Gardening as a mental health intervention: A review

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Gardening as a mental health intervention: a review

Jane Clatworthy, Joe Hinds and Paul M. Camic

Abstract

Purpose – The number of gardening-based mental health interventions is increasing, yet when the literature was last reviewed in 2003, limited evidence of their effectiveness was identified. The purpose of this paper is to evaluate the current evidence-base for gardening-based mental health interventions and projects through examining their reported benefits and the quality of research in this field.

Design/methodology/approach – Studies evaluating the benefits of gardening-based interventions for adults experiencing mental health difficulties were identified through an electronic database search. Information on the content and theoretical foundations of the interventions, the identified benefits of the interventions and the study methodology was extracted and synthesised.

Findings – Ten papers published since 2003 met the inclusion criteria. All reported positive effects of gardening as a mental health intervention for service users, including reduced symptoms of depression and anxiety. Participants described a range of benefits across emotional, social, vocational, physical and spiritual domains. Overall the research was of a considerably higher quality than that reviewed in 2003, providing more convincing evidence in support of gardening-based interventions. However, none of the studies employed a randomised-controlled trial design.

Research limitations/implications – There is a need for further high-quality research in this field. It is important that adequate outcome measures are in place to evaluate existing gardening-based mental health interventions/projects effectively.

Originality/value – This paper provides an up-to-date critique of the evidence for gardening-based mental health interventions, highlighting their potential clinical value.

Keywords Ecotherapy, Gardening, Horticultural therapy, Therapeutic horticulture

Paper type Literature review

Introduction

Gardening has long been considered therapeutic for people experiencing mental health difficulties, with horticultural activities featuring in the early psychiatric institutions in Europe and the USA in the 1800s (Davis, 1998; Parr, 2007). In recent years, there has been renewed interest in gardening as a mental health intervention. A survey of projects registered with Thrive, a charity that promotes and supports the use of therapeutic horticulture, revealed that the number of UK horticultural projects for vulnerable people (including those experiencing mental health difficulties) has increased dramatically from 45 in the mid-1980s to over 900 (Sempik et al., 2005).

Increasing attention on therapeutic gardening reflects a broader current interest in the role of nature in enhancing health and wellbeing. Over the past five years, several reports have been published in the UK from different perspectives, each acknowledging the potential psychological benefits of exposure to natural environments (Mind, 2007; Greenspace Scotland, 2008; Faculty of Public Health, 2010). In their report entitled “Ecotherapy – the green agenda for mental health”, Mind (2007), a leading mental health charity, stated that “Ecotherapy should be recognised as a clinically valid treatment for mental distress” (p. 3). This charity has supported over 130 “green” mental health projects in the UK through the Ecominds funding stream.
Similar projects are being established world-wide and in recent years international organisations such as the Therapeutic Landscapes Network and Farming for Health have been established to connect stakeholders and share knowledge and experience.

Two dominant theories considered helpful in understanding the impact of gardening on mental health are attention restoration theory (Kaplan and Kaplan, 1989; Kaplan, 1995) and psycho-physiological stress reduction theory (Ulrich, 1983). Both are psycho-evolutionary theories, based on the biophilia hypothesis – the idea that humans have an innate need to affiliate with the natural environment within which they have evolved (Wilson, 1984). There is considerable evidence that people have a preference for and a predisposition to respond to natural stimuli (see Gullone, 2000, for a review). However, in recent history people have become increasingly removed from the natural environment. Indeed it is estimated that people typically spend 95-99 per cent of their time indoors (Chalquist, 2009). Both attention restoration theory and psycho-physiological stress reduction theory suggest that interaction with the natural environment can serve a restorative function but through different mechanisms.

