Published in final edited form as:

J Am Psychiatr Nurses Assoc. 2018 ; 24(3): 199–208. doi:10.1177/1078390317723710.

Green Care as Psychosocial Intervention for Depressive Symptoms: What Might Be the Key Ingredients?

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Abstract

Background—Green care is an umbrella term for psychosocial interventions that integrate biotic and abiotic elements of nature to promote an individual's health and well-being. Green care decreases depressive symptoms but the parts of the interventions that lead to this effect are unknown.

Objectives—Review of literature to evaluate perceived social support, behavioral activation, and self-efficacy as key ingredients to decrease depressive symptoms in psychosocial interventions and extrapolate those mediators, or key ingredients, to green care.

Design—A literature search of three databases was conducted to find relevant studies examining a psychosocial intervention for adults, the mediator of interest, and depressive symptoms.

Results—Evidence supports behavioral activation, social support, and self-efficacy as mediators of psychosocial interventions to improve depressive symptoms.

Conclusions—Green care offers a portal for individuals with different depressive symptoms and severities to be treated alongside each other while receiving targeted interventions to meet the needs of each individual participant. Additionally, it offers the opportunity for psychiatric nurses to concurrently target all three active key ingredients.

Keywords

psychosocial intervention; depressive symptoms; green care

Introduction

Over 300 million people suffer from depression, making it the leading cause of disability worldwide according to the World Health Organization (2015). Depression, a diagnosis defined using standardized criteria (American Psychiatric Association, 2013; World Health

Organization, 1992), has significant negative outcomes for individuals and society including increased mortality by suicide, increased risk of other chronic illness and worse outcomes from those illnesses, and high direct and indirect costs (Goldberg & Steury, 2001; Schwenk et al., 2014). Depression is under-diagnosed, under-treated, and recurs in at least 50 percent of patients following treatment (Schwenk et al., 2014). Depressive symptoms are even more common, with a lifetime prevalence of 24%, and are a major risk factor for the development of a major depressive episode (Horwath, Johnson, Klerman, & Weissman, 1992).

The reasons for the under-diagnosis, under-treatment, and recurrence of depression and depressive symptoms are numerous. Many people delay seeking treatment for depressive symptoms which results in their symptoms remaining untreated (Thompson, Hunt, & Issakidis, 2004). When individuals do seek help, they may encounter barriers to care including limited availability or inability to afford treatment (Dockery et al., 2015). Finally, treatments are frequently ineffective and fail to decrease symptoms by a clinically significant margin (McPherson et al., 2005).

Researchers and clinicians need to consider treatments that fit into people's lives, are low cost, have fewer or more acceptable side effects, and can be initiated earlier. These factors may improve function and well-being, and prevent depressive symptoms from progressing to a depressive disorder. Green care fits those requirements. Green care is an umbrella term for interventions that integrate natural elements that are biotic (animals, plants, or microbes) and abiotic (sunlight, temperature) to promote an individual's health and well-being (Haubenhofer, Elings, Hassink, & Hine, 2010). Table 1 defines some common examples of green care intervention (Sempik, Hine, & Wilcox, 2010).

Many green care interventions vary significantly from traditional psychotherapeutic approaches in terms of their settings and format, offering greater access and lower cost. Florence Nightingale supported the importance of exposure to fresh air and sunshine for physical and mental healing in patients (Nightingale, 1860). This early recommendation by Nightingale has contributed to key conceptualizations in nursing including the metaparadigm of environment (Fawcett, 1984) and the focus on holistic care (Frisch, 2001). Green care interventions have been used for centuries, with western communities formally establishing care farms for mental health beginning in the early 1800s (Goldstein & Godemont, 2003; Neuberger et al., 2006; Smith & Beitzel, 2014). Modern qualitative research shows that patients seeking green care do not feel as stigmatized in this type of therapeutic environment (Iancu, 2013). Additionally, green care interventions can often be offered in a group therapy format, which can be tailored to individual needs while providing social benefits (Sempik et al., 2010).

