

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/257143385>

# Gardening as a mental health intervention: A review

Article in *Mental Health Review Journal* · September 2013

DOI: 10.1108/MHRJ-02-2013-0007

---

CITATIONS

40

READS

4,379

3 authors, including:



[Paul M. Camic](#)

Canterbury Christ Church University

100 PUBLICATIONS 1,453 CITATIONS

[SEE PROFILE](#)

Some of the authors of this publication are also working on these related projects:



Viewing Art on a Tablet Computer: A Well-Being Intervention for People With Dementia and Their Caregivers [View project](#)



Museums on Prescription [View project](#)

# Gardening as a mental health intervention: a review

Jane Clatworthy, Joe Hinds and Paul M. Camic

Dr Jane Clatworthy is a Trainee Clinical Psychologist, based at Canterbury Christ Church University, Kent, UK.

Dr Joe Hinds is a Senior Lecturer in Psychology, based at Canterbury Christ Church University, Kent, UK.

Paul M. Camic is a Professor of Psychology and Public Health, based at Canterbury Christ Church University, Kent, UK.

## 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 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,

2006; Stigsdotter *et al.*, 2011). 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, Relf (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; Relf, 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)			
			Psychiatr*
			OR
		Intervention	Mental*
		OR	OR
		Project	Depress*
		OR	OR
Garden*	AND	Therap*	Anxi*
OR		OR	OR
Horticultur*		Group	Psychosis
		OR	OR
		Program*	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 1** An overview of the studies included in the review

Study	Location	Type of gardening intervention	Sample size	Sample characteristics	Methodology	Main results
Gonzalez <i>et al.</i> (2011a)	Norway	Farm-based horticultural intervention	46	Age range: 25-65 years % female: 78 Diagnosis: depression	Questionnaires – repeated measures	Significant reduction in depression, maintained at 3-month follow-up. No significant increase in existential outcome measure. Positive feedback from clients.
Gonzalez <i>et al.</i> (2011b)	Norway	Farm-based horticultural intervention	46	Age range: 25-65 years % female: 78 Diagnosis: depression	Questionnaires – repeated measures	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.
Parkinson <i>et al.</i> (2011)	UK	Variety of gardening-based interventions	50	Age range: 20s-70s % female: 34 Diagnosis: mixed	Interviews and observations	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. Significant reduction in depression and brooding and significant increase in perceived attentional capacity.
Gonzalez <i>et al.</i> (2010)	Norway	Farm-based horticultural intervention	28	Age range: 25-64 years % female: 75 Diagnosis: depression	Questionnaires – repeated measures	Horticultural group experienced significantly greater reduction in depression and anxiety than control. No difference in wellbeing/work behaviour. Interviews revealed a range of perceived benefits.
Kam and Siu (2010)	Hong Kong, China	Horticultural programme as part of work skills training	24	Mean age: 44.3 years % female: 29 Diagnosis: mixed	Controlled trial – questionnaire and interviews	Horticultural group experienced significantly greater reduction in depression and anxiety than control. No difference in wellbeing/work behaviour. Interviews revealed a range of perceived benefits.
Gonzalez <i>et al.</i> (2009)	Norway	Farm-based horticultural intervention	18	Age range: 27-65 years % female: 83 Diagnosis: depression	Questionnaires – repeated measures	Significant reduction in depression scores, maintained at follow-up. Trend ( $p = 0.06$ ) for increase in attentional capacity.
Rappe <i>et al.</i> (2008)	Finland	Allotment-based project	5 “clients” 5 support workers	Age range: 41-64 years % female: 90 Diagnosis: not stated	Questionnaires, diaries, photos	Participants said that they felt calmer/better able to concentrate after visiting the plot.
Parr (2007)	UK	Two gardening projects	15 “clients” 17 staff members	Age range: not stated % female: not stated Diagnosis: not stated	Interviews/ethnography	Benefits including enhanced mood, sense of belonging, meaningful work. One project facilitated greater social inclusion than the other.
Stepney and Davis (2004)	UK	Intervention at a horticultural site	10	Age range: 32-50 years % female: 10 Diagnosis: mixed	Mixed methods – quasi-experimental	Paper also highlighted challenges of the projects. Reduction in anxiety and depression. In interviews, all but one participant felt that their mental health had improved.
Son <i>et al.</i> (2004)	Korea	Horticultural therapy programme	50	Age range: not stated % female: not stated Diagnosis: schizophrenia	Controlled trial	Significant increase in self-esteem, interpersonal relationships and social behaviour and decrease in depression/anxiety only in intervention group.