Attention restoration theory is primarily concerned with cognitive functioning. Kaplan and Kaplan (1989) suggest that people have two types of attention: directed attention (requiring effort, e.g. when we problem solve) and fascination (non-goal oriented and effortless attention). They propose that directed attention is a limited resource that can be overloaded (causing stress) and that people need to use the alternative system – fascination – to restore it. Fascination is thought to be dominant in natural environments, such as gardens, where there are captivating stimuli to hold attention. In addition to providing opportunities for fascination, gardens often have three further qualities suggested to contribute to a restorative environment: being away (allowing a person to mentally and physically move to a different space), extent (providing a sense of being connected to a larger world) and compatibility (the ability of an environment to meet the needs and interests of the person) (Kaplan and Kaplan, 1989). There is extensive experimental evidence that natural environments that provide these conditions can help to restore attention (see Kaplan and Berman, 2010, for a review). This restorative quality of gardens may be particularly relevant to people experiencing mental health difficulties, as cognitive problems such as poor attention, memory and problem solving ability are commonly reported symptoms associated with mental distress (Adhemar, 2008).

While Kaplan’s model is concerned with the restorative effect of nature on cognitive functioning, Ulrich’s (1983) psycho-physiological stress reduction theory is primarily concerned with the effect of nature on emotional and physiological functioning. He suggests that we are predisposed to find (non-threatening) natural stimuli relaxing, and that exposure to these stimuli has an immediate impact on affect and triggers a parasympathetic nervous system response leading to feelings of enhanced wellbeing and relaxation. Again, there is considerable experimental evidence to support this theory. For example, using measures of affect and physiological functioning (e.g. heart rate, skin conductance), people recovered more quickly and completely from a stressful event (watching a distressing film) when viewing images of natural rather than urban environments (Ulrich et al., 1991).

The theories outlined above address mechanisms for how contact with natural environments may impact on immediate wellbeing. Gardening interventions, however, offer more than simply contact with nature. They are usually social interventions, providing opportunities for people to interact with others. They also enable people to engage in a meaningful activity, developing specific knowledge and skills. These social and occupational factors may play a key role in promoting a sense of belonging and enhancing social inclusion for people experiencing mental health difficulties (Diamant and Waterhouse, 2010). Gardening interventions also involve physical exercise, recognised as helpful in the treatment of common mental health difficulties (Dunn and Jewell, 2010). These interventions therefore have to the potential to impact on mental, physical and social wellbeing (Abraham et al., 2010). Holistic interventions such as gardening-based programmes therefore appear to fit within the ethos of the recovery model of mental health (Jacobson and Greenley, 2001).

There are also more psychotherapeutic aspects of gardening which may be particularly relevant for people experiencing mental health difficulties. For example, nature has been referred to as a co-therapist, helping people to work through their psychological difficulties (Berger and McLeod,
For people experiencing psychological distress, who may not feel able to meet the demands of the human world, sensory contact with the natural environment enables connection and communication on a simpler, safer level (Grahn et al., 2010; Adevi, 2012). This may in turn lead to opportunities to begin to confront personal difficulties. For example, Reif (1981) described how sex and death, two potentially threatening topics, are encountered frequently in the garden environment (e.g. through plant propagation and death) and that through this benign contact it may become easier to address the more complex areas of human sexuality and death.

The use of metaphor is considered a powerful clinical tool across treatment modalities (Kopp, 1995). Many clinicians using nature-based approaches to mental health intervention speak of the power of metaphor in the natural environment in helping people to move forward. For example, Linden and Grut (2002), who developed a gardening-based intervention for refugees and asylum seekers, state “Metaphor is at the heart of the work at the Natural Growth Project, and parallels are drawn between the cycle of the natural world, with its successes and failures, and the world of the refugee client” (p. 42). They write about the language used to describe plants and the obvious parallels with their clients’ lives (e.g. “being uprooted”, “putting out new shoots”).