Research provides support for the beneficial effects of green care on physiological parameters. Multiple experiments have linked viewing natural scenes with positive health benefits such as decreased heart rate, blood pressure, and pain (Diette, Lechtzin, Haponik, Devrotes, & Rubin, 2003; Hartig, Evans, Jamner, Davis, & Gärling, 2003; Ulrich, Simons, & Miles, 2003). A variety of green care therapies – such as green exercise therapy (MIND, 2007; Peacock, Hine, & Pretty, 2007), equine therapy (McGibbon, Benda, Duncan, & Silkwood-Sherer, 2009), and care farming (Hassink, Elings, Zweekhorst, van den

Nieuwenhuizen, & Smit, 2010)– offer the benefit of physical exertion, which can be matched to a patient’s ability and emotional needs. Because green care often involves being outside, another benefit is the exposure of patients to natural sunlight, which is associated with improved depressive symptoms (Knippenberg et al., 2014).

In light of this research, green care therapies may offer substantial benefits as a mental health treatment for depressive symptoms. The Institute of Medicine (2015), now the National Academy of Sciences (NAS), has highlighted a need for researchers to identify the key elements of psychosocial intervention in order to improve the effectiveness of mental health treatment. The NAS defines psychosocial intervention as “interpersonal or informational activities, techniques, or strategies that target biological, behavioral, cognitive, emotional, social, or environmental factors with the aim of improving health functioning and well-being” (Institute of Medicine, 2015, p. 1–2). In the NAS call to action, researchers have been asked to identify the causal mechanisms that underlie the effects of psychosocial intervention on depressive symptom improvement.

Green care interventions fit within the NAS definition of psychosocial interventions; however, due to the complex nature of green care, the use of randomized control trials (RCTs) to examine the efficacy and mechanisms of green care interventions can be challenging (Sempik et al., 2010). Some green care researchers have even argued that RCTs are not always the most appropriate methodology to use, given that green care interventions and participants can be highly diverse (Sempik et al., 2010). As a consequence, a limited number of RCTs have tested green care interventions, and those studies that do exist have not included mediation analysis to uncover the mechanisms that underlie effects on symptom outcomes. An alternative approach is to examine variables that have been shown to be key elements, or mediators, of other types of psychosocial interventions on depressive symptoms. This approach might shed light on the mechanisms that underlie the effects of green care interventions on depressive symptoms.

Prior research has suggested that self-efficacy (Maciejewski, Prigerson, & Mazure, 2000), social support (Frasure-Smith et al., 2000; Kobeissi et al., 2012; Mohr, Classen, & Barrera, 2004), and behavioral activation (Cuijpers, van Straten, & Warmerdam, 2007; Dichter, Felder, & Smoski, 2010) may be related to the effects of psychosocial interventions on depressive symptoms. These mediators may also be key elements in the beneficial effects of green care therapies (Sempik et al., 2010). In Table 1, the authors extend the definitions of types of green care interventions by specifying aspects that could increase self-efficacy, social support or behavioral activation. While theoretical arguments could be made for the importance of each concept as a mediator, a search of PubMed revealed no prior systematic reviews that consolidate the findings on these three concepts as key elements of interventions for depressive symptoms. In order to support the premise that key elements in green care can be used to treat depressive symptoms, this paper will systematically review current literature to determine the extent to which self-efficacy, social support, and behavioral activation have been shown to mediate the effects of psychosocial interventions on depressive symptoms.

Methods

The authors followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to review studies testing an intervention that analyzed the mediating factors of psychosocial interventions for depressive symptoms. Potential mediators of interest were chosen under the advice of a researcher experienced in depressive symptoms; the mediators were supported by reviews addressing the substantial roles of self-efficacy (Blazer, 2002), social support (Santini, Koyanagi, Tyrovolas, Mason, & Haro, 2015), and behavioral activation (Dimidjian, Barrera, Martell, Noz, & Lewinsohn, 2011) in depressive symptoms as well as from green care literature (Sempik et al., 2010). Search strings for three databases (CINAHL, PubMed, and PsycINFO) were developed with the assistance of a librarian. See Table 2 for the string used for the PubMed search; the CINAHL and PsycINFO strings were similar.