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 on-going 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.

## References

- Abraham, A., Sommerhalder, K. and Abel, T. (2010), "Landscape and wellbeing: a scoping study on the health-promoting impact of outdoor environments", *International Journal of Public Health*, Vol. 55 No. 1, pp. 59-69.
- Adams, K.B., Leibbrandt, S. and Moon, H. (2011), "A critical review of the literature on social and leisure activity and wellbeing in later life", *Ageing and Society*, Vol. 31 No. 4, pp. 683-712.
- Adevi, A. (2012), "Supportive nature and stress: wellbeing in connection to our inner and outer landscape", Doctoral thesis, Swedish University of Agricultural Sciences, Alnarp.
- Adhemar, A. (2008), "Nature as clinical psychological intervention: evidence, applications and implications", Msc thesis, University of Aarhus, Aarhus.
- Alexandratos, K., Barnett, F. and Thomas, Y. (2012), "The impact of exercise on the mental health and quality of life of people with severe mental illness: a critical review", *British Journal of Occupational Therapy*, Vol. 75 No. 2, pp. 48-60.

- Annerstedt, M. and Wahrborg, P. (2011), "Nature-assisted therapy: systematic review of controlled and observational studies", *Scandinavian Journal of Public Health*, Vol. 39 No. 4, pp. 371-88.
- Antonovsky, A. (1987), *Unravelling the Mystery of Health: How People Manage Stress and Stay Well*, Jossey-Bass, San Francisco, CA.
- Beck, A.T. (1967), *Depression: Clinical Experimental and Theoretical Aspects*, Harper and Row, New York, NY.
- Behar, E. and Borkovec, T.D. (2003), "Psychotherapy outcome research", in Weiner, I.B. (Ed.), *Handbook of Psychology*, John Wiley, Hoboken, NJ, pp. 213-26.
- Berger, R. and McLeod, J. (2006), "Incorporating nature into therapy: a framework for practice", *Journal of Systemic Therapies*, Vol. 25 No. 2, pp. 80-94.
- Chalquist, C. (2009), "A look at the ecotherapy research evidence", *Ecopsychology*, Vol. 1 No. 2, pp. 64-74.
- Davis, S. (1998), "Development of the profession of horticultural therapy", in Simpson, S.P. and Strauss, M.C. (Eds), *Horticulture as Therapy*, Haworth Press, Binghamton, NY, pp. 3-20.
- Diamant, E. and Waterhouse, A. (2010), "Gardening and belonging: reflections on how social and therapeutic horticulture may facilitate health, wellbeing and inclusion", *British Journal of Occupational Therapy*, Vol. 73 No. 2, pp. 84-8.
- Dickens, G., Weleminksky, J., Onifade, Y. and Sugarman, P. (2012), "Recovery star: validating user recovery", *The Psychiatrist*, Vol. 36 No. 2, pp. 45-50.
- Dunn, A.L. and Jewell, J.S. (2010), "The effect of exercise on mental health", *Current Sports Medicine Reports*, Vol. 9 No. 4, pp. 202-7.
- Faculty of Public Health (2010), *Great Outdoors: How Our Natural Health Service Uses Green Space to Improve Wellbeing. An Action Report*, Faculty of Public Health in association with Natural England, London.
- Fieldhouse, J. (2003), "The impact of an allotment group on mental health clients' health, wellbeing and social networking", *British Journal of Occupational Therapy*, Vol. 66 No. 7, pp. 286-96.
- Frumkin, H. (2004), "White coats, green plants: clinical epidemiology meets horticulture", *Acta Horticulturae*, Vol. 639, pp. 15-25.
- Gonzalez, M.T., Hartig, T., Patil, G.G., Martinsen, E.W. and Kirkevold, M. (2009), "Therapeutic horticulture in clinical depression: a prospective study", *Research and Theory for Nursing Practice: An International Journal*, Vol. 23 No. 4, pp. 312-28.
- Gonzalez, M.T., Hartig, T., Patil, G.G., Martinsen, E.W. and Kirkevold, M. (2010), "Therapeutic horticulture in clinical depression: a prospective study of active components", *Journal of Advanced Nursing*, Vol. 66 No. 9, pp. 2002-13.
- Gonzalez, M.T., Hartig, T., Patil, G.G., Martinsen, E.W. and Kirkevold, M. (2011a), "A prospective study of existential issues in therapeutic horticulture for clinical depression", *Issues in Mental Health Nursing*, Vol. 32 No. 1, pp. 73-81.
- Gonzalez, M.T., Hartig, T., Patil, G.G., Martinsen, E.W. and Kirkevold, M. (2011b), "A prospective study of group cohesiveness in therapeutic horticulture for clinical depression", *International Journal of Mental Health Nursing*, Vol. 20 No. 2, pp. 119-29.
- Grahn, P., Tengart Ivarsson, C., Stigsdotter, U.K. and Bengtsson, I.L. (2010), "Using affordances as a health-promoting tool in a therapeutic garden", in Ward-Thompson, C., Bell, S. and Aspinall, P. (Eds), *Innovative Approaches to Researching Landscape and Health*, Taylor & Francis, London, pp. 120-59.
- Greenspace Scotland (2008), *Greenspace and Quality of Life: A Critical Literature Review*, Greenspace Scotland, Stirling.
- Gullone, E. (2000), "The biophilia hypothesis and life in the 21st century: increasing mental health or increasing pathology?", *Journal of Happiness Studies*, Vol. 1 No. 3, pp. 293-321.
- Hine, R., Peacock, J. and Pretty, J. (2008), "Working the land", *Mental Health Today*, June, pp. 23-6.
- Jacobson, N. and Greenley, D. (2001), "What is recovery? A conceptual model and explication", *Psychiatric Services*, Vol. 52 No. 4, pp. 482-5.
- Kam, M.C. and Siu, A.M. (2010), "Evaluation of a horticultural activity programme for persons with psychiatric illness", *Hong Kong Journal of Occupational Therapy*, Vol. 20 No. 2, pp. 80-6.

