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## **Nature-Based Interventions for Improving Health and Wellbeing: The Purpose, the People and the Outcomes**

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## Abstract

Engagement with nature is an important part of many people's lives, and the health and wellbeing benefits of nature-based activities are becoming increasingly recognised across disciplines from city planning to medicine. Despite this, urbanisation, challenges of modern life and environmental degradation are leading to a reduction in both the quantity and the quality of nature experiences. Nature-based health interventions (NBIs) can facilitate behavioural change through a somewhat structured promotion of nature-based experiences and, in doing so, promote improved physical, mental and social health and wellbeing. We conducted a Delphi expert elicitation process with 19 experts from seven countries (all named authors on this paper) to identify the different forms that such interventions take, the potential health outcomes and the target beneficiaries. In total, 27 NBIs were identified, aiming to prevent illness, promote wellbeing and treat specific physical, mental or social health and wellbeing conditions. These interventions were broadly categorized into those that change the environment in which people live, work, learn, recreate or heal (for example, the provision of gardens in hospitals or parks in cities) and those that change behaviour (for example, engaging people through organized programmes or other activities). We also noted the range of factors (such as socioeconomic variation) that will inevitably influence the extent to which these interventions succeed. We conclude with a call for research to identify the drivers influencing the effectiveness of NBIs in enhancing health and wellbeing.

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Article

# Nature–Based Interventions for Improving Health and Wellbeing: The Purpose, the People and the Outcomes

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**Abstract:** Engagement with nature is an important part of many people’s lives, and the health and wellbeing benefits of nature–based activities are becoming increasingly recognised across disciplines from city planning to medicine. Despite this, urbanisation, challenges of modern life and

environmental degradation are leading to a reduction in both the quantity and the quality of nature experiences. Nature-based health interventions (NBIs) can facilitate behavioural change through a somewhat structured promotion of nature-based experiences and, in doing so, promote improved physical, mental and social health and wellbeing. We conducted a Delphi expert elicitation process with 19 experts from seven countries (all named authors on this paper) to identify the different forms that such interventions take, the potential health outcomes and the target beneficiaries. In total, 27 NBIs were identified, aiming to prevent illness, promote wellbeing and treat specific physical, mental or social health and wellbeing conditions. These interventions were broadly categorized into those that change the environment in which people live, work, learn, recreate or heal (for example, the provision of gardens in hospitals or parks in cities) and those that change behaviour (for example, engaging people through organized programmes or other activities). We also noted the range of factors (such as socioeconomic variation) that will inevitably influence the extent to which these interventions succeed. We conclude with a call for research to identify the drivers influencing the effectiveness of NBIs in enhancing health and wellbeing.

**Keywords:** Nature-based health interventions; green prescriptions; wilderness therapy; forest schools; green exercise

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## 1. Introduction

There are many pressing public health and environmental challenges associated with modern living, with rapidly growing levels of chronic, non-communicable physical and mental health conditions [1–4] and global recognition of serious health risks posed by stressful living conditions [5]. Engagement with nature is a common pursuit in cities [6] and it is becoming increasingly recognised as a means to alleviate many of these challenges. Evidence now points to benefits for physical health (e.g., lower prevalence of high blood pressure and allergies) [7,8], mental health (e.g., lower prevalence of depression and anxiety) [8–11] and social wellbeing outcomes [8] for people who spend time in nature. Moreover, there is evidence that the magnitude of such benefits can increase with the dose of nature [9]. It is thus of significant concern that urbanisation and the challenges of modern life are leading to reduced engagement with the natural environment [12].

To counter this development, nature-based health interventions (NBIs) can facilitate change through a somewhat structured promotion of nature-based experiences. NBIs are programmes, activities or strategies that aim to engage people in nature-based experiences with the specific goal of achieving improved health and wellbeing. For example, environmental manipulations where green and blue spaces are incorporated into cities can have positive outcomes associated with the management of habitats and flow of ecosystem services to people [13,14], but there is also a growing body of evidence highlighting the potential of green space for the treatment and prevention of physical, mental and social health and wellbeing challenges [8,15–19]. This recognition that experiences of nature can provide benefits for people represents a major shift in public health thinking for both the prevention and the treatment of health issues, beyond considering nature solely as a risk-factor (e.g., through the transmission of insect-borne diseases [20–23]).

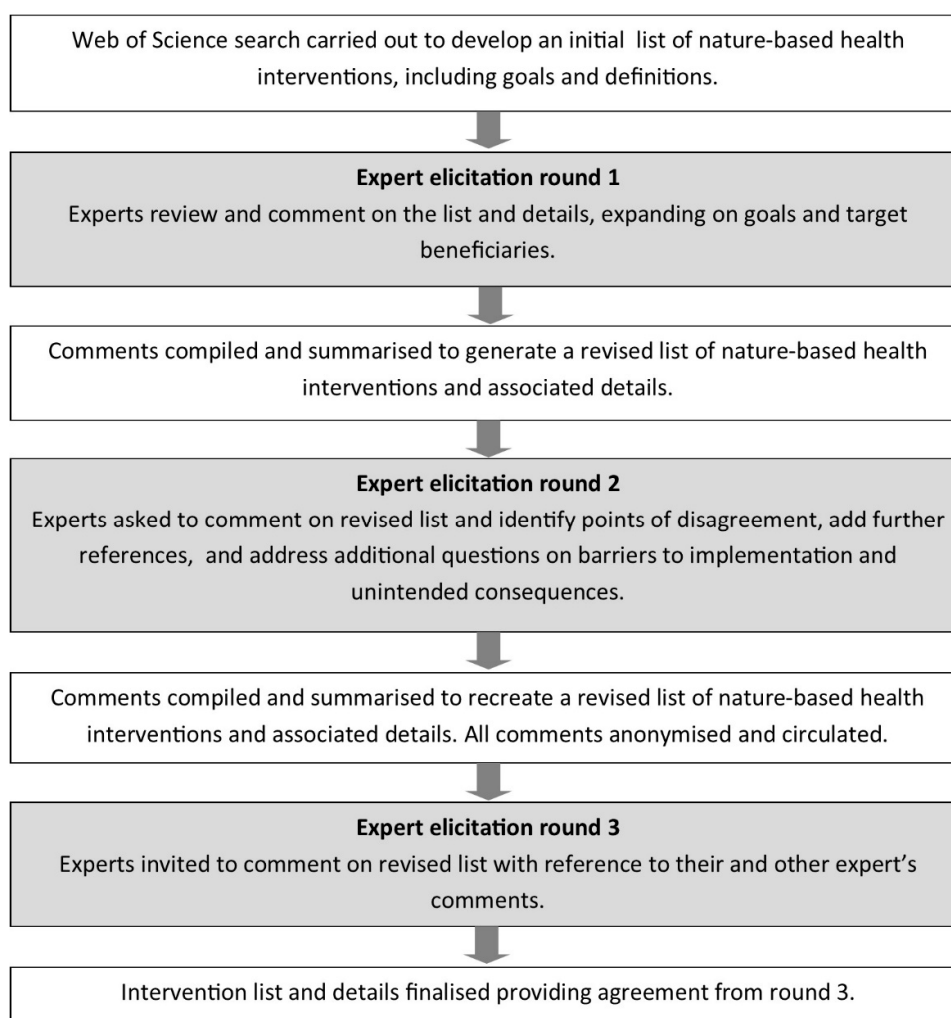
Reflecting the growing body of research demonstrating a link between interactions with nature and health, many governments, non-government organisations, public and private stakeholders are now beginning to consider these potential benefits in their policy and planning frameworks [24–27]. Indeed, across the world, many NBIs are being implemented. These include, for example, minimum area targets for public green space [28] and ‘nature prescriptions’, where doctors or other health practitioners prescribe nature-based experiences for patients living with specific health conditions [29–32]. However, despite this growing movement, there is a dearth of guidance as to what NBIs are available and what specific health outcomes they might achieve and for whom. This can only limit the potential leveraging

of natural settings to improve health and wellbeing outcomes for individuals and communities, potentially leading to inefficient and ill-targeted investment decisions.

Here, we used expert elicitation to identify a range of NBIs that have been examined in the peer-reviewed scientific literature. This list of interventions is intended to provide a resource for decision-makers in government, non-government organisations, and other interested groups by outlining possible interventions, the potential health outcomes, and the target beneficiaries.

## 2. Materials and Methods

We used a Delphi expert elicitation process [33] to develop and then to refine and improve a list of NBIs that have received attention in the peer-reviewed scientific literature to date (Figure 1). The Delphi technique is an iterative method for building consensus. In this case, it was based on three rounds of questionnaires. Before the rounds of questions began, D.F.S. carried out a broad-reaching Web of Science literature search (initial search terms including ‘nature AND health OR wellbeing’, ‘nature-based health interventions’, ‘nature interventions’). The goal of this search was not a comprehensive review, but to develop a list of interventions—that is, programmes, activities or strategies that aim to engage people in nature experiences with the specific intention of improving health and wellbeing outcomes. The articles identified through the initial search were assessed, and NBIs identified where possible; further articles were found through the reference lists within the initial article set.



**Figure 1.** The Delphi expert elicitation process followed in this study. Tasks in boxes with no shading were carried out by D.F.S., those in shaded boxes involved all experts.

*Round 1.* In the first round, experts were asked to review and refine the list of interventions to ensure that those with similar methods but different names were removed. Experts were also invited to add intervention types and provide example references. Experts also commented on the definition, goals, and target beneficiaries of each intervention and identified further relevant literature. Thirty experts were invited to contribute. All are scientists and/or health practitioners actively publishing peer-reviewed research on the connection between people, nature and health and wellbeing. Nineteen participated.

*Round 2.* Following the initial review process, the comments were compiled and summarised by D.F.S. This involved the revision of text to improve accuracy and incorporate new information from experts. This revised list was recirculated to all 19 experts, and they were invited to agree or disagree with the content. The experts were also provided with their own original comments during this step. At this point, the experts were also invited to answer further questions on four specific intervention types for which a significant body of literature was available and for which the panel of experts had specific expertise. The questions focused on the reach of the interventions, barriers to individuals and organisations in implementing the interventions and potential unintended negative consequences.

*Round 3.* The intervention list was again revised by D.F.S. on the basis of all comments made, involving addition of detail and refinement of definitions and other text. Some experts provided significant in-depth detail that went beyond the scope of this study, and in these instances, the detail was summarised. All responses from round 2 were anonymised and recirculated to all 19 experts again to review their own answers on reflection of other expert's answers and ensure that the revision conducted by D.F.S. accurately reflected their views and that a consensus had been reached. They were also invited to add final thoughts triggered by the comments that had been put forward by their peers.

