JO WEBBER BSc Hons

ALLOTMENT GARDENING, CONNECTEDNESS TO NATURE AND WELLBEING

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Summary

Section A

Section A provides a review of research investigating the relationship between feeling connected to the natural world and wellbeing. An overview of the theoretical background is given, and the empirical literature is summarised and critiqued. A need for further investigation of this relationship in individuals who spend time interacting with nature is identified.

Section B

Section B reports a mixed-methods study investigating the wellbeing of allotment gardeners. An online survey was used to administer measures of hedonic and eudaimonic wellbeing, connectedness to nature and preference for solitude, and to collect qualitative data. Both quantitative and qualitative data suggested a relationship between allotment gardening and eudaimonic wellbeing. Regression analysis showed that time spent on the allotment predicted eudaimonic wellbeing, and this relationship was mediated by feelings of connectedness to nature. Clinical and research implications are outlined.

Section C

The final section of this portfolio provides a critical appraisal of the research process, including reflections on what has been learned, what might have been done differently and the clinical and research implications.

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Section A

Connectedness to Nature and Wellbeing: A Review of the Research Evidence

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Abstract

A growing evidence base suggests that spending time in nature is beneficial to wellbeing, but little is understood of the mechanisms through which these benefits are conferred. Given the recent surge of interest in eco-therapeutic practices and the use of green interventions, greater understanding of the way nature impacts wellbeing is warranted. This review looks at the research evidence investigating the relationship between feeling connected to nature and wellbeing.

A search of electronic databases revealed 25 studies (reported in 12 papers) which examined the link between nature connectedness and both hedonic and eudaimonic conceptualisations of wellbeing. An association between feeling connected to nature and hedonic aspects of wellbeing was found in some studies, but results were inconsistent. A more robust association with eudaimonic aspects of wellbeing was demonstrated, in studies with both correlational and experimental designs.

The majority of studies investigated nature connectedness at the trait level or following minimal exposure to nature. Future research to investigate nature connectedness and wellbeing in individuals who spend significant time interacting with the natural environment is required. Such research could support the use of ecotherapy interventions alongside mainstream mental health interventions.

Introduction

For most of human history people have lived in close connection with the natural environment, only relatively recently, in industrialised societies, have individuals' lives become increasingly separate from the natural context in which humans evolved. The field of ecopsychology has developed since the 1960's with a view to addressing the growing concern with the effects of dismissing the human relationship with nature. Roszak (1992) wrote that "Mainstream Western society has limited the definition of mental health to the interpersonal context of an urban-industrial society" and argues that psychologists should take into account the primal bond between man and nature. Chalquist (2009) describes ecotherapy as "an umbrella term for a gathering of techniques and practices that lead to circles of mutual healing between the human mind and the natural world from which it evolved" (p.1).

Over the past few decades there has been much interest in the benefits to health and wellbeing from exposure to nature at various levels; there is a growing evidence base which suggests that contact with nature is beneficial (Howell & Passmore, 2013). For example, population studies have found that greener environments are associated with significantly lower rates of depression and anxiety (Weich, Twigg & Lewis, 2006), fewer physical health symptoms and greater perceived general health (de Vries, Verheij, Groenewegen & Spreeuwenberg, 2003) and lower levels of income-related health inequality (Mitchell & Popham, 2008). Following an appraisal of the research into the effect of nature on mental health and wellbeing, Passmore (2011) concludes that neglect of the human-nature relationship can negatively impact mental health.

Chalquist (2009) reviewed the evidence in support of eco-therapeutic practices, such as the inclusion of nature in health care settings, horticulture therapy, animal-assisted therapy and wilderness excursions. He suggested that common themes from the research are that

disconnection from the natural world produces psychological symptoms beyond those that can be explained by intrapsychic or intrafamilial dynamics, and that reconnection with nature can both alleviate these symptoms and increase capacity for health, self-esteem, relatedness and joy.