Articles were independently screened by the first and second author for inclusion. To be included in the review, studies had to assess the effects of a psychosocial intervention on both depressive symptoms and on one of the following potential mechanisms: social support, self-efficacy, or behavioral activation outcomes. Articles that did not use an adult aged sample were excluded from the review. Additionally, articles were limited to the English language. No time range was required for inclusion and the date of last search for all databases was July 27, 2016.

An extraction tool was adapted by the first author from the tool of a published synthesis project (Knafl et al., 2012) and completed for each article. The extracted variables were basic information on the study such as design, sample characteristics, intervention characteristics, findings, and background information. Extracted data for each study were entered into a spreadsheet that included all of the eligible studies and then coded for relevant findings.

Results

Selection Process

The flow of studies into the review is summarized in Figure 1. The database searches identified 159 unique articles. The first and second author completed separate reviews of the 159 articles and resolved any differences through discussion, excluding 139 articles based on title and abstract. Then, the remaining 20 abstracts were reviewed and screened again by the authors, excluding another 8 articles after discussion and agreement. Upon full text review, six articles were excluded for the following reasons: five did not analyze the mediator of interest's effect on depressive symptoms and one did not measure depressive symptoms after the intervention was completed. Two additional articles that were known to the primary author that fit the requirements for inclusion were added at this stage. After screening and exclusions, eight articles were included in the synthesis.

Study Characteristics

Table 3 summarizes the descriptive data of each study reviewed. At least one study addressed each potential mediator of interest. Two studies addressed the mediator of

behavioral activation, two addressed social support, and four addressed self-efficacy. The studies were completed in a variety of Western countries: four in the United States, one in Australia, one in Spain, one in Germany, and one in England. Studies ranged in sample size from 23 subjects to 1004 subjects. A range of interventions were performed across the studies. Of the eight studies included in the review, four interventions included Cognitive Behavioral Therapy, one was an unspecified combination of individual, family, and group psychotherapy, one was Mantram Repetition Therapy, one utilized Behavioral Activation therapy, and one was purely based on individual physical activity. The duration of each intervention also varied, ranging from six weeks in one study (Oman & Bormann, 2015) to one year (Roth, Mittelman, Clay, Madan, & Haley, 2005).

Review of Findings

There is evidence to support behavioral activation, social support, and self-efficacy as mediators of improved depressive symptoms following intervention. It is important to note that not all studies utilized the same type of mediation analyses to reach their results. The findings are summarized in Table 4.

Behavioral activation—Two studies examined behavioral activation and found that it fully mediated the effects of the tested intervention on depressive symptoms. Full mediation occurs when a key element of a psychosocial intervention statistically accounts for the entire change in the outcome variable—in this case, depressive symptoms. One study was a RCT with a sample size of 167 that looked at the mediation through the change in leisure activities (Losada, Marquez-Gonzalez, & Romero-Moreno, 2011). The authors analyzed mediation by comparing multiple regression analyses, with significance for the intervention found when behavioral activation was included in the regression ($p < .01$). The other study was a pretest/posttest design with a sample size of 23 (Ryba, Lejuez, & Hopko, 2014); findings from this study suggest that a higher proportion of planned activities completed, rather than a higher quantity, was correlated with decreased depressive symptoms ($p < .01$).

Social Support—Two studies supported the mediating role of social support in improving depressive symptoms. The first was a randomized control trial with a multi-state sample of 1004 subjects that assessed social support and found that perceived social support mediated improved depressive symptoms at 6, 12, and 18 months after intervention ($p < 0.05$; Dour et al., 2014). A second randomized control trial with a sample size of 312 found that satisfaction with social support mediated treatment effects both directly and indirectly through improvement in stress appraisals ($p < .001$, Roth et al., 2005).

Self-efficacy—Three studies supported the role of self-efficacy as a mediator of the effect of interventions on depressive symptoms while one did not. In a study using a pretest/posttest design with a sample size of 42, self-efficacy was found to mediate the intervention effects on depressive symptoms immediately after treatment and the recurrence of symptoms 12 months later ($p < .001$; Kavanagh & Wilson, 1989). Another study found that physical self-efficacy mediated treatment effects using a pretest/posttest design with a sample size of 47 ($p < .001$; White, Kendrick, & Yardley, 2009). A third study found that self-efficacy beliefs regarding an individual's ability to manage their post-traumatic stress disorder symptoms

was a partial mediator of treatment effects on depressive symptoms ($p=.01$; Oman & Bormann, 2015). Backenstrass et al. (2006) used a pretest/posttest design with a sample size of 51 and did not find mediation between self-efficacy and depressive symptoms.