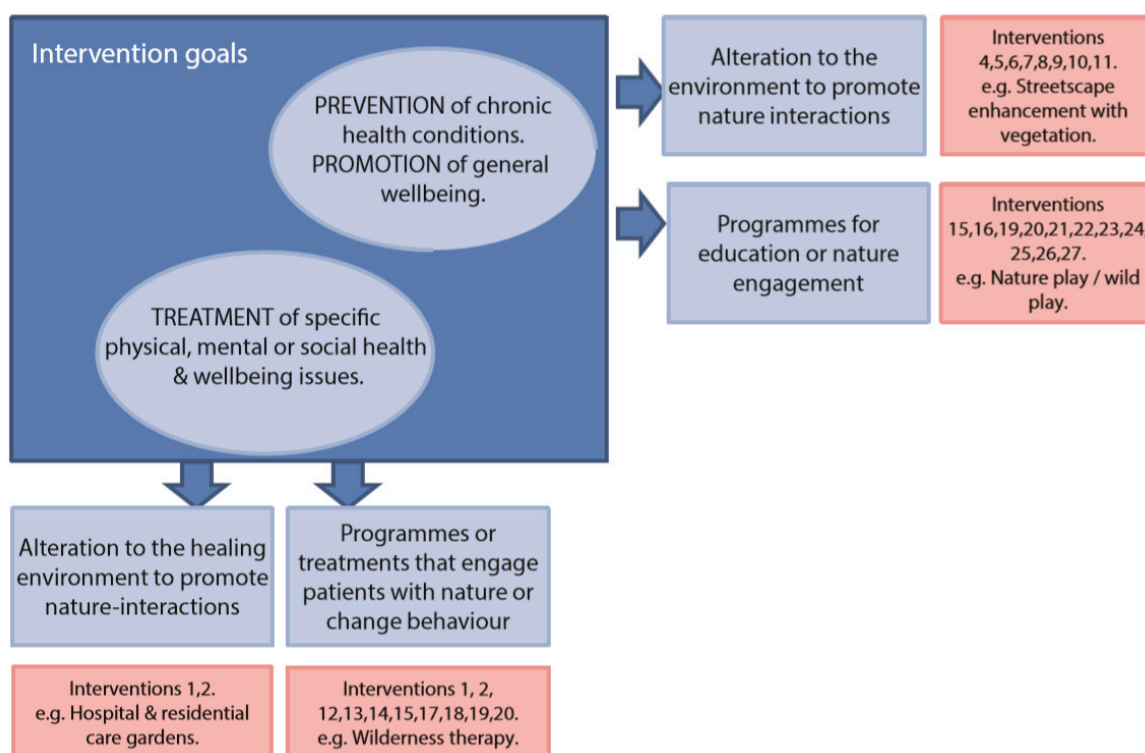
All comments were synthesised to produce the final list presented in this article.

### 3. Results

Nineteen of 30 invited experts who were identified from across the world actively engaged with a Delphi expert elicitation process to review a compilation of NBIs identified through a literature search conducted by D.F.S. The 19 experts who participated in the review are all named authors on this paper. They represent a diversity of disciplines and areas of expertise relevant to the broad field of nature and health. Geographically, representation in the panel was particularly good from the United Kingdom and Oceania, while there were gaps in representation from Europe, Asia, Africa and the Americas. This was in part related to the availability of the identified experts to participate and in part, to difficulties in identifying experts who do not publish in English-language peer-review journals. The representation of national/cultural contexts in the literature reviewed, however, extended beyond those in which the 19 experts are situated.

Twenty-seven distinct NBIs that have received some peer-reviewed research attention were summarised using the expert elicitation process (Tables 1 and 2). Interventions were excluded from the list where health and wellbeing outcomes were not explicit goals (e.g., programmes that solely aimed to connect people with nature without the intention of also delivering health and wellbeing benefits).

The intended outcomes and target beneficiaries varied widely across interventions, from the promotion of wellbeing and the prevention of chronic or lifestyle-based health conditions (e.g., through the provision of public parks) to targeted treatments for people living with specific health conditions (e.g., nature prescriptions for reducing high blood pressure). A categorisation of the different interventions is given in Figure 2; some aim to *change the environment* in which people live (e.g., providing new or better quality public green spaces [18,28,34]; Table 1) and work (e.g., hospital, workplace), and others aim to *change people's behaviour* and their interactions with nature (e.g., nature play/wild play programmes [35]; Table 2 and Figure 2). There was some overlap in these categories where people engaged in nature-based activities through interventions that also involved enhancing the environment (e.g., 'green gyms' or environmental volunteering; Table 2).



**Figure 2.** A categorisation schematic of the nature-based health interventions identified in an expert elicitation process. Numbers refer to interventions identified in Tables 1 and 2.

A closer investigation of barriers and potential negative implications for four intervention types was carried out, specifically, green prescriptions, wilderness therapy, green gyms and outdoor exercise groups (Table 2). There were a number of commonalities in the barriers, which included knowledge of health practitioners and lack of access to the intervention (especially where it relied on having transport or could not be completed independently as it relied on a specific organised programme). There were also some potential unanticipated negative implications, with risks of physical injury a common theme.

**Table 1.** Nature-based health and wellbeing treatment (T) or prevention (P) interventions that change environments.

Intervention	Description	T/P	Intervention Goals, and Intended Health or Wellbeing Outcome	Target Beneficiaries	Example References
<b>1. Provision of gardens in hospitals or residential care homes (sometimes referred to as healing gardens).</b>	The provision of gardens that can either be viewed from hospital rooms or accessed by patients and families (can include green walls).	T	Reduce pain and stress, potentially leading to improved healing time and mental health, quality of life, wellbeing, reduced agitation for patients with dementia.	Hospital or residential care patients, their families and friends, staff. Can have targeted groups in some circumstances, e.g., hospitals for patients living with dementia.	[36–44]
<b>2. Provision of nature within rooms in healing environments.</b>	The provision of nature that can be viewed or experienced from a person's room and/or in shared areas (e.g., the view from a window, or indoor plants, flowers, garden, green walls).	T	Reduce pain and stress, potentially leading to improved healing time and mental health, social contacts, quality of life, wellbeing.	Hospital or residential care patients, their families and friends, staff.	[40–42,45–51]
<b>3. Indoor plants in workplaces or other non-healing indoor environments such as shopping centres.</b>	Organisations shape policies and make provisions for indoor plants.	P	Enhance creativity, improve productivity, reduce absenteeism at work, improve mental wellbeing, improve air quality.	Those using indoor environments.	[52–54]
<b>4. Increased provision of public urban parks and gardens.</b>	Additional new parks are provided.	P	Parks are provided to encourage outdoor leisure, engagement with nature, increase neighbourhood walkability and physical activity, with some of the cited health benefits including the physical benefits from exercise, enhanced social cohesion, mental wellbeing and quality of life outcomes.	Neighborhoods or entire towns.	[18,26,34,55–58]
<b>5. Improvement of urban public parks and gardens.</b>	Improvement could include: (i) better public access to existing parks, including public transport provision and accessibility for those with disabilities, and improved equality in access across socioeconomic gradients; (ii) better street lighting and passive surveillance to reduce fear of crime; (iii) traffic reduction measures to reduce pollution and noise; (iv) enhancement of biodiversity within parks.	P	Improvement of parks to enhance community engagement with under-utilised parks and improve biodiversity to enhance the restorative benefits received. Some of the cited health benefits of parks include exercise, enhanced social cohesion and mental wellbeing and quality of life outcomes.	Neighborhoods or entire towns.	[59–64]
<b>6. Provision of walking or bike paths, or other shared use paths/trails.</b>	Areas designed specifically for walking or biking. Includes paths through parks or natural areas that facilitate active travel.	P	Provide a facility that encourages physical activity, delivers the associated benefits, and improves general wellbeing.	General population in an area.	[65–75]
<b>7. Streetscape enhancement/green corridors along streets.</b>	Councils plant vegetation along streets and support the efforts of residents to plant vegetation in their private or community gardens (includes both native and non-native species).	P	Enhance the environment for attention restoration, in part by improving the view from people's homes. Indirect health benefits include better air quality, reduced heat island effects.	Neighborhoods or entire towns.	[76–78]
<b>8. Community gardens/allotments.</b>	Gardens in accessible locations for community members to encourage engagement in growing one's own food and to provide food education involving fruit and vegetables.	P	Improve nutrition, social connections and psychological benefits (e.g., confidence, psychological restoration).	Neighbourhoods or entire towns, sometimes with specific intended beneficiaries (e.g., age groups).	[79–86]
<b>9. Greening childcare or school grounds.</b>	Increase amount and quality of natural elements, including around classrooms and play areas.	P	Increase physical activity, increase imaginative play, development of positive relationships, place of learning, attention restoration, overall improvement in health.	Children using the facility.	[87–90]
<b>10. Outdoor gym equipment.</b>	Provide alternative exercise facilities, specifically outdoor versions of traditional gym equipment.	P	Encourage physical activity and promote the associated benefits and increased wellbeing in those reluctant to use traditional gyms or more motivated by being outdoors.	Neighbourhoods or entire towns, those reluctant to go to indoor gyms.	[91,92]
<b>11. Provision of accessible natural environments.</b>	Location and spatial planning of accessible natural environments, with paths. Infrastructure created or improved in local woodlands, and a programme of social engagement.	P	Increase use of natural environments for health, recreation, leisure, etc. to facilitate health and wellbeing outcomes such as reduced stress, improvements in mood.	Local residents and wider populations.	[93–96]



**Table 2.** Nature-based health and wellbeing treatment (T) or prevention (P) interventions that aim to change the behaviour in individuals or groups with specific physical, mental or social health and wellbeing issues. ADHD: attention-deficit/hyperactivity disorder.