Theoretical Background

There are a number of theories which suggest that exposure to nature is intrinsically beneficial to wellbeing. The foremost of these are Kaplan and Kaplan's attention restoration theory and Ulrich's psycho-physiological stress reduction theory, which have their basis in evolutionary theory and Wilson's (1984) biophilia hypothesis.

The biophilia hypothesis states that humans have an inherent need to affiliate with nature (Wilson, 1984). For the bulk of our time on the planet humans interacted closely with the environment as hunters, gatherers and subsistence farmers, and this has shaped our cognitive and emotional processes. Wilson (1993) describes biophilia not as a single instinct, but as a complex of learning rules resulting in a tendency to learn some associations more easily than others. Wilson proposes that biophilia may have developed through a gene-culture coevolution, in which genes prescribing biophilia have been passed on through natural selection in a context in which learning principles have been taken up and expanded upon through culture. In her review of literature related to this claim, Gullone (2000) found evidence to indicate that time spent away from the environments to which we humans adapted may be detrimental, and exposure to more elements of nature may enhance psychological wellbeing. However, it has been noted that much of the evidence for biophilia is circumstantial, it has not been examined in well-controlled experiments (Hartig et al., 2011).

Another prominent theoretical perspective is attention restoration theory (Kaplan & Kaplan, 1989; Kaplan, 1995). Building on the work of William James (1892), Kaplan and

Kaplan (1989) propose that there are two types of attention: direct attention and involuntary attention or fascination. Direct attention is goal driven and requires effort, whereas fascination is automatic and stimulus driven and thought to occur predominantly in natural environments. Attention restoration theory takes the evolutionary perspective that over human ancestral history much of what was important to people was inherently fascinating (such as animals, danger, caves), but in the modern world humans are required to overly rely on direct attention, which requires effort, leading to mental fatigue. Attention restoration theory proposes that while exposed to nature voluntary, rather than direct attention, is utilized. Thus nature provides a restorative environment, reducing mental fatigue. Kaplan and Berman (2010) distinguish between hard fascination, which comes from highly fascinating stimulation, such as television, and soft fascination. Hard fascination provides distraction in the short term but allows no space for reflection, whereas softly fascinating environments do allow time to reflect and are therefore more likely to produce feelings of restoration. A number of studies provide support for attention restoration theory, see Kaplan and Berman (2010) for a review.

Ulrich's (1983) psycho-physiological stress reduction theory encompasses the impact of natural stimuli on physiological and emotional functioning, as well as cognitive functioning. Ulrich et al. (1991) suggested that unconsciously stimulated emotional responses lead to avoidance behaviour or approach and restoration behaviour, depending on the type of natural setting, and serve an adaptive function. For example, positive liking or approach responses to situations that favour wellbeing or survival. There is much experimental evidence to support this theory. In an often cited study, Ulrich (1984) found that patients with a view of trees from their hospital windows recovered faster, required fewer painkillers and made fewer negative comments than patients with a view of a brick wall. Ulrich et al. (1991) found that participants recovered faster on measures of affect and

physiological functioning from a stressful event (watching a distressing film) if they were shown images of natural rather than urban environments.

The human relationship with nature has also been viewed from a psychodynamic perspective. Roszak, Gomes and Kanner (1995) posited that humans have an ecological unconscious and industrialized society results from repression of our evolutionary relationship with nature. Through ecopsychology the ecological unconscious can be reawakened and with it the inherent sense of environmental reciprocity. Jordan (2009) considers human relationships with nature in terms of attachment theory. He suggests that nature could be seen as a secure base, having both maternal and paternal aspects, and could be strongly involved in affect regulation (a process through which individuals can regulate their own mood states; Fonagy, Gergely, Jurist & Target, 2002), a capacity associated with secure attachments. Jordan also suggests that the dominant attachment patterns in industrialized societies are ambivalence and avoidance. He argues that some indigenous cultures, such as the Australian Aborigines, prior to their culture being changed by European settlers, achieved positive attachments with nature, with concepts of interdependence at their roots. These ideas have not been extensively researched, Jordan cites support from the literature that contact with nature positively affects mood states (e.g. Shibata & Suzuki, 2001, 2004; van den Berg, Hartig & Staats, 2007); however, there are a number of other possible explanations for this, some of which have been discussed above. There is some evidence that migrants exhibit attachment to both human and nonhuman aspects of their homeland (Ward & Styles, 2007).