A major review of the evidence for horticultural-based interventions was conducted in 2003 (Sempik et al., 2003). The review included both evaluations of horticultural therapy (i.e. where plants are used by a trained professional as a means of achieving clinical goals) and therapeutic horticulture (i.e. interventions designed to enhance wellbeing through the use of plants and horticulture). It also included both active (e.g. physical gardening) and passive interventions (e.g. observing flowers/plants). The review considered the evidence for the use of therapeutic horticulture for a variety of clinical groups, including people with dementia, children with mental health problems, people with learning disabilities, people undergoing physical rehabilitation and adults with mental health difficulties. Sempik et al. (2003) identified 12 studies evaluating horticulture-based interventions for adults with mental health difficulties. The literature broadly supported the view that gardening can be beneficial for this group, with perceived benefits including reduced symptoms (O’Reilly and Handforth, 1955; Spelfogel and Modrzakowski, 1980), improved social interaction/networks (Prema et al., 1986; Fieldhouse, 2003) and acquisition of skills (Vaccaro et al., 1992). However, many of the studies reviewed had major methodological limitations. For example, the outcomes reported were frequently based on the researchers’ observations, a potential source of bias. Indeed, none of the studies included objective, validated outcome measures to explore the impact of a gardening-based intervention. Furthermore, there were no controlled trials or even pre-post evaluations conducted.

Sempik et al. (2003) highlighted “the scant amount of “hard evidence” that exists in support of therapeutic horticulture” (p. 47), yet claimed that it would be unrealistic to expect controlled trials of horticultural therapy, given the cost and time commitment involved. It is arguable, however, that for horticultural-based interventions to be recognised as a serious, fundable intervention option for people experiencing mental health difficulties, there is a need to provide more convincing evidence, including controlled trials. Indeed, others have called for a more rigorous approach to evaluating gardening-based interventions (Frumkin, 2004; Reif, 2006) and a subsequent scoping exercise by Sempik (2007) revealed that such research was both feasible and considered necessary by key stakeholders.

A decade has passed since Sempik et al.’s (2003) review. During this time a systematic review of nature-assisted therapy has been published (Annerstedt and Wahrborg, 2011). However, this was a broad review, concerned with all types of nature-assisted therapy (e.g. wilderness therapy, adventure-based therapy) and a wide range of clinical populations (dementia, addiction, physical health difficulties, mental health). Furthermore it only included gardening-based interventions that involved a therapist (i.e. horticultural therapy rather than therapeutic horticulture). A need was therefore identified to evaluate the current evidence-base for gardening-based mental health interventions.

Methods
A critical review of relevant research published since Sempik et al.’s (2003) review was conducted. A critical review is a systematic literature review where the retrieved papers are
subjected to critical appraisal (e.g. Adams et al., 2011; Alexandratos et al., 2012; York and Wiseman, 2012).

Search strategy
Papers were identified through a search of online electronic databases using the text terms listed in Box 1. The search was restricted to papers published from 2003 onwards (following the publication of Sempik et al.’s review). The following databases were searched:

- Ovid Platform: PsycINFO
  - Medline
- ProQuest Platform: British Nursing Index
  - Applied Social Sciences Index and Abstracts
- EBSCO Host Platform: CINAHL
- Web of Knowledge: Web of Science

In order to identify any other material not captured by the database searches, reference lists of relevant papers were searched for potentially appropriate papers. Following inspection of the abstracts, papers that appeared to be relevant to this review were obtained in full and assessed in relation to the review selection criteria.

Selection criteria
Papers were selected for review if:
- they included an empirical evaluation of an intervention involving active horticulture (gardening);
- participants were adults experiencing functional mental health difficulties (i.e. non-organic);
- they were published in a peer-reviewed journal; and
- they were written in English.

Data extraction and analysis
All papers were read and evaluated, drawing on recognised appraisal criteria (Public Health Resource Unit, 2006). A data extraction form was developed to facilitate the process of reviewing the papers and synthesising the data. This was completed for each study meeting the selection criteria. Consideration was given to the types of intervention developed, the theoretical rationale for the interventions, the settings in which the interventions have been used, the study methodology and the benefits of the interventions for service users.

Box 1: Search terms (*Indicates truncation – i.e. all words with the initial root retrieved)

| Garden* OR Horticultur* | Intervention OR Project OR Therap* OR Group OR Program* | Psychiatr* OR Mental* OR Depress* OR Anxi* OR Psychosis OR Schizophren* OR Bipolar OR Trauma* |
Results and discussion

Overview of selected papers

The OVID search resulted in 156 references, 20 of which appeared relevant following examination of the abstracts. The ProQuest search resulted in 72 references, with 11 additional potential papers identified. The EBSCO Host CINAHL search resulted in 81 journal articles, with three further potential papers identified. The Web of Science search resulted in 111 journal articles, with six more potential papers identified. Full text versions of the 40 potentially relevant papers were obtained and reviewed against the review selection criteria. No additional papers were identified through the reference list search.