Intervention	Description	T/P	Intervention Goals (i.e. Health Outcome)	Target Beneficiaries	Barriers to Implementation, Unintended Negative Impacts	Example References
12. Green/nature/park/garden prescriptions.	Doctors (or other professionals) 'prescribe' or refer patients/clients to outdoor activities (often walks).	P/T	Increase exercise and the associated benefits, stress reduction, reduce blood pressure, improve healing times, reduce depression, increase resilience and other mental health benefits. Some are targeted towards children for purposes such as prevention or treatment of obesity, cancer and diabetes. Some also target quality of life, wellbeing and social support.	Individual patients or groups with a range of conditions.	<i>Individual-level barriers:</i> Geographic accessibility and availability of facilities (e.g., green spaces), affordability of the activity, social acceptability, physical and cognitive capability of individuals, perceived issues such as danger. <i>Organisation-level barriers:</i> Acceptability by and lack of knowledge of medical professionals, difficulty in changing behaviours of medical professionals. <i>Potential unintended impacts:</i> Could present risks for people with some conditions.	[31,32,97–104]
13. Care-farming or farm therapy, including horticulture and animal-assisted therapy.	Therapeutic use of commercial farms and agricultural landscapes as a base for promoting mental and physical health, through normal farming activity or horticulture.	T	Mental health promotion and to reduce distress in people with dementia. Reduce social isolation.	Youth at risk; youth with special needs (e.g., autism); cancer survivors; mental disorders; people with lost functionality; people recovering from serious illness.	Not assessed in this study.	[83,105–114]
14. Residential retreats.	Multi-modal therapies delivered in a removed natural setting.	T	Holistic wellbeing; physical, but primarily psychological (coping), social, spiritual.	Patients with chronic conditions such as cancer or cardiovascular disease.	Not assessed in this study.	[115]
15. Wilderness therapy.	Structured nature-based activities and programmes in 'wilder' environments for 'at risk' groups or those recuperating or in recovery	P/T	Address social and psychological issues through a range of pathways, including by facilitating positive human-nature interactions, building self-esteem and fostering social connections.	People with severe mental health issues; youth at risk of involvement in crime; individuals who are imprisoned or on probation from crime; ex-offenders; victims of crime; children with ADHD; those living with or recovering from a range of mental and physical conditions; people with post-traumatic stress disorder.	<i>Individual-level barriers:</i> Geographic accessibility and availability of facilities (e.g., green spaces), affordability of the activity, social acceptability, some people may not appreciate the group context, physical ability, time (several days often required). <i>Organisational level barriers:</i> Poor system support, lack of financial resources to support the activities. <i>Potential unintended impacts:</i> Mental distress and physical injury in poorly managed activities, poor follow-on care. Often offered as a once-in-a-lifetime developmental boost, and they may be required more often.	[111,116–125]
16. Wilderness programmes.	Programmes designed to challenge participants in natural environments. Treatment modalities that include the natural world in relationships of mutual healing and growth, and as such are a form of applied ecopsychology.	P	Personal growth, social skills.	Often youth, but also targeting any interested people and groups.	Not assessed in this study.	[126,127]
17. Ecotherapy.	Use of pets, especially in hospitals to benefit patients.	T	Positive effects on psychological wellbeing, fitness and self-reported health.	People with symptoms of stress, or other mental health and wellbeing issues.	Not assessed in this study.	[128–131]
18. Pet therapy, or pet-assisted therapy.	Practice of spending time in forest settings, often with emphasis on attention to breathing and other meditative techniques	T	Psychological wellbeing; social wellbeing.	Hospital inpatients; other vulnerable groups.	Not assessed in this study.	[132–134]
19. Forest bathing.		P/T	Improved physical and mental wellbeing.	People referred to the program or voluntary participation.	Not assessed in this study.	[95,96,100,135,136]

Table 2. Cont.

Intervention	Description	T/P	Intervention Goals (i.e. Health Outcome)	Target Beneficiaries	Barriers to Implementation, Unintended Negative Impacts	Example References
20. Green gyms or environmental volunteering.	Active work in an outdoor environment, often with a focused conservation outcome.	P/T	Provide diverse benefits including physical activity, mental wellbeing, social connection/(re)integration.	People referred to the program or voluntary participation.	<p><i>Individual-level barriers:</i> Geographic accessibility (including transport) and availability of facilities (e.g., green spaces), affordability of the activity, social acceptability, availability of the programmes.</p> <p><i>Organisation-level barriers:</i> Lack of financial resources, acceptability by and lack of knowledge of health professionals, difficulty in changing behaviours of health professionals.</p> <p><i>Potential unintended impacts:</i> Chance of injuries and risk of other negative impacts of nature (e.g., insect bites, allergic responses), conflict in management of green spaces. Limited knowledge by host organisations of how to supervise people with physical or mental impairment.</p>	[137–144]
21. Outdoor exercise groups.	Groups with the specific aim of exercising in nature (most commonly walking) for health benefits.	P/T	Improve physical, psychological, social and spiritual wellbeing, including better cardio-vascular health, psychological wellbeing.	Local interested residents, or people referred to the program with a specific health condition, or voluntary participation.	<p><i>Individual-level barriers:</i> Geographic accessibility and availability of facilities (e.g., green spaces), affordability of the activity, social acceptability, concerns about, e.g., getting muddy or other issues, unfamiliarity with using non-urban environments, personality (e.g., introverts may elect out), mobility issues.</p> <p><i>Organisational-level barriers:</i> Lack of financial resources or certainty, communication preferences for older individuals (e.g., social media).</p> <p><i>Potential unintended impacts:</i> Chance of physical injury, group setting may engender negative feelings and interactions.</p>	[72,128,145–150]
22. Nature play/wild play.	Structured programmes designed to facilitate children’s play in natural environments.	P	Enhance child health and development through provision of social programmes and physical environments that promote varied play opportunities, improved attention and learning, physical activity, mental health.	Children (general).	Not assessed in this study.	[151–157]
23. Forest Schools/outdoor classrooms/learning environment.	Programme of education in the outdoors (rather than about the outdoors). Typically children spend a period of their schooling (ranging from a couple of hours a week to all their time) undertaking outdoor activities. Forest school is both a pedagogy and a physical entity, with the use often being interchanged.	P	Provide alternative (and sometimes improved) learning environment, increase physical activity and the associated benefits.	Typically children, but has been used with adults and people with special needs.	Not assessed in this study.	[158–161]
24. Children’s kitchen gardens.	Gardens in schools and kindergartens to encourage engagement in growing one’s own food and to increase access to fruit and vegetables	P	Improve nutrition, social connections and psychological benefits (e.g., confidence, team work skills), physical activity, educational outcomes, school-based quality of life.	Children in childcare, nurseries and schools.	Not assessed in this study.	[162–171]

Table 2. Cont.

Intervention	Description	T/P	Intervention Goals (i.e. Health Outcome)	Target Beneficiaries	Barriers to Implementation, Unintended Negative Impacts	Example References
25. Outdoor education schemes.	Schemes designed to introduce children/adults to nature with the purpose of altering their knowledge about, attitudes toward and contact with nature.	P	Increase confidence to use natural environments for physical activity and recreation and promote the health and wellbeing benefits associated with this and increased nature exposure.	Largely children, but also aimed at adults from vulnerable groups (e.g., rehabilitation) and others.	Not assessed in this study.	[172]
26. Promotion and facilitation campaigns.	Promotional campaigns (e.g., via media) to highlight and encourage engagement with natural environments and potential health benefits.	P	Increase awareness, engagement, use and experience of natural environments.	General population, but often targeted at specific groups such as different age groups.	Not assessed in this study.	[128,173]
27. Blue gym.	Water- or shoreline-based activities.	P	Improve mental wellbeing.	General population.	Not assessed in this study.	[174]

#### 4. Discussion

The scientific literature includes studies on a diverse suite of nature-based interventions through which ill health might be prevented, health and wellbeing can be promoted, and/or specific illnesses might be treated. These interventions could provide a useful tool for enabling and encouraging people to engage with nature and, in doing so, potentially receive a multitude of physical, mental and social health benefits. Broadly speaking, the interventions identified in this study can be grouped into actions that change the environment in which people live, work, learn, recreate or heal, and those that change people's behaviour through programs or other means. Because of this, the scale of impact varies from the population to the individual level and in the level of effort needed to achieve outcomes [175]. Consequently, the selection of one intervention over another or the composition of a suite of interventions, must reflect the capacity and skills of the administering organisations, the goals of the activity or activities, as well as the needs of the population or the individual.

A key feature of nature-based health interventions is that a single intervention can affect people in multiple ways and, therefore, potentially improve wellbeing across a range of domains [15,17,176]. For example, nature prescriptions can both promote physical activity leading to many positive health outcomes, while also providing patients with the mentally restorative effects of natural spaces [32,98,99,177]. Thus, investment in interventions can achieve significant outcomes across multiple domains [17] and, when scaled up, could have significant and cost-effective implications for population health. Furthermore, nature can be pro-actively planned into city development activities to provide a protective factor against many health conditions [15,177]. Research into the extent and magnitude of these outcomes is critical to assist decision-makers (such as hospital or care-home managers and urban planners) in weighing up the costs and benefits of investing in the various options, identifying ways to coordinate efforts (e.g., with regard to the siting of health care facilities) and ultimately supporting 'prevent-to-save' initiatives [178].

As with other public health interventions, there are many factors that influence both the effectiveness and the success of NBIs. For example, the accessibility of public parks will inevitably influence their use by communities, and a number of studies have found people are more likely to exercise in neighborhoods with greater levels of park availability [11,59,179–185]. There are also social equity issues at play. For example, disadvantaged neighborhoods have been repeatedly found to have less vegetation cover, fewer public parks and fewer street trees; additionally, organised user-pays programmes may be inaccessible for some disadvantaged sectors of society [186–189]. Furthermore, the physical and mental capability of participants is a potential barrier to accessing some intervention types, as identified in this expert elicitation study. Social factors, such as acceptability of the intervention to local communities, are also likely to have an important influence on the uptake of nature-based health interventions; for example, several studies have now found that cultural differences have a critical influence on the use of public green spaces [190–192]. Finally, an individual's age, gender and other factors will play a role, as will perceptions of nature and the appropriateness of the nature setting in its wider context (e.g., ecological characteristics of the nature setting, facilities and infrastructure, programmed activities and experiences of social inclusion in the setting) [193–195].

As NBIs are not yet mainstream within the health care community, practitioner buy-in and knowledge was identified as a particular challenge in this study. Further knowledge and communication about the effectiveness of interventions gained from rigorous research is therefore likely to be an important precursor for their use, including understanding the limitations or barriers to success and accounting for local contexts. Active evaluation and communication of findings from relevant studies is needed to build more solid foundations for decision-making that will help improve health and narrow health inequities. This said, much is already known about the potential benefits and how they are realised, and public appreciation for parks and other NBIs has such long-standing support that many generations of urban residents have already been able to benefit from their availability.