- Kaplan, S. (1995), "The restorative benefits of nature: toward an integrative framework", *Journal of Environmental Psychology*, Vol. 15 No. 3, pp. 169-82.
- Kaplan, R. and Kaplan, S. (1989), *The Experience of Nature: A Psychological Perspective*, Cambridge University Press, New York, NY.
- Kaplan, S. and Berman, M.G. (2010), "Directed attention as a common resource for executive functioning and self-regulation", *Perspectives on Psychological Science*, Vol. 5 No. 1, pp. 43-57.
- Kim, K.I., Kim, J.H. and Won, H.T. (1984), *Korean Manual of Symptom Checklist-90 Revision*, Joongang Press, Seoul.
- Kopp, R. (1995), *Metaphor Therapy: Using Client Generated Metaphors in Psychotherapy*, Brunner/Mazel, New York, NY.
- Linden, S. and Grut, J. (2002), *The Healing Fields: Working with Psychotherapy and Nature to Rebuild Shattered Lives*, Frances Lincoln Limited, London.
- Lovibond, S.H. and Lovibond, P.F. (1995), *Manual for the Depression Anxiety Stress Scales*, Psychological Foundation, Sydney.
- Mind (2007), *Ecotherapy: The Green Agenda for Mental Health*, Mind, London.
- O'Reilly, P.O. and Handforth, J.R. (1955), "Occupational therapy with refractory patients", *American Journal of Psychiatry*, Vol. 111 No. 10, pp. 763-6.
- Parkinson, S., Lowe, C. and Vecsey, T. (2011), "The therapeutic benefits of horticulture in a mental health service", *The British Journal of Occupational Therapy*, Vol. 74 No. 11, pp. 525-34.
- Parr, H. (2007), "Mental health, nature work, and social inclusion", *Environment and Planning D-Society & Space*, Vol. 25 No. 3, pp. 537-61.
- Prema, T.P., Devarajaiah, C. and Gopinath, P.S. (1986), "Horticulture therapy: an attempt at Indianisation of psychiatric nursing", *Nursing Journal of India*, Vol. 77 No. 6, pp. 154-6.
- Public Health Resource Unit (2006), "The critical skills appraisal programme: making sense of evidence", available at: [www.casp-uk.net/](http://www.casp-uk.net/) (accessed 15 October 2013).
- Rappe, E., Koivunen, T. and Korpela, E. (2008), "Group gardening in mental outpatient care", *Therapeutic Communities*, Vol. 29 No. 3, pp. 273-84.
- Relf, D. (1981), "Dynamics of horticultural therapy", *Rehabilitation Literature*, Vol. 42 Nos 5-6, pp. 147-50.
- Relf, D. (2006), "Theoretical models for research and program development in agriculture and health care: avoiding random acts of research", in Hassink, J. and van Dijk, M. (Eds), *Farming for Health: Green-Care Farming Across Europe and the United States of America*, Springer, Netherlands, pp. 1-20.
- Sempik, J. (2007), *Researching Social and Therapeutic Horticulture for People with Mental Ill Health: A Study of Methodology*, Thrive and Loughborough Centre for Child and Family Research, Reading.
- Sempik, J., Aldridge, J. and Becker, S. (2003), *Social and Therapeutic Horticulture: Evidence and Messages from Research*, Thrive in association with the Centre for Child and Family Research, Loughborough University, Reading.
- Sempik, J., Aldridge, J. and Becker, S. (2005), *Health, Well-being and Social Inclusion: Therapeutic Horticulture in the UK*, The Policy Press in association with Thrive, Bristol.
- Son, K.C., Um, S.J., Kim, S.Y. and Song, J.E. (2004), "Effect of horticultural therapy on the changes of self-esteem and sociality of individuals with chronic schizophrenia", *Acta Horticulturae*, Vol. 639, pp. 185-91.
- Spelfogel, B. and Modrzakowski, M. (1980), "Curative factors in horticultural therapy in a hospital setting", *Hospital and Community Psychiatry*, Vol. 31 No. 8, pp. 572-3.
- Stepney, P. and Davis, P. (2004), "Mental health, social inclusion and the green agenda: an evaluation of a land based rehabilitation project designed to promote occupational access and inclusion of service users in North Somerset, UK", *Social Work in Health Care*, Vol. 39 Nos 3-4, pp. 375-97.
- Stigsdotter, U.K., Palsdottir, A.M., Burls, A., Chermaz, A., Ferrini, F. and Grahn, P. (2011), "Nature-based therapeutic interventions", in Nilsson, K. and Sangster, M. (Eds), *Forests, Trees and Human Health*, Springer Verlag, New York, pp. 309-42.