Ten papers met the inclusion criteria for the review (see Table I for an overview). Four of the papers were written by the same research team in Norway, based on the doctoral research of Marianne Gonzalez (Gonzalez et al., 2009, 2010, 2011a, b). Each paper presented different data and they are all therefore included in this review. The remaining interventions were based in the UK (Stepney and Davis, 2004; Parr, 2007; Parkinson et al., 2011), Finland (Rappe et al., 2008), Korea (Son et al., 2004) and Hong Kong (Kam and Siu, 2010). The authors came from a diverse range of occupational groups, including nursing, occupational therapy, social work, horticultural therapy and social geography.

Benefits of gardening-based mental health interventions

As shown in Table I, all studies reported beneficial effects of gardening-based interventions for people experiencing mental health difficulties. Benefits included significant reduction in symptoms of depression (Son et al., 2004; Stepney and Davis, 2004; Gonzalez et al., 2009, 2010, 2011a, b; Kam and Siu, 2010) and anxiety (Son et al., 2004; Stepney and Davis, 2004; Kam and Siu, 2010; Gonzalez et al., 2011b) and significant increase in attentional capacity (Rappe et al., 2008; Gonzalez et al., 2010) and self-esteem (Son et al., 2004). These quantitative findings were supported and extended by the results of qualitative analyses, which enabled a more in-depth exploration of the types of benefits perceived by clients. Key themes included emotional benefits such as reduced stress and improved mood (Rappe et al., 2008; Kam and Siu, 2010), social benefits such as the development of a social network and improved social skills (Kam and Siu, 2010; Gonzalez et al., 2011b), vocational benefits such as learning new skills and changing attitudes towards work (Stepney and Davis, 2004; Kam and Siu, 2010), physical benefits such as improved sleep and physical health (Rappe et al., 2008) and spiritual benefits such as feeling more connected to nature and fascinated by plants (Kam and Siu, 2010; Gonzalez et al., 2011a). Participants reported that they enjoyed being in the fresh air (Stepney and Davis, 2004; Rappe et al., 2008) and doing meaningful activity, where they felt productive and useful (Stepney and Davis, 2004; Parr, 2007; Rappe et al., 2008; Parkinson et al., 2011).

Two studies focused on the potential for gardening-based mental health projects to promote social inclusion (i.e. equal access for people with mental health difficulties to rights, resources and opportunities available in society) (Stepney and Davis, 2004; Parr, 2007). Projects were perceived to vary in their success on this front, largely depending on the extent to which they were connected to wider society (e.g. through provision of networking opportunities/working in spaces used by the broader community) and appropriate education and employment opportunities.

Parr (2007) also highlighted some of the challenges of gardening-based interventions (e.g. clients may struggle with the physical and social demands, the sun does not always shine, dilemmas surrounding payment/potential exploitation), notably absent in many of the papers reviewed.