In this study, we used an expert elicitation process to compile a list of the nature-based health interventions that have received some research attention. This process is not without its limitations.

Most notably, some interventions may have been overlooked, and the list was subject to a consensus on grouping and categorisation that others may have done in a different way. Furthermore, this study has thus not systematically addressed issues of intervention efficacy, effectiveness, and efficiency. While systematic analyses of efficacy and efficiency are as yet not possible for many intervention types because of a high level of variation in the methods used, outcomes measured within the literature to date (but see, e.g., [51]), and co-benefits realised by indirect means (e.g., parks along rivers may support nature experiences and also protect homes from flooding), such evaluations will be important avenues for future research. Finally, it bears mentioning that the recognition of the possibilities with nature-based interventions is engendering considerable innovation, as with the development of therapeutic gardens for new client groups (e.g., war veterans [196]) and the use of nature experience to support the acquisition of mindfulness meditation techniques [197,198].

## 5. Conclusions

We have identified a suite of NBIs that can be used to improve population health and wellbeing, and to address specific physical, mental and social health issues. The identified interventions broadly fall into two categories: those that change the environment, and those that change behaviours. The selection of an intervention will require the consideration of a range of factors, including cost, likely benefit, accessibility (including availability and social acceptability) and the capacity of the organisation to deliver it. Most importantly, however, the needs of the community or the individual and the goals of the intervention must be considered. To integrate nature-based health interventions into public health and planning policy, strong evidence for their effectiveness is important, and thus evaluation should be carefully built into new interventions.

**Author Contributions:** K.J.G. generated the study concept; D.F.S. compiled the initial intervention list, coordinated the expert elicitation process and wrote the article; D.F.S. and K.J.G. developed the study methods; all authors contributed to the revision of the intervention list and critical review of tables/schematics, edited the manuscript and revised materials for final submission.

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## References

1. Moore, M.; Gould, P.; Keary, B.S. Global urbanization and impact on health. *Int. J. Hyg. Environ. Health* **2003**, *206*, 269–278. [CrossRef] [PubMed]
2. World Health Organization. Urban Health. 2015. Available online: [http://www.who.int/topics/urban\\_health/en/](http://www.who.int/topics/urban_health/en/) (accessed on 14 October 2015).
3. Dye, C. Health and urban living. *Science* **2008**, *319*, 766–769. [CrossRef]
4. Sundquist, K.; Frank, G.; Sundquist, J. Urbanisation and incidence of psychosis and depression: Follow-up study of 4.4 million women and men in Sweden. *Br. J. Psychiatry* **2004**, *184*, 293–298. [CrossRef]
5. Schneiderman, N.; Ironson, G.; Siegel, S.D. Stress and health: Psychological, behavioral, and biological determinants. *Ann. Rev. Clin. Psychol.* **2005**, *1*, 607–628. [CrossRef] [PubMed]
6. Cox, D.T.C.; Hudson, H.L.; Shanahan, D.F.; Fuller, R.A.; Gaston, K.J. The rarity of direct experiences of nature in an urban population. *Landsc. Urban Plan.* **2017**, *160*, 79–84. [CrossRef]

7. Donovan, G.H.; Gatzliolis, D.; Longley, I.; Douwes, J. Vegetation diversity protects against childhood asthma: Results from a large New Zealand birth cohort. *Nat. Plants* **2018**, *4*, 358–364. [[CrossRef](#)]
8. Shanahan, D.F.; Bush, R.; Gaston, K.J.; Lin, B.B.; Dean, J.; Barber, E.; Fuller, R.A. Health benefits from nature experiences depend on dose. *Sci. Rep.* **2016**, *6*, 28551. [[CrossRef](#)] [[PubMed](#)]
9. Cohen-Cline, H.; Turkheimer, E.; Duncan, G.E. Access to green space, physical activity and mental health: A twin study. *J. Epidemiol. Community Health* **2015**, *69*, 523–529. [[CrossRef](#)]
10. Cox, D.T.C.; Shanahan, D.F.; Hudson, H.L.; Fuller, R.A.; Anderson, K.; Hancock, S.; Gaston, K.J. Doses of nearby nature simultaneously associated with multiple health benefits. *Int. J. Environ. Res. Public Health* **2017**, *14*, 172. [[CrossRef](#)]
11. Pretty, J.; Peacock, J.; Hine, R.; Sellens, M.; South, N.; Griffin, M. Green exercise in the UK countryside: Effects on health and psychological well-being, and implications for policy and planning. *J. Environ. Plan. Manag.* **2007**, *50*, 211–231. [[CrossRef](#)]
12. Soga, M.; Gaston, K.J. Extinction of experience: The loss of human–nature interactions. *Front. Ecol. Environ.* **2016**, *14*, 94–101. [[CrossRef](#)]
13. Gaston, J.K.; Ávila-Jiménez, M.L.; Edmondson, J.L. Managing urban ecosystems for goods and services. *J. Appl. Ecol.* **2013**, *50*, 830–840. [[CrossRef](#)]
14. UK National Ecosystem Assessment. *The UK National Ecosystem Assessment Technical Report*; UNEP-WCMC: Cambridge, UK, 2011.
15. Shanahan, D.F.; Lin, B.B.; Bush, R.; Gaston, K.J.; Barber, L.; Dean, J.; Fuller, R.A. Toward improved public health outcomes from urban nature. *Am. J. Public Health* **2015**, *105*, 470–477. [[CrossRef](#)] [[PubMed](#)]
16. Keniger, L.E.; Gaston, K.J.; Irvine, K.N.; Fuller, R.A. What are the benefits of interacting with nature? *Int. J. Environ. Res. Public Health* **2013**, *10*, 913–935. [[CrossRef](#)]
17. Hartig, T.; Mitchell, R.; de Vries, S.; Frumkin, H. Nature and Health. *Annu. Rev. Public Health* **2014**, *35*, 207–228. [[CrossRef](#)]
18. Maller, C.; Townsend, M.; Pryor, A.; Brown, P.; St Leger, L. Healthy nature healthy people: ‘Contact with nature’ as an upstream health promotion intervention for populations. *Health Promot. Int.* **2006**, *21*, 45–54. [[CrossRef](#)]
19. Pretty, J.; Peacock, J.; Sellens, M.; Griffin, M. The mental and physical health outcomes of green exercise. *Int. J. Environ. Health Res.* **2005**, *15*, 319–337. [[CrossRef](#)]
20. Douglas, I. Urban ecology and urban ecosystems: Understanding the links to human health and well-being. *Curr. Opin. Environ. Sustain.* **2012**, *4*, 385–392. [[CrossRef](#)]
21. Frumkin, H. Beyond toxicity: human health and the natural environment. *Am. J. Prev. Med.* **2001**, *20*, 234–240. [[CrossRef](#)]
22. Husk, R.; Blockley, K.; Lovell, R.; Bethel, A.; Bloomfield, D.; Warber, S.L.; Pearson, M.; Lang, I.; Byng, R.; Garside, R. What approaches to social prescribing work, for whom, and in what circumstances? A protocol for a realist review. *Syst. Rev.* **2016**, *5*, 93. [[CrossRef](#)]
23. Finlayson, C.M.; Horwitz, P. *Wetlands as Settings for Human Health—The Benefits and the Paradox*, in *Wetlands and Human Health*; Weinstein, P., Horwitz, P., Finlayson, C.M., Eds.; Springer: Berlin, Germany, 2015.
24. Department of Health. *Healthy Lives, Healthy People: Our Strategy for Public Health in England*; The Stationery Office Limited: London, UK, 2010.
25. The Scottish Government. *National Planning Framework for Scotland 2*; Scottish Government Directorate for the Built Environment: Edinburgh, Scotland, 2009.
26. National Park Service Health and Wellness Executive Steering Committee. *Healthy Parks Health People US Strategic Action Plan*; U.S. Department of the Interior: Washington, DC, USA, 2011.
27. Parks Victoria. *Linking People and Spaces: A strategy for Melbourne’s Open Space Network*; Victorian Government: Melbourne, Australia, 2002.
28. UN-Habitat. *State of the World’s Cities, 2012/2013: Prosperity of Cities*; UN-Habitat: New York, NY, USA, 2013; p. 80.
29. Carpenter, M. From ‘healthful exercise’ to ‘nature on prescription’: The politics of urban green spaces and walking for health. *Landsc. Urban Plan.* **2013**, *118*, 120–127. [[CrossRef](#)]
30. Jepson, R.R.; Robertson, R.; Cameron, H. *Green Prescription Schemes: Mapping and Current Practice*; NHS Scotland: Edinburgh, Scotland, 2010.