Discussion

The purpose of this review was to determine the strength of the evidence that self-efficacy, social support or behavioral activation functions as a mediator in psychosocial interventions for depressive symptoms. Further, the review was completed to provide support for the potential key mechanisms for green care therapies. Findings suggest that social support, behavioral activation, and self-efficacy do have mediating roles with different dimensions of each construct measured across studies. This is an expected finding as all three constructs are cited in the literature as being linked with depressive symptoms (Beeber et al., 2013; Cuijpers et al., 2007; Dichter et al., 2010; Frasure-Smith et al., 2000; Kobeissi et al., 2012; Maciejewski et al., 2000; Mohr et al., 2004).

The evidence that the constructs mediate the effects of psychosocial interventions on depressive symptoms is in line with findings from a variety of studies of green care interventions. Qualitative research, including a randomized controlled trial, supports the role of social support as a mechanism of action, with participants frequently reporting the importance of support from the group and leader to the therapy (Elings & Hassink, 2008; Kogstad, Agdal, & Hopfenbeck, 2014; Pedersen, Ihlebæk, & Kirkevold, 2012). Qualitative studies have also found that the activities and physical exertion in many green care therapies – such as farm animal-assisted interventions or forest environment rehabilitation – are key to the interventions, supporting the role of behavioral activation (Kam & Siu, 2010; Nordh, Grahn, & Währborg, 2009; Pedersen et al., 2012). A recent study evaluating a farm animal-assisted intervention in Norway found quantitative evidence that the intervention improved depressive symptoms and anxiety, with many physically active tasks (specifically milking, moving, cleaning and feeding the animals) associated with the lowest levels of depressive symptoms and anxiety (Pedersen, Nordaunet, Martinsen, Berget, & Braastad, 2011). The role of self-efficacy in green care interventions is also supported by qualitative and quantitative research. Youth in green care interventions have emphasized the importance of building self-efficacy through individually adapted personally meaningful tasks (Kogstad et al., 2014). A randomized controlled trial of farm animal assisted therapy determined that increased self-efficacy was associated with physical contact with the animals and with improved mood and coping (Berget, Ekeberg, & Braastad, 2008).

Implications

The findings that behavioral activation, social support, and self-efficacy mediate psychosocial interventions for depressive symptoms will allow practitioners and researchers to focus in on these key elements. By extension, these findings suggest that the three mediators could be studied as potential active ingredients in the positive effects of green care therapies. Identifying the mechanisms through which green care can reduce depressive symptoms will help to develop greater precision and wider accessibility treatments for different populations. For example, if social support is found to mediate the effect of green

care on depressive symptoms, many different variants of green care containing social support could be developed to fit rural, urban and suburban settings. Conversely, green care could be incorporated into a variety of settings not associated with mental health as a non-stigmatizing way for symptomatic individuals to achieve symptom reduction.

While this review provides support for each of the three mediators included, studies comparing the mediating capacity of each mediator within the same study would be useful in learning where interventions should focus most strongly. It may be that certain mediators are stronger, or that they have varying impact for different people or symptoms (moderation of effects). Future research should seek to identify the characteristics of individuals receiving treatment and what mediators are most important for them to support the efforts for personalized treatment and targeting of symptoms.

Strengths and Limitations

The authors were supported by multiple experts in the field while preparing the review, including a health sciences librarian who assisted with the creation of the search terms and a researcher who has focused on developing psychosocial interventions aimed at improving depressive symptoms throughout her career. One limitation for the review that there is a strong risk of publication bias due to the topic; papers with the specific goal of determining mediation are less likely to be published if the results of the analysis of the mediation analysis did not support the hypothesized mediation. Further, mediation is not examined if effects of the intervention on study outcomes were non-significant. In the case of the studies synthesized here, the only findings that were non-significant were included in papers that reported on other statistically significant mediators. A third limitation was the difference in the ways mediation analyses were conducted in the studies included in the review; ideally, these would have all been the same in order to strengthen the comparisons across the mediators. A final limitation falls in extrapolating findings from a variety of psychosocial interventions to green care interventions, which may work differently. However, considering the limited availability of green care studies that could be considered for mediators, this review is a suitable place to start.