Content and delivery of the interventions

The gardening-based interventions were conducted in a variety of settings, including on farms (Gonzalez et al., 2009, 2010, 2011a, b), community allotments (Parkinson et al., 2011; Parr, 2007; Rappe et al., 2008) and within hospitals/residential settings (Parkinson et al., 2011; Son et al., 2004). Some of the evaluations were of time-limited gardening programmes (Son et al., 2004; Gonzalez et al., 2009, 2010, 2011a, b; Kam and Siu, 2010), with the intervention durations...
<table>
<thead>
<tr>
<th>Study</th>
<th>Location</th>
<th>Type of gardening intervention</th>
<th>Sample size</th>
<th>Sample characteristics</th>
<th>Methodology</th>
<th>Main results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gonzalez et al. (2011a)</td>
<td>Norway</td>
<td>Farm-based horticultural intervention</td>
<td>46</td>
<td>Age range: 25-65 years</td>
<td>% female: 78</td>
<td>Significant reduction in depression maintained at 3-month follow-up. Positive feedback from clients.</td>
</tr>
<tr>
<td>Gonzalez et al. (2011b)</td>
<td>Norway</td>
<td>Farm-based horticultural intervention</td>
<td>46</td>
<td>Age range: 25-65 years</td>
<td>% female: 78</td>
<td>Significant reduction in depression, anxiety and stress – only the reduction in depression maintained at follow-up. Participants reported that the social aspects of the intervention were important. Participants said a wide range of factors supported engagement in the intervention. Significant increase in perceived attentional capacity.</td>
</tr>
<tr>
<td>Parkin et al. (2010)</td>
<td>UK</td>
<td>Variety of gardening-based interventions</td>
<td>50</td>
<td>Age range: 20s-70s</td>
<td>% female: 34</td>
<td>Participants said a wide range of factors supported their motivation to engage in the gardening project, including personal appeal and meaningfulness of the activity and social factors.</td>
</tr>
<tr>
<td>Gonzalez et al. (2009)</td>
<td>Norway</td>
<td>Farm-based horticultural intervention</td>
<td>28</td>
<td>Age range: 25-64 years</td>
<td>% female: 75</td>
<td>Significant reduction in depression scores, maintained at follow-up. Trend (p = 0.06) for increase in attentional capacity.</td>
</tr>
<tr>
<td>Kam and Su (2010)</td>
<td>Hong Kong, China</td>
<td>Horticultural programme as part of work skills training</td>
<td>24</td>
<td>Mean age: 44.3 years</td>
<td>% female: 29</td>
<td>Horticultural group experienced significantly greater reduction in depression and anxiety than control. No difference in wellbeing. Participants reported a range of perceived benefits.</td>
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<tr>
<td>Rapo et al. (2009)</td>
<td>Finland</td>
<td>Allotment-based project</td>
<td>5 &quot;clients&quot;, 5 support workers</td>
<td>Age range: 41-64 years</td>
<td>% female: 83</td>
<td>Significant reduction in depression scores, maintained until follow-up. Participants reported a range of perceived benefits.</td>
</tr>
<tr>
<td>Parr (2007)</td>
<td>UK</td>
<td>Horticultural programme</td>
<td>10</td>
<td>Age range: 32-50 years</td>
<td>% female: 10</td>
<td>Benefits including enhanced mood, sense of belonging, meaningful work. One project facilitated greater social inclusion than the other. Paper also highlighted challenges of the projects.</td>
</tr>
<tr>
<td>Stepney and Davis (2004)</td>
<td>UK</td>
<td>Intervention at a horticultural site</td>
<td>10</td>
<td>Age range: 32-50 years</td>
<td>% female: 10</td>
<td>Reduction in anxiety and depression. In interviews, all but one participant felt that their mental health had improved. Significant increase in self-esteem, interpersonal relationships and social behaviour and decrease in depression/anxiety.</td>
</tr>
</tbody>
</table>
ranging from ten hours over two weeks (Kam and Siu, 2010) to 72 hours over 12 weeks (Gonzalez et al., 2009, 2010, 2011a, b), while others were long-term ongoing gardening projects (Stepney and Davis, 2004; Parr, 2007; Rappe et al., 2008; Parkinson et al., 2011). Only two of the interventions appeared to meet a definition of horticultural therapy, involving trained professionals with clear clinical goals (Son et al., 2004; Kam and Siu, 2010). The remaining interventions had a greater emphasis on the horticultural experience rather than therapy and would be considered therapeutic horticulture. It was not always clear from the papers who facilitated the intervention groups, although some were facilitated by farmers (Gonzalez et al., 2009, 2010, 2011a, b) and others appeared to be more service-user led (Rappe et al., 2008).

Several of the studies provided very few details of the intervention, making them difficult to evaluate or replicate (Stepney and Davis, 2004; Parkinson et al., 2011).