31. Johnson, M.; Wood, A. *Green Prescription Patient Survey 2015 Report*; Research New Zealand: Wellington, New Zealand, 2015.
32. Swinburn, B.A.; Walter, L.G.; Arroll, B.; Tilyard, M.W.; Russell, D.G. The green prescription study: A randomized controlled trial of written exercise advice provided by general practitioners. *Am. J. Public Health* **1998**, *88*, 288–291. [[CrossRef](#)] [[PubMed](#)]
33. Hsu, C.C.; Sandford, B.A. The Delphi technique: Making sense of consensus. *Pract. Assess. Res. Eval.* **2007**, *12*, 1–8.
34. Maller, C.; Townsend, M.; St Leger, L.; Henderson-Wilson, C.; Pryor, A.; Prosser, L.; Moore, M. *Health Parks, Healthy People: The Benefits of Contact with Nature in a Park Context*; School of Health and Social Development, Deakin University: Melbourne, Australia, 2008.
35. Play England. The Wild Network. 2015. Available online: <http://www.playengland.org.uk/our-work/campaigns/the-wild-network.aspx> (accessed on 10 June 2015).
36. Cooper Marcus, C.; Barnes, M. *Healing Gardens: Therapeutic Benefits and Design Recommendations*; John Wiley & Sons: Hoboken NJ, USA, 1999.
37. Cooper Marcus, C. Healing gardens in hospitals. *Interdiscip. Des. Res. e-J.* **2007**, *1*, 1–27. Available online: <http://www.idrp.wsu.edu/> (accessed on 30 January 2016).
38. Hartig, T.; Cooper Marcus, C. Essay: Healing gardens—Places for nature in healthcare. *Lancet* **2006**, *368*, S36–S37. [[CrossRef](#)]
39. O'Brien, E. *Innovative NHS Greenspace in Scotland. Forest Research*; Farnham Forestry Commission: Farnham, Scotland, 2014.
40. Van den Berg, A.E.; Jaspers, F.C.A.; Wagenaar, C. *Health Impacts of Healing Environments*; University Hospital Groningen: Groningen, The Netherlands, 2005.
41. Weerasuriya, R.; Townsend, M.; Henderson-Wilson, C.; Wells, S. Exploring the health and wellbeing experiences in accessing gardens within a healthcare setting in Australia: The preliminary findings. *Acta Hort.* in press.
42. Whear, R.; Coon, J.T.; Bethel, A.; Abbott, R.; Stein, K.; Garside, R. What is the impact of using outdoor spaces such as gardens on the physical and mental well-being of those with dementia? A systematic review of quantitative and qualitative evidence. *J. Am. Med. Dir. Assoc.* **2014**, *15*, 697–705. [[CrossRef](#)]
43. Gerlach-Spriggs, N.; Kaufman, R.E.; Warner, J.B.S. *Restorative Gardens: The Healing Landscape*; Yale University Press: New Haven, CT, USA, 2004.
44. Ulrich, R.S.; Bogren, L.; Gardiner, S.K.; Lundin, S. Psychiatric ward design can reduce aggressive behavior. *J. Environ. Psychol.* **2018**, *57*, 53–66. [[CrossRef](#)]
45. Gonzalez, M.T.; Kirkevold, M. Benefits of sensory garden and horticultural activities in dementia care: A modified scoping review. *J. Clin. Nurs.* **2014**, *23*, 2698–2715. [[CrossRef](#)]
46. Irvine, K.N.; Warber, S.L. Greening healthcare: Practicing as if the natural environment really mattered. *Altern. Ther. Health Med.* **2002**, *8*, 76–83. [[PubMed](#)]
47. Park, S.H.; Mattson, R.H. Effects of flowering and foliage plants in hospital rooms on patients recovering from abdominal surgery. *Horttechnology* **2008**, *18*, 563–568. [[CrossRef](#)]
48. Park, S.H.; Mattson, R.H. Therapeutic influences of plants in hospital rooms on surgical recovery. *Hortscience* **2009**, *44*, 102–105. [[CrossRef](#)]
49. Raanaas, R.K.; Patil, G.G.; Hartig, T. Health benefits of a view of nature through the window: A quasi-experimental study of patients in a residential rehabilitation center. *Clin. Rehabil.* **2012**, *26*, 21–32. [[CrossRef](#)] [[PubMed](#)]
50. Ulrich, R.S. View through a window may influence recovery from surgery. *Science* **1984**, *224*, 420–421. [[CrossRef](#)] [[PubMed](#)]
51. Yeo, N.L.; Elliott, L.R.; Bethel, A.; White, M.P.; Dean, S.G.; Garside, R. Indoor nature interventions for health and wellbeing of older adults in residential settings: A systematic review. *The Gerontologist* **2019**. [[CrossRef](#)] [[PubMed](#)]
52. Bringslimark, T.; Hartig, T.; Patil, G.G. Psychological benefits of indoor plants in workplaces: Putting experimental results into context. *HortScience* **2007**, *42*, 581–587. [[CrossRef](#)]
53. Shibata, S.; Suzuki, N. Effects of an indoor plant on creative task performance and mood. *Scand. J. Psychol.* **2004**, *45*, 373–381. [[CrossRef](#)] [[PubMed](#)]

54. Dela Cruz, M.; Christensen, J.H.; Thomsen, J.D.; Muller, R. Can ornamental potted plants remove volatile organic compounds from indoor air? A review. *Environ. Sci. Pollut. Res. Int.* **2014**, *21*, 13909–13928. [[CrossRef](#)] [[PubMed](#)]
55. De Sousa, C.A. Unearthing the benefits of brownfield to green space projects: An examination of project use and quality of life impacts. *Local Environ.* **2006**, *11*, 577–600. [[CrossRef](#)]
56. Hoehner, C.M.; Brownson, R.C.; Allen, D.; Gramann, J.; Behrens, T.K.; Floyd, M.F.; Leahy, J.; Liddle, J.B.; Smaaldone, D.; Spain, D.D.; et al. Parks promoting physical activity: synthesis of findings from interventions in seven national parks. *J. Phys. Act. Health* **2010**, *7*, S67–S81. [[CrossRef](#)]
57. Nordh, H.; Alalouch, C.; Hartig, T. Assessing restorative components of small urban parks using conjoint methodology. *Urban For. Urban Green.* **2011**, *10*, 95–103. [[CrossRef](#)]
58. Nordh, H.; Hartig, T.; Hägerhäll, C.; Fry, G. Components of small urban parks that predict the possibility for restoration. *Urban For. Urban Green.* **2009**, *8*, 225–235. [[CrossRef](#)]
59. Giles-Corti, B.; Broomhall, M.H.; Knuiman, M.; Collins, C.; Douglas, K.; Ng, K.; Lange, A.; Donovan, R.J. Increasing walking—How important is distance to, attractiveness, and size of public open space? *Am. J. Prev. Med.* **2005**, *28*, 169–176. [[CrossRef](#)] [[PubMed](#)]
60. Thomsen, J.M.; Powell, R.B.; Allen, D. Designing parks for human health benefits park health resources: Benefits, values, and implications. *Park Sci.* **2013**, *30*, 30–36.
61. Veitch, J.; Ball, K.; Crawford, D.; Abbott, G.R.; Salmon, J. Park improvements and park activity: a natural experiment. *Am. J. Prev. Med.* **2012**, *42*, 616–619. [[CrossRef](#)] [[PubMed](#)]
62. Roemmich, J.N.; Beeler, J.E.; Johnson, L. A microenvironment approach to reducing sedentary time and increasing physical activity of children and adults at a playground. *Prev. Med.* **2014**, *62*, 108–112. [[CrossRef](#)] [[PubMed](#)]
63. Dallimer, M.; Irvine, K.N.; Skinner, A.M.J.; Davies, Z.G.; Rouquette, J.R.; Maltby, L.L.; Warren, P.H.; Armsworth, P.R.; Gaston, K.J. Biodiversity and the feel-good factor: understanding associations between self-reported human well-being and species richness. *Bio. Science* **2012**, *62*, 47–55. [[CrossRef](#)]
64. Fuller, R.A.; Irvine, K.N.; Devine-Wright, P.; Warren, P.H.; Gaston, K.J. Psychological benefits of greenspace increase with biodiversity. *Biol. Lett.* **2007**, *3*, 390–394. [[CrossRef](#)] [[PubMed](#)]
65. Badland, H.; Knuiman, M.; Hooper, P.; Giles-Corti, B. Socio-ecological predictors of the uptake of cycling for recreation and transport in adults: Results from the RESIDE study. *Prev. Med.* **2013**, *57*, 396–399. [[CrossRef](#)]
66. Bauman, A.E.; Reis, R.S.; Sallis, J.F.; Wells, J.C.; Loos, R.J.F.; Martin, B.W. Correlates of physical activity: why are some people physically active and others not? *Lancet* **2012**, *380*, 258–270. [[CrossRef](#)]
67. Evenson, R.K.; Herring, A.H.; Huston, S.L. Evaluating change in physical activity with the building of a multi-use trail. *Am. J. Prev. Med.* **2005**, *28*, 177–185. [[CrossRef](#)]
68. Fraser, S.D.S.; Lock, K. Cycling for transport and public health: A systematic review of the effect of the environment on cycling. *Eur. J. Public Health* **2011**, *21*, 738–743. [[CrossRef](#)] [[PubMed](#)]
69. Giles-Corti, B.; Bull, F.; Knuiman, M.; McCormack, G.; Van Niel, K.; Timperio, A.; Christian, H.; Foster, S.; Divitini, M.; Middleton, N.; et al. The influence of urban design on neighbourhood walking following residential relocation: Longitudinal results from the RESIDE study. *Soc. Sci. Med.* **2013**, *77*, 20–30. [[CrossRef](#)] [[PubMed](#)]
70. Gomez-Feliciano, L.; McCreary, L.L.; Sadowsky, R.; Peterson, S.; Hernandez, A.; McElmurry, B.J.; Park, C.G. Active Living Logan Square: Joining together to create opportunities for physical activity. *Am. J. Prev. Med.* **2009**, *37*, S361–S367. [[CrossRef](#)] [[PubMed](#)]
71. Jia, Y.N.; Fu, H. Associations between perceived and observational physical environmental factors and the use of walking paths: a cross-sectional study. *BMC Public Health* **2014**, *14*, 11. [[CrossRef](#)]
72. Morris, J.; O'Brien, E. Encouraging healthy outdoor activity amongst under-represented groups: An evaluation of the Active England woodland projects. *Urban For. Urban Green.* **2011**, *10*, 323–333. [[CrossRef](#)]
73. Mosquera, J.; Parra, D.C.; Gomez, L.F.; Sarmiento, O.; Schmid, T.; Jacoby, E. An inside look at active transportation in Bogota: A qualitative study. *J. Phys. Act. Health* **2012**, *9*, 776–785. [[CrossRef](#)]
74. Sallis, J.E.; Certero, R.B.; Ascher, W.; Henderson, K.A.; Kraft, M.K.; Kerr, J. An ecological approach to creating active living communities. *Ann. Rev. Publ. Health* **2006**, *27*, 297–322. [[CrossRef](#)]
75. Shafer, C.S.; Bong Koo, L.; Turner, S. A tale of three greenway trails: User perceptions related to quality of life. *Landsc. Urban Plan.* **2000**, *49*, 163. [[CrossRef](#)]



