mental health is via its positive impact on air quality [7**]. Evidence also suggests that nature and green space can impact mental health and illness via reductions in perceived and physiological stress [6*, 7**]. This supports well-established theories of nature and health, which suggest that the natural environment enhances mental health through stress reducing or psychologically restorative spaces [14, 15].

Green space exposure may also enhance mental health via its positive indirect influence on physical activity. Individuals who are exposed to green space are more likely to be physically active [7**, 16]; which can reduce the risk of many non-communicable diseases, including mental illness [17]. Given that approximately 1.4 billion adults are not sufficiently active and 33% of women and 25% of men fail to meet physical activity guidelines (at least 30 minutes of moderate to vigorous physical activity on five or more days per week) [18]; the role green space can play in facilitating physical activity is key. The coronavirus pandemic has contributed to

further declines in physical activity; Wilke et al [19] estimated that compliance to physical activity guidelines in a sample of over 13,000 adults from 14 countries declined from 80.9% pre-pandemic to 62.5% during the pandemic.

Nature and green space can also encourage social interaction and reduce loneliness. Astell-Burt *et al.* [20*] reported a lower cumulative incidence of loneliness in individuals with more green space within 1.6km of the home, with stronger beneficial effects for those living alone. Loneliness is associated with increased risk of mental illness [21, 22], with evidence suggesting that each one-point increase in loneliness is associated with a 16% increase in severity of depression, with 11–18% of cases of depression potentially being prevented if loneliness were eliminated [23].

The importance of accessible green space for mental health

Mounting evidence suggests that green space close to the home is important for mental health. Findings from a cross-sectional study of 479 Spanish adults revealed that individuals with views of green space from their home had a significantly reduced risk of anxiety and depression [24]. Pauso *et al.* [25*] found that individuals who had views with blue-green elements (with blue referring to bodies of water) had more positive emotions. Whilst the findings of these studies are focused on individuals residing in Spain, they are also supported by a Japanese study which found that green views from the home were associated with increased self-esteem, life satisfaction and happiness, and reduced depression, anxiety, and loneliness [26].

In addition, accessible green spaces can have a significant impact on mental health outcomes. In their review, Zhang *et al.* [27] reported reduced stress and depression

and improved mood, emotional wellbeing, and mental health in young people with greater green space exposure. However, the measurement of green space exposure varied widely between studies with some looking at neighbourhood greenness and others reporting percentage of green space in postcode areas, vegetation density and percentage of green space and parks within 5km of school and home settings. Furthermore, the studies included had a high risk of bias reducing the reliability of these findings.

Studies of adult populations have also demonstrated the importance of accessible green space for mental health and specifically urban green space [25, 28, 29, 30, 31*]. In their scoping review, Callaghan *et al.* [29] reported that 23 out of 25 studies found a positive association between access to urban green space and mental health outcomes. In an 18-country study of over 16,000 participants, White *et al.* [32**] also reported that people who lived in greener or coastal neighbourhoods reported higher wellbeing, although when recreational visits to green space were controlled for these effects largely disappeared. Recreational visits to natural spaces in the last 4 weeks were also associated with more positive wellbeing and reduced mental distress; with consistent findings across seasons and countries. Lehberger *et al.* [33] also reported that garden owners had significantly greater life satisfaction and mental wellbeing than individuals who did not own a garden (based on 495 adults living in Germany).

Literature has also considered the effects of green space exposure for vulnerable groups. It is well documented that green space exposure is not equitable across populations, with those from low socio-economic groups and deprived urban areas

having reduced green space exposure and access [34**]. Evidence indicates that socio-economic and demographic factors such as income, gender and age moderate the relationship between green space exposure and mental health [36]; with cross sectional data from Scotland also indicating that psychological distress (measured via the 4-item Patient Health Questionnaire) during the covid-19 pandemic was worse in participants living in deprived urban areas who did not have access to residential outside space or had fewer visits to greenspace in the last week [30]. Urban green spaces are therefore likely to be important for reducing health inequality [36] and future green infrastructure planning should acknowledge existing health disparities [37].

Despite literature indicating beneficial effects of green space exposure on mental health outcomes, a narrative review of longitudinal observational studies revealed that in nine studies exploring whether green space affects the risk of developing depression, six found no significant impact, whilst only two found a small reduction and one found a small increase [38**]. Furthermore, data from Australia reported that a 10% increase in urban green space and more open grass was associated with higher levels of antidepressant prescribing [28]. However, it may be that these individuals were from marginalised groups who may be more likely to suffer from mental ill-health. The disparities in the literature may also be attributed to the different measures of mental health and green space exposure used across studies. Different disciplines adopt alternative operational definitions, and the type/quality of green space is not always reported in studies. Therefore, a more rigorous approach to defining and quantifying green spaces across the literature will increase understanding and interpretation across multiple disciplines.

Many studies are also cross-sectional or observational, making it difficult to identify cause and effect [29]. The quality and quantity of green space is also likely to be key, as poor-quality environments with poor accessibility are unlikely to positively impact mental health [35, 39]. As highlighted by some of the literature, the use of and interaction with green space may also be more important for mental health and mental illness than the ability to access green space [32**].