Conclusion

This review provides support that behavioral activation, social support, and self-efficacy may mediate improvements in depressive symptoms, indicating that each could be a key element of effective psychosocial interventions. Further research is needed to determine the other key elements of interventions and how these mediators function in green care therapies. Additional research may also determine if different subgroups of individuals respond more to different key elements. These and future findings will help researchers develop and clinicians utilize a wider range of personalized treatment options for depressive symptoms.

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Figure 1.
PRISMA diagram of article selection process.

Table 1

Green care therapies.

Green Care Intervention	Definition	Potential Application of Key Ingredient		
		Social Support (SS)	Self Efficacy (SE)	Behavioral Activation
Horticulture Therapy	The use of plants and/or gardens to promote mental and physical health	Often offered as group therapy so facilitates social contact in non-threatening setting	Success at small focused tasks such as weeding fosters SE	Involves gentle physical activity and novel tasks which acts as BA
Animal-assisted Intervention	The use of animals to promote mental and physical health; animal-assisted therapy is a subtype of goal-directed interventions by trained providers	Animal may provide a more simple relational attachment for SS than other people	Completing a task with an animal, such as grooming, may increase patient's SE	Completing physical activities such as petting or walking a dog is a form of BA
Care Farming	The use of common farming activities to promote mental and physical health	Tasks are typically led by a farmer who acts in a therapeutic role and provides SS	Completing challenging tasks such as herding cows enhances patient's SE	Involves various levels of physical activities such as grooming, herding, and milking
Green Exercise	Synergistic combination of exercise and nature exposure to promote mental and physical health	A group walk through a community park would enhance SS	Gradually increasing skills at outdoor activities such as hiking or biking would build SE	The exercise would be comprised of physical activity, acting as BA
Wilderness Therapy	The use of remote outdoor locations to promote mental health and personal growth.	Taking a group of youth into the woods removes them from their typical environment and may encourage increased SS through subsequent changes to group dynamics	An overnight camping trip develops skills in hiking as well as skills in other activities like campfire preparation and cooking.	Typically involves hiking in the wilderness which would be BA

Table 2

Search string for PubMed.

Boolean Term	Keywords
	("self efficacy"[Title] OR "self concept"[Title] OR "self-efficacy"[Title] OR "social interaction"[Title] OR "social support"[Title] OR "self-esteem"[Title] OR "behavioral activation"[Title] OR "problem-solving"[Title] OR "self-attribution"[Title] OR "self-criticism"[Title])
AND	("Depressive Disorder"[Title/Abstract] OR "Depression"[Title/Abstract])
AND	mediat*[Title/Abstract]
AND	(treatment OR intervention OR therapy)
AND	adult[MeSH]
NOT	(Autobiography[Publication Type] OR Bibliography[Publication Type] OR Biography[Publication Type] OR Case Reports[Publication Type] OR Classical Article[Publication Type] OR comment[Publication Type] OR Congresses[Publication Type] OR Consensus Development Conference[Publication Type] OR Dictionary[Publication Type] OR Directory[Publication Type] OR Editorial[Publication Type] OR Electronic supplementary materials[Publication Type] OR Festschrift[Publication Type] OR Interactive Tutorial[Publication Type] OR Interview[Publication Type] OR Lecture[Publication Type] OR Legal Cases[Publication Type] OR Legislation[Publication Type] OR Letter[Publication Type] OR News[Publication Type] OR Newspaper article[Publication Type] OR Patient Education Handout[Publication Type] OR Personal Narratives[Publication Type] OR Periodical Index[Publication Type] OR Pictorial works[Publication Type] OR Popular works[Publication Type] OR Portraits[Publication Type] OR Scientific Integrity Review[Publication Type] OR Video Audio Media[Publication Type] OR Webcasts[Publication Type])

Table 3

Description of studies.