Public Health Initiatives

Annerstedt and Währborg (2011) conducted a systematic review of the evidence for nature-assisted therapies (such as social and therapeutic horticulture and wilderness therapy). They found a “small but reliable evidence base” (p. 2) to support the use of nature-assisted

therapies for public health. Within the public health arena there has been much call for increasing interaction with nature to enhance health and wellbeing. Mind, a leading mental health charity, published a report which calls for acknowledgement of the wealth of evidence supporting positive benefits for health and wellbeing from contact with the natural environment (Mind, 2007). Mind recommends the recognition of ecotherapy as a valid treatment option for psychological problems and a key part of a public health strategy. Other reports have similarly endorsed the use of natural environments to promote psychological wellbeing (Bell et al., 2008; Faculty of Public Health, 2010). Resources are currently being invested in initiatives which utilise the natural environment to promote public health, such as The British Trust for Conservation Volunteers Green Gym and the EcoMinds initiative, through which Mind has funded 130 projects to improve mental health using green activities in the UK.

Rationale for Review

A wealth of disparate evidence has amassed which indicates that contact with nature can benefit wellbeing, but little is understood of what aspects of being in nature create positive benefits. Annerstedt and Währborg (2011) highlighted in their review of nature-assisted therapies that the literature provided little in the way of explanation of the underlying mechanisms contributing to their functionality. Some mediators of the benefits of nature that have been proposed include recovery from stress and attention fatigue, facilitation of social contact, increased exercise, encouraging children's optimal development, the opportunity for personal development and to feel a sense of purpose (Health Council of The Netherlands, 2005). Given the investment in, and proliferation of, eco-therapeutic methods, better understanding of the mechanisms by which exposure to nature is beneficial is warranted, and is important for the development of effective applications (Mayer, Frantz, Bruehlman-Senecal & Dolliver, 2009).

In the context of the theoretical background described above the idea that feeling connected to nature may be a mediator of the positive health benefits associated with contact with nature has face validity. For example, the biophilia hypothesis suggests that people have a biologically based need to feel connected to the natural world; therefore fulfilment of this need may enhance wellbeing. This paper will review the evidence for a relationship between connectedness to nature and wellbeing, in order to facilitate understanding of the mechanisms promoting wellbeing when exposed to natural environments.

Connectedness to Nature

Connectedness to nature refers to an individual's belief about the extent to which they are part of natural world. It has been described as an important psychological construct, with an adaptive purpose (Bruni, Chance, Schultz & Nolan, 2012). The concept of connectedness to nature has received increasing attention over the last decade, much of the investigation has looked at its relationship to attitudes to the environment and sustainability (e.g. Nisbet & Zelenski, 2009; Nisbet & Zelenski, 2011; Schultz, 2000; Schultz, 2001; Schultz & Tabanico, 2007). Connectedness to nature has been cited as an important benefit of nature contact in a number of qualitative studies, for example, it was identified as one of four elements that made walking meaningful to leisure walkers (Wensley & Slade, 2012) and as an important motivating factor for conservation volunteers (Guiney & Oberhauser, 2009).