Nature-based interventions for mental health and mental illness

One way of increasing access to green spaces is to use those spaces to deliver nature-based interventions (e.g., activities in green spaces, conservation work, community gardens, allotments etc.), which can also often target more vulnerable cohorts. Three recent reviews [31*, 40*, 41**] have indicated a range of positive mental health benefits of nature-based interventions. In their systematic review of Shinrin-yoku (forest bathing) interventions, Kotera *et al.* [41**] reported significant reductions in depression, anxiety, and anger. Lackey *et al.* [31*] found positive mental health outcomes in 87.5% of reviewed studies, with the most commonly reported improvements for anxiety and stress. Coventry *et al.* [40*] also reported improvements in depressed mood, anxiety and positive affect. Whilst these reviews incorporated studies of individuals with clinical diagnoses of mental ill-health the majority of studies were within healthy groups making it difficult to identify the impact for individuals with mental illness. Lackey *et al.* [31*] reported that evidence of the impact for individuals with clinical diagnoses of mental health was less clear, with three of the nine included studies indicating no significant impact of nature-based

activities. Similarly, Coventry *et al.* [40*] reported that the effects of nature-based interventions in individuals with severe mental illness is unclear.

In a meta-analysis exploring the effect of physical activity in natural outdoor environments a moderate positive effect was reported for mental wellbeing [42*]. Wellbeing improvements were also greater following nature based physical activity compared to indoor physical activity, although the effect was not statistically significant. However, the studies included used multiple measures of wellbeing and different durations of physical activity interventions, with study quality being low. It is a challenge to conduct the gold standard randomised control trials as it is not possible to blind participants to interventions, limiting the quality of studies and further increasing the risk of bias, which is a consistent limitation across nature-based intervention studies. The meta-analysis was also focused on healthy populations and therefore did not consider those diagnosed with mental illness.

A study exploring the impact of The Conservation Volunteers Green Gym programme, a UK national initiative which engages individuals in a range of practical activities in local natural environments including planting, community growing and green space improvement, reported significant improvements in wellbeing following 4.5months of attendance. These improvements were also sustained on average 8.5months and 13months later [43]. Whilst Green Gym volunteers included individuals who both self-selected to engage in the programme and those who were referred via social prescribing or other health and social care routes, the referral routes of participants in this study were unknown, making it difficult to determine whether participants had a diagnosed mental illness. However, the findings did

reveal that improvements in wellbeing were greatest for those whose had lower wellbeing at the start of their engagement; thus, indicating the potential of nature-based interventions for those with poor mental health or mental illness.

Green social prescribing for mental health and mental illness

Green social prescribing is an area of health and research interest, with significant investment by the UK government to tackle the rising tide of mental illness [10].

Emerging evidence indicates positive mental health outcomes following participation in green social prescribing interventions. In a study exploring the impact of a 6-week, wetlands for wellbeing structured intervention for individuals referred through community mental wellbeing services and diagnosed with depression and/or anxiety, significant improvements in mental and emotional wellbeing, anxiety and stress were reported, alongside reductions in social isolation [44]. This is supported by research indicating significantly greater improvements in wellbeing, positive and negative affect, following a nature-based walk compared to an urban walk, in individuals diagnosed with depression and anxiety [45]. However, these studies are focused on short term interventions, with small sample sizes. To enhance the evidence-base in relation to green social prescribing, evidence of the long-term effectiveness in individuals with diagnosed mental illness is required. Currently the evidence base is not clear about the optimum duration of exposure for maximum health gain or whether individuals with particular mental disorders may respond better.

Furthermore, whilst evidence suggests that green social prescriptions are likely to be cost-effective for individuals with mild to moderate mental illness [46]; further research is required to demonstrate the magnitude of these benefits and the potential social and wider returns on investment. It is also reported that whilst mental

health clinicians perceive nature-based interventions to provide a range of health benefits for individuals with mental illness including improved mood, wellbeing, and social connections; there are concerns over barriers to use of services such as individuals' mental health symptoms, lack of motivation and geographical accessibility [47, 48]. These barriers need to be overcome in order to increase accessibility and uptake of green social prescriptions for the prevention and treatment of mental illness.

Conclusion

This review highlights the promising but equivocal research findings, which are partly due to the study designs and the complexity of multicomponent health interventions. Although the evidence is encouraging, there is a need to design robust, high-quality research studies that can strengthen the evidence base further and inform future health promotion practice and policy decision making. This will require a multidisciplinary approach involving academics, key stakeholders, end users, clinicians, urban planners, public and third sector organisations to identify the optimum green infrastructure to maximise public health, especially in deprived urban communities. Individuals are living longer, but often with poorer mental health, so we need to identify alternative solutions to address these challenges. Ensuring individuals have access to local green space or community nature-based initiatives might offer an important, inclusive, low-cost, and effective opportunity for health promotion.

Key points

- Mental illness is a global challenge, exacerbated by the coronavirus pandemic, which has both individual and societal costs.
- Evidence shows that accessible greenspaces facilitate physical activity, diminish stress, encourage social interaction, and reduce loneliness, all of which positively impact on mental health.
- Access to urban green spaces reduces health inequalities, yet the pandemic compounded inequality in access to green space, further disadvantaging the most deprived and vulnerable groups in society.
- Nature-based interventions and green social prescriptions offer an opportunity to deliver accessible all-inclusive health promoting activities.
- To maximise public mental health, we need to invest in robust, high-quality research to strengthen the evidence base and inform future practice and policy decision making.

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