**Theoretical perspectives**

Attention restoration theory was the most frequently reported theoretical influence, with the majority of the studies citing Kaplan and Kaplan (1989) or Kaplan (1995). Only Gonzalez et al. (2009, 2010), however, attempted to measure participants’ perceived attentional function and the degree to which the environment was perceived to be restorative. The other papers by Gonzalez drew on a different theoretical models, with one focusing on social models of depression and the potential role of group cohesiveness in mediating the impact of gardening on depression (Gonzalez et al., 2011b) and the other considering existential theories of depression, drawing on salutogenic orientation of coherence theory (Antonovsky, 1987), exploring whether the gardening intervention increased perceived meaningfulness (Gonzalez et al., 2011a).

The interventions did not always have a strong theoretical basis. Stepney and Davis’ (2004) intervention, for example, was instead driven by the political agenda regarding welfare to work.

**Study design**

Two of the studies conducted a controlled trial, where half of the participants received the horticultural intervention and half received treatment as usual (Son et al., 2004; Kam and Siu, 2010). While the inclusion of a control group in these studies is a positive development, the process of comparing a group receiving an intervention with a group receiving no intervention has been criticised, as it is likely that some form of additional attention and treatment will be more effective (regardless of its content) than the treatment as usual condition (Behar and Borkovec, 2003). Moreover, neither study randomised participants to the conditions, introducing the potential for bias.

None of the other studies included a control group, making it difficult to establish whether the changes that occurred following the gardening intervention would have occurred over time in the absence of the intervention. In an attempt to compensate for the lack of control group, Gonzalez et al. (2009, 2010, 2011a, b) collected baseline data at more than one time point (e.g. at recruitment and again before the start of the intervention) and demonstrated no significant change over this time (implying that symptoms were not simply going to decrease without intervention). They do not specify, however, the length of this period of time. Stepney and Davis (2004) used what they termed a “hypothetical control”, whereby a panel of clinicians made predictions about how they thought the participants would respond to the intervention based on “diagnostic information” and each participant’s actual response was then compared with this prediction. It was not clear whether the panel was independent from the research team. If not, there would have been the potential for bias.

**Selection of study participants**

Participants in most of the studies volunteered for the gardening interventions (e.g. they responded to newspaper adverts: Gonzalez et al., 2009, 2010, 2011a, b or posters: Parkinson et al., 2011). They are therefore likely to have had a particular interest in gardening and care should be taken not to generalise the benefits of such projects to all people experiencing mental health difficulties.
Many of the papers did not document the other forms of treatment that the participants were receiving. Exceptions were the studies conducted by Gonzalez et al. (2009, 2010, 2011a, b) where the vast majority of participants were also receiving medication and/or individual therapy. It is important to recognise that these gardening-based interventions appear to have been tested as an adjunct rather than alternative to mainstream treatment options.

Outcome measurement

In contrast to the studies reviewed by Sempik et al. (2003), most of the studies used questionnaires in an effort to get quantitative “hard data” on the effectiveness of the interventions. Two exceptions were Parr (2007) who used interviews within an ethnographic framework to attempt to understand the experiences of service users and staff and Parkinson et al. (2011) who collected quantitative data on services users’ motivation to engage with different tasks through structured interviews and observations.

The majority of the quantitative studies used appropriate validated measures to assess the outcomes of the intervention. The most commonly assessed outcome was depression which was assessed using the Beck Depression Inventory (Beck, 1967) in four studies (Gonzalez et al., 2009, 2010, 2011a, b), the Hospital Anxiety and Depression Scale (Zigmond and Snaith, 1983) in one study (Stepney and Davis, 2004), the Depression Anxiety Stress Scale (Lovibond and Lovibond, 1995) in one study (Kam and Siu, 2010) and the Korean version of the Symptom Checklist-90 Revised (Kim et al., 1984) in one study (Son et al., 2004).

Of the studies evaluating time-limited interventions, only those conducted by Gonzalez et al. (2009, 2010, 2011a, b) included a follow-up assessment to explore whether the beneficial effects of the intervention had been maintained. It is possible that the positive effects observed in the other studies would not have been maintained when the interventions came to an end. Indeed in Gonzalez’s studies, only scores on the Beck Depression Inventory (Beck, 1967) remained significantly lower than baseline scores by the three-month follow-up, and symptoms of depression still increased following the end of the intervention. At present there is therefore insufficient evidence that relatively brief gardening-based interventions can have long-term effects for people experiencing mental health difficulties.