Connectedness to nature has been conceptualised in different ways and various measures have been developed in an attempt to quantify the construct. The two most widely used measures are Mayer and Frantz's (2004) Connectedness to Nature Scale and Nisbet, Zelenski and Murphy's (2009) Nature Relatedness Scale. The Connectedness to Nature Scale was developed to operationalize Leopold's (1949) ideas of human relatedness to the natural environment, it measures "an individual's affective, experiential connection to nature" (Mayer & Frantz, 2004, p. 504). Nisbet et al. (2009) proposed a new construct, nature

relatedness, to describe an individual's level of relatedness to the natural world which includes affective, cognitive and experiential aspects. Another sometimes used measure is the Inclusion of Nature in Self Scale (Schultz, 2002). This single-item scale presents participants with seven pairs of circles with differing degrees of overlap. One circle in each pair is labelled "me" and one is labelled "nature". Participants are asked to choose a pair of circles to represent their level of connectedness to nature. The Allo-Inclusive Identity Scale (Leary, Tipsord & Tate, 2008) uses an adaptation of the same method to assess the degree to which an individual incorporates the natural world into their identity.

Wellbeing

Research on wellbeing encompasses two general perspectives: the hedonic approach and the eudaimonic approach. The hedonic approach focuses on happiness and attainment of pleasure, conceptualising wellbeing as the presence of positive affect and the absence of negative affect, whereas the eudaimonic approach focuses on meaning and self-realization, including positive relationships, autonomy and competence (Ryan & Deci, 2001). Ryan, Huta and Deci (2006) highlight an essential difference between these approaches; the hedonic approach focuses on outcomes whereas the eudaimonic approach is orientated around the process of living well. In this review the associations between connectedness to nature and both hedonic and eudaimonic conceptualisations of wellbeing will be investigated.

Literature Review

Using the methodology outlined in Appendix A, 25 studies (reported in 12 papers) investigating the relationship between connectedness to nature and wellbeing were identified. Fourteen studies (reported in eight papers) were correlational in design (Cervinka, Roderer & Hefler, 2012; Howell, Dopko, Passmore & Buro, 2011; Ingulli & Lindbloom, 2013; Luck, Davidson, Boxhall & Smallbone, 2011; Mayer & Frantz, 2004; Nisbet, Zelenski & Murphy, 2011; Tang & Chang, 2011; Zelenski & Nisbet, 2012). Two studies (reported in one paper)

employed a quasi-experimental design (Nisbet, et al., 2011), eight studies (reported in three papers: Mayer, et al., 2009; Nisbet & Zelenski, 2011; Weinstein, Przybylski & Ryan, 2009) employed an experimental design and one was a qualitative study (Hennigan, 2010). Fifteen studies investigated nature connectedness at trait level and ten studies investigated state level. A summary of the studies can be found in Appendix B.

Hedonic Wellbeing

Diener (2000) suggests that there are two main components usually associated with happiness, these are cognitive and affective evaluations of life: feeling positive and judging that life is going well (satisfaction with life). A number of authors investigated the relationship between these constructs and feeling connected to nature.

Life satisfaction. Four papers investigated the relationship between connectedness to nature and life satisfaction (Cervinka et al., 2012; Mayer & Frantz, 2004; Nisbet et al., 2011; Zelenski & Nisbet, 2012). A five-item measure of life satisfaction was used in these studies, the Satisfaction with Life Scale (Diener, Emmons, Larsen & Griffin, 1985). A significant positive association between connectedness to nature and wellbeing was reported in three of these papers. Mayer and Frantz (2004) found a small positive correlation between the Connectedness to Nature Scale and life satisfaction in 135 adults approached in the community. Zelenski and Nisbet (2012) found that the Nature Relatedness Scale and the Inclusion of Nature in Self Scale correlated significantly with life satisfaction in both community and student samples in one study, but the finding was not repeated in a second study in which the scales were administered via an online survey. Nisbet et al. (2011) administered the Satisfaction with Life Scale and the Nature Relatedness Scale to 184 Canadian undergraduate students and 145 executives and found significant correlations once the effect of measures investigating environmental attitudes, beliefs and values (but not feelings about being in nature) were controlled for. Cervinka et al. (2012) found no

significant correlations between the Connectedness to Nature Scale or a single-item measure of nature connectedness and life satisfaction.