76. Lindal, P.J.; Hartig, T. Effects of urban street vegetation on judgments of restoration likelihood. *Urban For. Urban Green.* **2015**, *14*, 200–209. [[CrossRef](#)]
77. Lovasi, G.S.; O’Neil-Dunne, J.P.M.; Lu, J.W.T.; Sheehan, D.; Perzanowski, M.S.; MacFaden, S.W.; King, K.L.; Matte, T.; Miller, R.L.; Hoepner, L.A.; et al. Urban tree canopy and asthma, wheeze, rhinitis, and allergic sensitization to tree pollen in a New York City birth cohort. *Environ. Health Perspect.* **2013**, *121*, 494–500. [[CrossRef](#)]
78. Kardan, O.; Gozdyra, P.; Mistic, B.; Moola, F.; Palmer, L.J.; Paus, T.; Berman, M.G. Neighborhood greenspace and health in a large urban center. *Sci. Rep.* **2015**, *5*. [[CrossRef](#)] [[PubMed](#)]
79. Okvat, H.A.; Zautra, A.J. Community gardening: A parsimonious path to individual, community, and environmental resilience. *Am. J. Community Psychol.* **2011**, *47*, 374–387. [[CrossRef](#)] [[PubMed](#)]
80. George, D.R. Harvesting the biopsychosocial benefits of community gardens. *Am. J. Public Health* **2013**, *103*, E6. [[CrossRef](#)] [[PubMed](#)]
81. Hatchett, L.; Brown, L.; Hopkins, J.; Larsen, K.; Fournier, E. “Something good can grow here”: Chicago urban agriculture food projects. *J. Prev. Interv. Community* **2015**, *43*, 2. [[CrossRef](#)] [[PubMed](#)]
82. Laaksoharju, T.; Rappe, E.; Kaivola, T. Garden affordances for social learning, play, and for building nature-child relationship. *Urban For. Urban Green.* **2012**, *11*, 195–203. [[CrossRef](#)]
83. Gonzalez, M.T.; Hartig, T.; Patil, G.G.; Martinsen, E.W.; Kirkevold, M. Therapeutic horticulture in clinical depression: A prospective study of active components. *J. Adv. Nurs.* **2010**, *66*, 2002–2013. [[CrossRef](#)]
84. Blair, D.; Giesecke, C.C.; Sherman, S. A dietary, social and economic evaluation of the Philadelphia urban gardening project. *J. Nutr. Educ.* **1991**, *23*, 161–167. [[CrossRef](#)]
85. Kingsley, J.; Townsend, M. ‘Dig in’ to social capital: Community gardens as mechanisms for growing urban social connectedness. *Urban Policy Res.* **2006**, *24*, 525–537. [[CrossRef](#)]
86. Kingsley, J.; Townsend, M.; Henderson-Wilson, C. Cultivating health and wellbeing: members’ perceptions of the health benefits of a Port Melbourne community garden. *Leis. Stud.* **2009**, *28*, 207–219. [[CrossRef](#)]
87. Fjørtoft, I.; Kristoffersen, B.; Sageie, J. Children in schoolyards: Tracking movement patterns and physical activity in schoolyards using global positioning system and heart rate monitoring. *Landsc. Urban Plan.* **2009**, *93*, 210–217.
88. Dymont, J.E.; Bell, A.C.; Lucas, A.J. The relationship between school ground design and intensity of physical activity. *Child. Geogr.* **2009**, *7*, 261–276. [[CrossRef](#)]
89. Dowdell, K.; Gray, T.; Malone, K. Nature and its influence on children’s outdoor play. *Aust. J. Outdoor Educ.* **2011**, *15*, 24–35. [[CrossRef](#)]
90. Dadvand, P.; Nieuwenhuijsen, M.J.; Esnaola, M.; Fornis, J.; Basagana, X.; Alvarez-Pedrerol, M.; Rivas, I.; Lopez-Vicente, M.; Pascual, M.D.; Su, J.; et al. Green spaces and cognitive development in primary schoolchildren. *Proc. Natl. Acad. Sci. USA* **2015**, *112*, 7937–7942. [[CrossRef](#)] [[PubMed](#)]
91. Cranney, L.; Phongsavan, P.; Kariuki, M.; Stride, V.; Scott, A.; Hua, M.; Bauman, A. Impact of an outdoor gym on park users’ physical activity: A natural experiment. *Health Place* **2016**, *37*, 26–34. [[CrossRef](#)]
92. Neville, L.; Scott, A. *The Impact of Outdoor Gyms on Park Use and Physical Activity*; NSW Government: Sydney, Australia, 2013.
93. Thompson, W.C.; Roe, J.; Aspinall, P. Woodland improvements in deprived urban communities: What impact do they have on people’s activities and quality of life? *Landsc. Urban Plan.* **2013**, *118*, 79–89. [[CrossRef](#)]
94. Owen, R. *An Evaluation of Cydcoed*; Forestry Commission Wales: Cardiff, UK, 2009.
95. Park, B.J.; Tsunetsugu, Y.; Ishii, H.; Furuhashi, S.; Hirano, H.; Kagawa, T.; Miyazaki, Y. Physiological effects of Shinrin-yoku (taking in the atmosphere of the forest) in a mixed forest in Shinano Town, Japan. *Scand. J. For. Res.* **2008**, *23*, 278–283. [[CrossRef](#)]
96. Tsunetsugu, Y.; Park, J.B.; Miyazaki, Y. Trends in research related to “Shinrin-yoku” (taking in the forest atmosphere of forest bathing) in Japan. *Environ. Health Prev. Med.* **2010**, *15*, 27–37. [[CrossRef](#)] [[PubMed](#)]
97. Patel, A.; Schofield, G.M.; Kolt, G.S.; Keogh, J.W.L. General practitioners’ views and experiences of counselling for physical activity through the New Zealand Green Prescription program. *BMC Fam. Pract.* **2011**, *12*, 8. [[CrossRef](#)] [[PubMed](#)]
98. Barton, J.; Pretty, J. What is the best dose of nature and green exercise for improving mental health? A multi-study analysis. *Environ. Sci. Technol.* **2010**, *44*, 3947–3955. [[CrossRef](#)] [[PubMed](#)]
99. Cimprich, B.; Ronis, D.L. An environmental intervention to restore attention in women with newly diagnosed breast cancer. *Cancer Nurs.* **2003**, *26*, 284–292. [[CrossRef](#)] [[PubMed](#)]

100. Mao, G.X.; Cao, Y.B.; Lan, X.G.; He, Z.H.; Chen, Z.M.; Wang, Y.Z.; Hu, X.L.; Lv, Y.D.; Wang, G.F.; Yan, J. Therapeutic effect of forest bathing on human hypertension in the elderly. *J. Cardiol.* **2012**, *60*, 495–502. [[CrossRef](#)] [[PubMed](#)]
101. Laumann, K.; Garling, T.; Stormark, K.M. Selective attention and heart rate responses to natural and urban environments. *J. Environ. Psychol.* **2003**, *23*, 125–134. [[CrossRef](#)]
102. Grinde, B.; Patil, G.G. Biophilia: Does visual contact with nature impact on health and well-being? *Int. J. Environ. Res. Public Health* **2009**, *6*, 2332–2343. [[CrossRef](#)] [[PubMed](#)]
103. The Appalachian Mountain Club. Appalachian Mountain Club and MassGeneral Hospital for Children Team Up with WGBH on Outdoors Rx Expansion. 2014. Available online: <http://www.outdoors.org/about/newsroom/press/2014/outdoorsrx-chelsea-revere.cfm> (accessed on 22 May 2015).
104. Marselle, M.R.; Warber, S.L.; Irvine, K.N. Growing resilience through interaction with nature: Can group walks in nature buffer the effects of stressful life events on mental health? *Int. J. Environ. Res. Public Health* **2019**, *16*, 986. [[CrossRef](#)] [[PubMed](#)]
105. Hine, R.; Peacock, J.; Pretty, J. Care farming in the UK: Contexts, benefits and links with therapeutic communities. *Int. J. Ther. Communities* **2008**, *29*, 245–260.
106. De Bruin, S.R.; Oosting, S.J.; Tobi, H.; Blauw, Y.H.; Schols, J.M.G.A.; De Groot, C.P.G.M. Day care at green care farms: a novel way to stimulate dietary intake of community-dwelling older people with dementia? *J. Nutr. Health Aging* **2010**, *14*, 352–357. [[CrossRef](#)]
107. Hine, R. Care farming: Bringing together agriculture and health. *ECOS A Rev. Conserv.* **2008**, *29*, 42–51.
108. Brown, K.H.; Jameton, A.L. Public Health Implications of Urban Agriculture. *J. Public Health Policy* **2000**, *21*, 30–39. [[CrossRef](#)]
109. Berget, B.; Braastad, B.O. Animal-assisted therapy with farm animals for persons with psychiatric disorders. *Annali Dell Istituto Superiore Di Sanita* **2011**, *47*, 384–390.
110. Haugan, L.; Nyland, R.; Fjeldavli, E.; Meistad, T.; Braastad, B.O. Green Care in Norway—Farms as a Resource for the educational, health and social sector. In *Farming for Health: Green-Care Farming Across Europe and the United States of America*; Hassink, J., VanDijk, M., Eds.; Springer: Berlin, Germany, 2006; Volume 13, pp. 109–126.
111. Annerstedt, M.; Wahrborg, P. Nature-assisted therapy: Systematic review of controlled and observational studies. *Scand. J. Public Health* **2011**, *39*, 371–388. [[CrossRef](#)]
112. Gonzalez, M.T.; Hartig, T.; Patil, G.G.; Martinsen, E.W.; Kirkevold, M. Therapeutic horticulture in clinical depression: A prospective study. *Res. Theory Nurs. Pract.* **2009**, *23*, 312–328. [[CrossRef](#)] [[PubMed](#)]
113. Kamioka, H.; Tsutani, K.; Yamada, M.; Park, H.; Okuizumi, H.; Honda, T.; Okada, S.; Park, S.J.; Kitayuguchi, J.; Abe, T.; et al. Effectiveness of horticultural therapy: A systematic review of randomized controlled trials. *Complement. Ther. Med.* **2014**, *22*, 930–943. [[CrossRef](#)] [[PubMed](#)]
114. Clatworthy, J.; Hinds, J.; Camic, P.M. Gardening as a mental health intervention: A review. *Ment. Health Rev. J.* **2013**, *18*, 214–225. [[CrossRef](#)]
115. Warber, S.L.; Ingerman, S.; Moura, V.L.; Wunder, J.; Northrop, A.; Gillespie, B.W.; Durda, K.; Smith, K.; Rhodes, K.S.; Rubenfire, M. Healing the heart: A randomized pilot study of a spiritual retreat for depression in acute coronary syndrome patients. *Explor. J. Sci. Heal.* **2011**, *7*, 222–233. [[CrossRef](#)] [[PubMed](#)]
116. Carter, C.; West, D. *Policy into Practice: Employment for Ex-Offenders—An Innovative Approach*; Forest Research: Farnham, UK, 2008.
117. South, N.; Brisman, A. *Routledge International Handbook of Green Criminology*; Routledge International Handbooks: Oxford, UK, 2013.
118. Morris, J.; Marzano, M.; Dandy, N.; O'Brien, L. *Lessons Learned from Interventions and Evaluations, in Forestry, Sustainable Behaviours and Behaviour Change: Interventions*; Forest Research: Bristol, UK, 2012; pp. 1–13.
119. Easley, T.A.; Passineau, J.F.; Driver, B.L. *The Use of Wilderness for Personal Growth, Therapy, and Education (USDA Forest Service General Technical Report RM-193)*; USDA Forest Service Rocky Mountain Forest and Range Experiment Station: Fort Collins, CO, USA, 1990.
120. Garg, R.; Couture, R.T.; Ogryzlo, T.; Schinke, R. Perceived psychosocial benefits associated with perceived restorative potential of wilderness river-rafting trips. *Psychol. Rep.* **2010**, *107*, 213–226. [[CrossRef](#)] [[PubMed](#)]
121. Stuhlmiller, C.M. Breaking down the stigma of mental illness through an adventure camp: A collaborative education initiative. *Aust. e-J. Adv. Ment. Health* **2003**, *2*, 1–9. [[CrossRef](#)]