Ulrich, R.S. (1983), "Aesthetic and affective response to natural environment", in Altman, I. and Wohlwill, J.F. (Eds), *Human Behaviour and Environment: Behaviour and the Natural Environment*, Plenum Press, New York, NY, pp. 85-125.

Ulrich, R.S., Simons, R.F., Losito, B.D., Fiorito, E., Miles, M.A. and Zelson, M. (1991), "Stress recovery during exposure to natural and urban environments", *Journal of Environmental Psychology*, Vol. 11 No. 3, pp. 201-30.

Vaccaro, J.V., Cousino, I. and Vatcher, R. (1992), *The Growth of Supported Employment from Horticulture Therapy in the Veterans' Garden*, Jossey-Bass, San Francisco, CA.

Wilson, E.O. (1984), *Biophilia*, Harvard University Press, Cambridge, MA.

York, M. and Wiseman, T. (2012), "Gardening as an occupation: a critical review", *British Journal of Occupational Therapy*, Vol. 75 No. 2, pp. 76-84.

Zigmond, A.S. and Snaith, R.P. (1983), "The hospital anxiety and depression scale", *Acta Psychiatrica Scandinavica*, Vol. 67 No. 6, pp. 361-70.

### About the authors

Dr Jane Clatworthy is a Clinical Psychologist working at Grow2Grow, a social enterprise for disadvantaged young people based at Commonwork in Kent. This work was completed as part of her Doctoral Training in Clinical Psychology at Canterbury Christ Church University. Dr Jane Clatworthy is the corresponding author and can be contacted at: [janec@commonwork.org](mailto:janec@commonwork.org)

Dr Joe Hinds is a Senior Lecturer in Psychology in the Department of Psychology, Politics & Sociology at Canterbury Christ Church University.

Paul M. Camic, PhD, is a Professor of Psychology and Public Health at the Canterbury Christ Church University and Research Director in the Department of Applied Psychology. He is also a Consultant Clinical Health Psychologist and Fellow of the Royal Society for Public Health.

---

To purchase reprints of this article please e-mail: [reprints@emeraldinsight.com](mailto:reprints@emeraldinsight.com)  
Or visit our web site for further details: [www.emeraldinsight.com/reprints](http://www.emeraldinsight.com/reprints)