These studies provide some evidence for a relationship between life satisfaction and connectedness to nature, but the findings are inconsistent. This may be due to methodological issues with the measure of life satisfaction. It may also be there are moderators of the relationship between nature relatedness and life satisfaction (Zelenski & Nisbet, 2012). Nisbet et al. (2011) suggest that the values held by nature-related individuals may place the biosphere over individual concerns (Schultz, 2002), and so seeing the health of the planet threatened may result in a dissatisfied state.

Luck et al. (2011) investigated whether variation in animal and plant species in one's neighbourhood were related to life satisfaction, neighbourhood satisfaction and connectedness to nature. They measured environmental variables, including species richness and diversity, vegetation cover and urban development in nine urban areas in Australia. They found that most environmental measures were weakly related to connectedness to nature and wellbeing, but demographic variables were most strongly related to both, which highlights the importance of controlling for these variables when investigating this relationship (Luck et al., 2011). Neighbourhood wellbeing, which was conceptualised as satisfaction with living in one's neighbourhood, was more strongly related to environmental variables, such as increased vegetation, more bird species and less urban development. Connectedness to nature was associated with neighbourhood and general activity levels, suggesting that social and physical activities may increase nature connectedness. A direct relationship between connectedness to nature and wellbeing was not investigated in this study.

Positive and negative affect. Four papers investigated the relationship between trait level connectedness to nature and mood (Cervinka et al., 2012; Howell et al., 2011; Nisbet et

al., 2011; Zelenski & Nisbet, 2012) and two reported on state level connectedness to nature and mood (Mayer et al., 2009; Nisbet & Zelenski, 2011).

Nisbet et al. (2011) found that positive affect was significantly correlated with nature relatedness in both undergraduate students and executives. Zelenski and Nisbet (2012; study 1) found significant correlations between nature relatedness, positive affect and subjective happiness in community and student populations. A relationship between negative affect or low mood and nature relatedness was not found. Zelenski and Nisbet (2012; study 2) found the Perspective subscale of the Nature Relatedness Scale predicted ill-being (low subjective happiness, life satisfaction, vitality and high negative affect). Emotional wellbeing was not consistently related to connectedness to nature in two studies reported by Howell et al. (2011). In the first study emotional wellbeing was not significantly correlated to nature connectedness, small correlations were found between emotional wellbeing and three measures of nature connectedness in the second study. Cervinka et al. (2012) found no correlation between connectedness to nature and current mood.

Mayer et al. (2009) divided participants in their study into two groups and transported one to a natural setting and the other to an urban setting, where they were taken on a guided walk for 10 minutes and then asked to reflect on a loose end in their life that needed resolution. They found that those in the nature condition experienced significantly more positive emotion (measured on the Positive and Negative Affect Schedule; Watson, Clark & Tellegen, 1988) and had greater ability to reflect on their loose end, moreover, the authors carried out a mediational analysis which supported connectedness to nature being at least a partial mediator of the effect of condition on positive affect scores. In a second study, Mayer et al. (2009) investigated whether exposure to virtual nature (through a video of an outdoor walk) affected participants in the same way as actually taking the walk. A third group were shown a video of an urban route. Those in the actual nature condition reported significantly

more positive emotions than the other two conditions, and those in the virtual urban condition reported significantly more negative affect than the other two conditions. Trait level nature connectedness significantly predicted state level nature connectedness. All three groups differed significantly in Connectedness to Nature Scale scores, with those in the actual nature group scoring highest and those in the virtual nature group scoring lowest. State nature connectedness scores significantly predicted positive affect and ability to reflect, and were at least a partial mediator of the effect of condition on positive outcomes.