122. Thomas, M. The potential unlimited programme: An outdoor experiential education and group work approach that facilitates adjustment to brain injury. *Brain Inj.* **2004**, *18*, 1271–1286. [[CrossRef](#)]
123. Pryor, A.; Carpenter, C.; Townsend, M. Outdoor Education and Bush Adventure Therapy: A Socio-ecological approach to Health and Wellbeing. *Aust. J. Outdoor Educ.* **2005**, *9*, 3–13. [[CrossRef](#)]
124. Levitt, L. What is the therapeutic value of camping for emotionally disturbed girls? *Women Ther.* **1994**, *15*, 129–137. [[CrossRef](#)]
125. Shanahan, L.; McAllister, L.; Curtin, M. Wilderness adventure therapy and cognitive rehabilitation: Joining forces for youth with TBI. *Brain Inj.* **2009**, *23*, 1054–1064. [[CrossRef](#)]
126. Drebing, C.E.; Cabot Willis, S.; Genet, B. Anxiety and the Outward Bound process. *J. Exp. Educ.* **1987**, *10*, 17–21. [[CrossRef](#)]
127. Warber, S.L.; DeHudy, A.A.; Bialko, M.F.; Marselle, M.R.; Irvine, K.N. Addressing (nature-deficit disorder): A mixed methods pilot study of young adults attending a wilderness camp. *Evid. Based Complement. Altern. Med.* **2015**, *2015*, 651827. [[CrossRef](#)] [[PubMed](#)]
128. Tzoulas, K.; Greening, K. Urban ecology and human health. In *Urban Ecology: Patterns, Processes, and Application*; Niemelä, J., Breuste, J.H., Guntenspergen, G., McIntyre, N.E., Elmqvist, T., James, P., Eds.; Oxford University Press: Oxford, UK, 2011; pp. 263–271.
129. Mind. *Ecotherapy: The Green Agenda for Mental Health*; Mind: London, UK, 2007.
130. Buzzell, L.; Chalquist, C. *Ecotherapy: Healing with Nature in Mind*; Sierra Club Books: San Francisco, CA, USA, 2009.
131. Chalquist, C. A look at the ecotherapy research evidence. *Ecophysiology* **2009**, *1*, 64–74. [[CrossRef](#)]
132. Cherniack, E.P.; Cherniack, A.R. The benefit of pets and animal-assisted therapy to the health of older individuals. *Curr. Gerontol. Geriatr. Res.* **2014**, *2014*, e623203. [[CrossRef](#)] [[PubMed](#)]
133. Richeson, N.E. Effects of animal-assisted therapy on agitated behaviours and social interactions of older adults with dementia. *Am. J. Alzheimers Dis. Other Dement.* **2003**, *18*, 353–358. [[CrossRef](#)] [[PubMed](#)]
134. Banks, M.R.; Banks, W.A. The effects of animal-assisted therapy on loneliness in an elderly population in long-term care facilities. *J. Gerontol. Ser. A Biol. Sci. Med. Sci.* **2002**, *57*, M428–M432. [[CrossRef](#)]
135. Lee, J.; Park, B.J.; Tsunetsugu, Y.; Ohira, T.; Kagawa, T.; Miyazaki, Y. Effect of forest bathing on physiological and psychological responses in young Japanese male subjects. *Public Health* **2011**, *125*, 93–100. [[CrossRef](#)]
136. Mao, G.X.; Lan, X.G.; Cao, Y.B.; Chen, Z.M.; He, Z.H.; Lv, Y.D.; Wang, Y.Z.; Hu, X.L.; Wang, G.F.; Yan, J. Effects of short-term forest bathing on human health in a broad-leaved evergreen forest in Zhejiang Province, China. *Biomed. Environ. Sci.* **2012**, *25*, 317–324.
137. Yerrell, P. *National Evaluation of BTCV's Green Gym*; School of Health and Social Care, Oxford Brookes University: Oxford, UK, 2008.
138. O'Brien, L.; Burls, A.; Townsend, M.; Ebdon, M. Volunteering in nature as a way of enabling people to re-integrate into society. *Perspect. Public Health* **2010**, *131*, 71–81. [[CrossRef](#)]
139. Birch, M. Cultivating wildness: Three conservation volunteers' experiences of participation in the Green Gym scheme. *Br. J. Occup. Ther.* **2005**, *68*, 244–252. [[CrossRef](#)]
140. O'Brien, L.; Townsend, M.; Ebdon, M. Doing something positive': Volunteers' experiences of the well-being benefits derived from practical conservation activities in nature. *Voluntas* **2010**, *21*, 525–545. [[CrossRef](#)]
141. Townsend, M. Feel blue? Touch green! Participation in forest/woodland management as a treatment for depression. *Urban For. Urban Green.* **2006**, *5*, 111–120. [[CrossRef](#)]
142. Blaschke, P. Health and wellbeing benefits of conservation in New Zealand. In *Science for Conservation*; New Zealand Department of Conservation: Wellington, New Zealand, 2013.
143. Cowie, C. *The Geographies of Community-Based Ecological Restoration Groups in the Wellington Region*; Victoria University: Wellington, New Zealand, 2010.
144. Pillemer, K.; Fuller-Rowell, T.E.; Reid, M.C.; Wells, N.M. Environmental volunteering and health outcomes over a 20-year period. *Gerontologist* **2010**, *50*, 594–602. [[CrossRef](#)] [[PubMed](#)]
145. ulz, A.J.; Israel, B.A.; Mentz, G.B.; Bernal, C.; Caver, D.; DeMajo, R.; Diaz, G.; Gamboa, C.; Gaines, C.; Hoston, B.; et al. Effectiveness of a Walking Group Intervention to Promote Physical Activity and Cardiovascular Health in Predominantly Non-Hispanic Black and Hispanic Urban Neighborhoods: Findings from the Walk Your Heart to Health Intervention. *Health Educ. Behav.* **2015**, *42*, 380–392.
146. Hanson, S.R.; Jones, A.P. Is there evidence that walking groups have health benefits? A systematic review and meta-analysis. *Br. J. Sports Med.* **2015**, *49*, 710–715. [[CrossRef](#)] [[PubMed](#)]

147. Mitchell, T.L.; Yakiwchuk, C.V.; Griffin, K.L.; Gray, R.E.; Fitch, M.I. Survivor dragon boating: A vehicle to reclaim and enhance life after treatment for breast cancer. *Health Care Women Int.* **2007**, *28*, 133. [[CrossRef](#)]
148. Lane, K.; Jespersen, D.; McKenzie, D.C. The effect of a whole body exercise pro-gramme and dragon boat training on arm volume and arm circumference in women treated for breast cancer. *Eur. J. Cancer Care* **2005**, *14*, 353. [[CrossRef](#)] [[PubMed](#)]
149. Marselle, M.R.; Irvine, K.N.; Warber, S.L. Examining group walks in nature and multiple aspects of well-being: A large-scale study. *Ecophysiology* **2014**, *6*, 134–147.
150. Hanson, S.J.; Guell, C.; Jones, A.P. Walking groups in socioeconomically deprived communities: A qualitative study using photo elicitation. *Health Place* **2016**, *39*, 26–33. [[CrossRef](#)] [[PubMed](#)]
151. Children & Nature Network and IUCN. *Children and Nature Worldwide: An Exploration of Children's Experiences of the Outdoors and Nature with Associated Risks and Benefits*; Children & Nature Network: Minneapolis, ME, USA, 2012.
152. Staempfli, M.B. Reintroducing adventure into children's outdoor play environments. *Environ. Behav.* **2008**, *41*, 268–280. [[CrossRef](#)]
153. Arbogast, K.L.; Kane, B.C.P.; Kirwan, J.L.; Hertel, B.R. Vegetation and outdoor recess time at elementary schools: What are the connections? *J. Environ. Psychol.* **2009**, *29*, 450–456. [[CrossRef](#)]
154. Donovan, T. Natural play areas for London children. *Child. Young People Now* **2008**, *2*, 2.
155. Herrington, S.; Studtmann, K. Landscape interventions: New directions for the design of children's outdoor play environments. *Landsc. Urban Plan.* **1998**, *42*, 191. [[CrossRef](#)]
156. Fjortoft, I. The natural environment as a playground for children: The impact of outdoor play activities in pre-primary school children. *Early Child. Educ. J.* **2001**, *29*, 111–117. [[CrossRef](#)]
157. Maller, C.J.; Townsend, M. Children's mental health & wellbeing and hands-on contact with nature: perceptions of principals and teachers. *Int. J. Learn.* **2006**, *12*, 359–372.
158. Kson, M.; Dillon, J.; Teamey, K.; Morris, M.; Young Choi, M.; Sanders, D.; Benefield, P. *A Review of Research on Outdoor Learning*; National Foundation for Educational Research: Slough, UK, 2004.
159. Eastwood, G.; Mitchell, H. *An Evaluation of the First Three Years of the Oxfordshire Forest School Project*; Oxfordshire County Council: Oxford, UK, 2003.
160. Murray, R. *Forest Schools Project Evaluation: A Study in Wales* London; New Economics Foundation: London, UK, 2004; pp. 1–68.
161. O'Brien, L. Learning outdoors: The Forest School approach. *Education* **2009**, *37*, 45–60. [[CrossRef](#)]
162. Block, K.; Gibbs, L.; Staiger, P.K.; Gold, L.; Johnson, B.; Macfarlane, S.; Long, C.; Townsend, M. Growing community: The Impact of the Stephanie Alexander Kitchen Garden Program on the social and learning environment in primary schools. *Health Educ. Behav.* **2012**, *39*, 419–432. [[CrossRef](#)] [[PubMed](#)]
163. Gibbs, L.; Staiger, P.K.; Johnson, B.; Block, K.; Macfarlane, S.; Gold, L.; Kulas, J.; Townsend, M.; Long, C.; Ukoumunne, O. Expanding children's food experiences: The impact of a school-based kitchen garden program. *J. Nutr. Educ. Behav.* **2013**, *45*, 137–146. [[CrossRef](#)]
164. Christian, M.S.; El Evans, C.; Nykjaer, C.; Hancock, N.; Cade, J.E. Evaluation of the impact of a school gardening intervention on children's fruit and vegetable intake: a randomised controlled trial. *Int. J. Nutr. Phys. Activ.* **2014**, *11*, 99. [[CrossRef](#)]
165. Davis, J.N.; Ventura, E.E.; Cook, L.T.; Gyllenhammer, L.E.; Gatto, N.M. LA Sprouts: A gardening, nutrition, and cooking intervention for Latino youth improves diet and reduces obesity. *J. Am. Diet. Assoc.* **2011**, *111*, 1224–1230. [[CrossRef](#)]
166. Gatto, N.M.; Martinez, L.C.; Spruijt-Metz, D.; Davis, J.N. LA sprouts randomized controlled nutrition and gardening program reduces obesity and metabolic risk in latino youth. *Obesity* **2015**, *23*, 1244–1251. [[CrossRef](#)] [[PubMed](#)]
167. Gatto, N.M.; Ventura, E.E.; Cook, L.T.; Gyllenhammer, L.E.; Davis, J.N. LA Sprouts: A garden-based nutrition intervention pilot program influences motivation and preferences for fruits and vegetables in Latino youth. *J. Acad. Nutr. Diet.* **2012**, *112*, 913–920. [[CrossRef](#)] [[PubMed](#)]
168. Hutchinson, J.; Christian, M.S.; Evans, C.E.L.; Nykjaer, C.; Hancock, N.; Cade, J.E. Evaluation of the impact of school gardening interventions on children's knowledge of and attitudes towards fruit and vegetables. A cluster randomised controlled trial. *Appetite* **2015**, *91*, 405–414. [[CrossRef](#)] [[PubMed](#)]