Analysis

None of the studies included a power calculation. While the sample sizes of the studies reviewed were larger than those of the studies featured in Sempik et al.’s (2003) review, they were still relatively small (range n = 10-50) and it is likely that the quantitative studies would only have been powered to detect large effect sizes. While all of the studies conducting inferential statistics found a significant improvement in at least one outcome measure following the gardening intervention, most also reported some non-significant results. In these cases it was unclear whether there was truly no difference in the variable in question, or whether the study was simply not powered to detect the difference. This was particularly relevant in Gonzalez et al.’s (2009, 2010, 2011a, b) studies where they were keen to explore variables that could mediate the relationship between participating in the gardening intervention and reduction in depression (e.g. sense of cohesiveness, existential variables). In these instances they reported several non-significant results as “trends”. While it was encouraging that there had been some attempt to explore the active components of the intervention, this may have been over ambitious given the sample size. Difficulties with recruiting the desired number of participants for quantitative research are well recognised in this field (Sempik et al., 2005) and researchers may be left to test hypotheses with lower power than intended. These studies do, however, provide effect size information useful for conducting more accurate power calculations for future research.

Conclusions and future directions

There is now a substantial body of research demonstrating that gardening-based interventions can benefit people experiencing mental health difficulties. Such interventions have been evaluated in a variety of settings in Europe, Asia and America, and across a range of diagnostic groups, including participants experiencing depression and psychosis. Although there have
been no RCTs in this field, research drawing on a range of methodological approaches suggests that gardening-based interventions can have a variety of benefits for people with an interest in gardening, as an adjunct to existing treatment. Quantitative studies have found a significant reduction in symptoms of depression and anxiety following gardening-based interventions. Qualitative studies have provided insight into service users’ experiences of gardening-based interventions, with a range of potential benefits highlighted, including enhanced emotional wellbeing, improved social functioning, improved physical health and opportunities for vocational development. These findings have important clinical implications, as gardening-based interventions may have the potential to provide benefits across many of the domains that service users have identified as being important for recovery (Dickens et al., 2012). It should be noted, however, that there was wide variation in the types of gardening intervention evaluated (e.g. short term vs long term, qualified staff members vs volunteer/user led, horticultural therapy vs therapeutic horticulture) and further research should investigate the impact of such variables on outcomes. Furthermore, while participants appear to benefit while engaged in the interventions, there is currently insufficient evidence to suggest that benefits persist once short-term gardening-based interventions come to an end. Gardening-based mental health interventions may therefore be best conceptualised as a longer-term therapeutic option, that over time may help facilitate recovery and social inclusion among people experiencing mental health difficulties. Gardening-based interventions are likely to vary in their ability to support people in recovery, depending on the degree to which they help people to connect with wider society and meaningful social and vocational opportunities (Parr, 2007).

In terms of clinical recommendations, while in some settings it may be appropriate for clinical staff to consider setting up gardening projects (e.g. for inpatient units), there may also be projects in existence locally that clinicians could refer clients to. It is important that clinicians are informed about such initiatives and the evidence-base to support them, as they are in a prime position to connect people to these potentially valuable resources. There have also been calls for “green” interventions to be more formally built into the health and social care referral system (Hine et al., 2008), which would facilitate greater awareness of and access to gardening-based mental health interventions.

While there has been a marked improvement in the quality of the research since Sempik et al.’s (2003) review, there is still a need for well-designed, controlled trials to help establish causality (i.e. that the gardening-based intervention caused the improvement in mental health rather than the passage of time/some other factor). Furthermore, there is currently a lack of research exploring the active components of the interventions (i.e. what is it specifically about a gardening-based mental health intervention that makes it effective?). When conducting the literature search for this review, many papers did not meet the inclusion criteria because they simply described a gardening-based intervention without providing any empirical evaluation of its effectiveness. At this time when an unprecedented number of “green” interventions are being set up, it is of vital importance that they are appropriately evaluated in order to develop the existing evidence base.

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