Primary Author	Study design	Theoretical Framework	Sample	Intervention
Mediator: Behavioral Activation				
Losada (2011)	RCT control: usual care	Cognitive Behavioral Theory	n=167 age: 33–84 %M: 17.2	<ul style="list-style-type: none"> - CBT - Outpatient, clinic type NR - Duration: 12 weeks
Ryba (2014)	Pretest/posttest	behavioral Activation Model	n=23 age: NR %M: NR	<ul style="list-style-type: none"> - Behavioral Activation Therapy - Outpatient, breast cancer clinic - Duration: 8 weeks
Mediator: Social Support				
Dour (2014)	RCT control: usual care	Cognitive Behavioral Theory and Social Support Theory	n=1004 age: 18–75 %M: 29	<ul style="list-style-type: none"> - CBT, med management, or both - Outpatient, primary care clinic - Duration: not reported
Roth (2015)	RCT control: usual care	Social Support Theory and Stress Process Model	n=312 mean age: NR %M: 42	<ul style="list-style-type: none"> - Individual, family, & group therapy - Outpatient, specialty care clinic - Duration: 1 year
Mediator: Self-Efficacy				
Backenstrass (2006)	Pretest/posttest	Cognitive Behavioral Theory	n=51 mean age: 47.41 %M: 64.7	<ul style="list-style-type: none"> - CBT and med management - Inpatient - Duration: 10 weeks
Kavanaugh (1989)	Pretest/posttest	Social-cognitive model	n=42 age: 22–60 %Male: 45.2	<ul style="list-style-type: none"> - CBT - Outpatient, psychiatric clinic - Duration: 12 weeks

Primary Author	Study design	Theoretical Framework	Sample	Intervention
Oman (2015)	RCT control: case management	Self-efficacy Theory	n=132 age: 23–70+ %Male: 98	<ul style="list-style-type: none"> - Mantram Repetition Therapy - Outpatient, psychiatric clinic - Duration: 6 weeks
White (2009)	Pretest/posttest	Tripartite model of anxiety and depression	n=47 age: 18–45 %Male: 18.9	<ul style="list-style-type: none"> - Physical activity - independent - 8 weeks

RCT: Randomized Controlled Trial. %M: percent male, CBT: Cognitive Behavioral Therapy, NR: not reported

Table 4

Key findings across studies.

	Primary Author	Intervention	Outcomes Measures of Depressive Symptoms	Significant Results?
Mediator: Behavioral Activation				
	Losada (2011)	Cognitive Behavioral Therapy	CES-D	Yes, frequency of leisure activities mediated depressive symptoms.
	Ryba (2014)	Behavioral Activation Therapy	BDI-II	Yes, the proportion of completed activities mediated improved depressive symptoms. The total number of completed activities did not.
Mediator: Social Support				
	Dour (2014)	Cognitive Behavioral Therapy, medication management, or both	BSI, PHQ-9	Yes: perceived social support mediated depressive symptoms at 6, 12, and 18 months.
	Roth (2005)	Individual, family, and group therapy	GDS	Yes: satisfaction with social support mediated treatment effects directly and indirectly via improvement in stressfulness appraisals.
Mediator: Self-Efficacy				
	Backenstrass (2006)	Cognitive Behavioral Therapy and medication management	HRSD, BDI	No: no mediation by self-efficacy or sub-scales of internality, powerful others' control, chance control, and own competence.
	Kavanaugh (1989)	Cognitive Behavioral Therapy	BDI	Yes: cognition self-efficacy and stress control self-efficacy mediated immediate improvement to depressive symptoms.
	Oman (2015)	Mantram Repetition Program	BSI	Yes: management of PTSD symptom self-efficacy partially mediated treatment effects.
	White (2009)	Physical activity	BDI-II	Yes: Physical self-efficacy significantly mediated treatment effects.

Measures: *BDI*: Beck Depressive Inventory, *BDI-II*: Beck Depressive Inventory-II, *BSI*: Brief Symptoms Inventory, *CES-D*: Center for Epidemiological Studies Depression Scale, *GDS*: Geriatric Depression Scale, *HRSD*: Hamilton Rating Scale of Depression, *PHQ-9*: Patient Health Questionnaire