169. Keys, E.B.; Lindsey, P.; Bradley, L.K.; Werner, D.; Driscoll, E. Residential children's landscapes: Connecting with nature in the backyard. In *III International Conference on Landscape and Urban Horticulture, Nanjing, China, 29 June–3 July 2011*; Wuzhong, Z.Z., Groening, G., Drew, R.A., Eds.; International Society for Horticultural Science: Leuven, Belgium, 2013; pp. 81–87.
170. McAleese, J.D.; Rankin, L.L. Garden-based nutrition education affects fruit and vegetable consumption in sixth-grade adolescents. *J. Am. Diet. Assoc.* **2007**, *107*, 662–665. [[CrossRef](#)] [[PubMed](#)]
171. Wells, N.M.; Myers, B.M.; Henderson, C.R. School gardens and physical activity: A randomized controlled trial of low-income elementary schools. *Prev. Med.* **2014**, *69*, S27–S33. [[CrossRef](#)] [[PubMed](#)]
172. Mitchell, R.; Shaw, R. *Health Impacts of the John Muir Award*; University of Glasgow: Glasgow, Scotland, 2015.
173. De Kievit, J. *Healthy Parks, Healthy People—A Natural Link*; Parks and Leisure Australia: Melbourne, Australia, 2001; pp. 20–21.
174. Caddick, N.; Smith, B.; Phoenix, C. The effects of surfing and the natural environment on the well-being of combat veterans. *Qual. Health Res.* **2015**, *25*, 76–86. [[CrossRef](#)] [[PubMed](#)]
175. Frieden, T.R. A framework for public health action: The health impact pyramid. *Am. J. Public Health* **2010**, *100*, 590–595. [[CrossRef](#)] [[PubMed](#)]
176. Irvine, K.N.; Warber, S.L.; Devine-Wright, P.; Gaston, K.J. Understanding urban green space as a health resource: A qualitative comparison of visit motivation and derived effects among park users in Sheffield, UK. *Int. J. Environ. Res. Public Health* **2013**, *10*, 417–442. [[CrossRef](#)]
177. Davids, K.; Araujo, D.; Brymer, E. Designing affordances for physical activity: An ecological dynamics perspective. *Sports Med*, In press.
178. Pretty, J.; Barton, J.; Perves Bharucha, Z.; Bragg, R.; Pencheon, D.; Wood, C.; Depledge, M. Improving health and well-being independently of GDP: Dividends of greener and prosocial economies. *Int. J. Environ. Health Res.* **2015**, *11*, 1–26. [[CrossRef](#)]
179. Pikora, T.; Giles-Corti, B.; Bull, F.; Jamrozik, K.; Donovan, R. Developing a framework for assessment of the environmental determinants of walking and cycling. *Soc. Sci. Med.* **2003**, *56*, 1693–1703. [[CrossRef](#)]
180. Owen, N.; Humpel, N.; Leslie, E.; Bauman, A.; Sallis, J.F. Understanding environmental influences on walking—Review and research agenda. *Am. J. Prev. Med.* **2004**, *27*, 67–76. [[CrossRef](#)] [[PubMed](#)]
181. Richardson, E.A.; Pearce, J.; Mitchell, R.; Kingham, S. Role of physical activity in the relationship between urban green space and health. *Public Health* **2013**, *127*, 318–324. [[CrossRef](#)] [[PubMed](#)]
182. Lee, C.; Ory, M.G.; Yoon, J.; Forjuoh, S.N. Neighborhood walking among overweight and obese adults: Age variations in barriers and motivators. *J. Community Health* **2013**, *38*, 12–22. [[CrossRef](#)] [[PubMed](#)]
183. Timperio, A.; Giles-Corti, B.; Crawford, D.; Andrianopoulos, N.; Ball, K.; Salmon, J.; Hume, C. Features of public open spaces and physical activity among children: findings from the CLAN study. *Prev. Med.* **2008**, *47*, 514–518. [[CrossRef](#)] [[PubMed](#)]
184. Roemmich, J.N.; Epstein, L.H.; Raja, S.; Yin, L.; Robinson, J.; Winiewicz, D. Association of access to parks and recreational facilities with the physical activity of young children. *Prev. Med.* **2006**, *43*, 437–441. [[CrossRef](#)]
185. Astell-Burt, T.; Feng, X.; Kolt, G.S. Greener neighborhoods, slimmer people? Evidence from 246,920 Australians. *Int. J. Obes.* **2014**, *38*, 156–159. [[CrossRef](#)] [[PubMed](#)]
186. Iverson, L.R.; Cook, E.A. Urban forest cover of the Chicago region and its relation to household density and income. *Urban Ecosyst.* **2000**, *4*, 105–124. [[CrossRef](#)]
187. Shanahan, D.F.; Lin, B.B.; Gaston, K.; Bush, R.; Fuller, R.A. Socio-economic inequalities in access to nature on public and private lands: A case study from Brisbane, Australia. *Landsc. Urban Plan.* **2014**, *130*, 14–23. [[CrossRef](#)]
188. Landry, S.M.; Chakraborty, J. Street trees and equity: Evaluating the spatial distribution of an urban amenity. *Environ. Plan. A* **2009**, *41*, 2651–2670. [[CrossRef](#)]
189. Pham, T.-T.-H.; Apparicio, P.; Landry, S.; Seguin, A.-M.; Gagnon, M. Predictors of the distribution of street and backyard vegetation in Montreal, Canada. *Urban For. Urban Green.* **2013**, *12*, 18–27. [[CrossRef](#)]
190. Cohen, D.A.; Han, B.; Derosé, K.P.; Williamson, S.; Marsh, T.; Rudick, J.; McKenzie, T.L. Neighborhood poverty, park use, and park-based physical activity in a Southern California city. *Soc. Sci. Med.* **2012**, *75*, 2317–2325. [[CrossRef](#)] [[PubMed](#)]
191. Cohen, D.A.; Lapham, S.; Evenson, K.R.; Williamson, S.; Golinelli, D.; Ward, P.; Hillier, A.; McKenzie, T.L. Use of neighbourhood parks: Does socio-economic status matter? A four-city study. *Public Health* **2013**, *127*, 325–332. [[CrossRef](#)] [[PubMed](#)]

192. Cohen, D.A.; Marsh, T.; Williamson, S.; Derose, K.P.; Martinez, H.; Setodji, C.; McKenzie, T.L. Parks and physical activity: why are some parks used more than others? *Prev. Med.* **2010**, *50*, S9–S12. [[CrossRef](#)]
193. Seaman, P.J.; Jones, R.; Ellaway, A. It's not just about the park, it's about integration too: Why people choose to use or not use urban greenspaces. *Int. J. Behav. Nutr. Phys. Activ.* **2010**, *7*, 78. [[CrossRef](#)]
194. Carter, M.; Horwitz, P. Beyond proximity: The importance of green space useability to self-reported health. *Ecohealth* **2014**, *11*, 322–332. [[CrossRef](#)] [[PubMed](#)]
195. Van den Berg, A.E.; Jorgensen, A.; Wilson, E.R. Evaluating restoration in urban green spaces: Does setting type make a difference? *Landsc. Urban Plan.* **2014**, *127*, 173–181. [[CrossRef](#)]
196. Poulsen, D.V.; Stigsdotter, U.K.; Djernis, D.; Sidenius, U. 'Everything just seems much more right in nature': How veterans with post-traumatic stress disorder experience nature-based activities in a forest therapy garden. *Health Psychol. Open* **2016**, *3*, 2055102916637090. [[CrossRef](#)]
197. Lymeus, F.; Lindberg, P.; Hartig, T. Building mindfulness bottom-up: Meditation in natural settings supports open monitoring and attention restoration. *Conscious. Cognit.* **2018**, *59*, 40–56. [[CrossRef](#)]
198. Lymeus, F.; Lundgren, T.; Hartig, T. Attentional effort of beginning mindfulness training is offset with practice directed toward images of natural scenery. *Environ. Behav.* **2017**, *49*, 536–559. [[CrossRef](#)]



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