Nisbet and Zelenski (2011) investigated whether people would predict positive feelings associated with nature contact. They randomly assigned student participants to indoor and outdoor walking routes in two studies, and to be either forecasters or experiencers of emotions. They used an adapted version of the Positive and Negative Affect Scale, incorporating items to measure Kaplan's soft fascination, and the Inclusion of Nature in Self Scale. The first study employed a between subjects design. The outdoor group reported significantly higher positive affect, relaxation, fascination, nature relatedness and less negative affect than the indoor group. Positive mood was found to mediate the relationship between nature exposure and nature relatedness. It was also found that participants underestimated the positive effects of walking outdoors and overestimated the positive effects of walking indoors. A second study replicated the findings using a within-subjects design and different walking locations.

Overall, there is some evidence of a link between trait level connectedness to nature and positive mood, but state level connectedness to nature is more reliably associated with positive mood. There is evidence that when exposed to natural environments feelings of nature relatedness enhance positive mood and also that positive mood whilst outdoors mediates the relationship to nature relatedness. Measures of positive affect utilized in these studies have investigated high energy rather that low energy states, such as calm and

contentment, future research may benefit from investigating other forms of positive mood (Nisbet et al., 2011).

General connectedness. Zelenski and Nisbet (2012) investigated whether the link between nature relatedness and happiness is independent of general connectedness in two studies. They adapted the Inclusion of Nature in Self scale to measure other subjective connections to country, family, home, culture, music and friends, by altering the labels on the circles. They used a composite average score of these connections as a measure of general connectedness. Partial correlations between nature relatedness and happiness were computed, controlling for general connectedness. Many relationships between nature relatedness and happiness measures remained significant, with personal growth and pleasant emotions having the strongest correlations, suggesting that nature relatedness has a distinct happiness benefit. The authors developed this idea further in a second study which utilized other widely used and well-validated methods of assessing connectedness, including measures of attachment, loneliness, belongingness and identity. A general connectedness composite was again created. Of the Nature Relatedness Scale subscales, Self and Experience predicted positive affect, vitality and personal growth, but were not significant predictors of subjective happiness, life satisfaction, autonomy or purpose as they have been in other studies. The Perspective subscale sometimes predicted unhappiness (low scores on the measures of happiness, vitality and life satisfaction, and high negative affect). The connectedness composite was strongly related to happiness indicators, but was not significantly correlated with nature relatedness and controlling for it had little impact on the relationship between nature relatedness and happiness. The study suggests that nature relatedness was distinct from other subjective connections.

Eudaimonic Wellbeing

The Psychological Wellbeing Scales (Ryff, 1989) measure six dimensions associated with eudaimonic wellbeing: autonomy, environmental mastery, positive relations with others, self-acceptance, purpose in life and personal growth. A number of authors have used this measure to investigate links with connectedness to nature. Nisbet et al. (2011) reported that autonomy, personal growth, purpose in life and self-acceptance significantly correlated with nature relatedness in undergraduates and personal growth was associated with nature relatedness in executives. Zelenski and Nisbet (2012) found that nature relatedness was associated with autonomy, personal growth and purpose in life in student and community samples.

Howell et al. (2009) found that connectedness to nature remained significantly correlated with psychological and social wellbeing when controlling for a socially desirable response bias. This finding was consistent across two studies employing three different measures of nature connectedness. Cervinka et al. (2012) utilized a number of measures of physical and psychological wellbeing, when age and gender effects were controlled for the only scale to remain significantly correlated with two measures of nature connectedness was meaningfulness, which refers to a sense of purpose in life and a life relatively free from hopelessness, powerlessness and depression.

Life aspirations. Kasser and Ryan (1996) suggested that intrinsic aspirations, those which are inherently rewarding to pursue and contribute to satisfying basic psychological needs, such as those for personal growth, emotional intimacy and community involvement, will impact psychological wellbeing differently to extrinsic aspirations (e.g. for wealth, image and fame), which are less satisfying of basic psychological needs and may negatively impact wellbeing if they become more central to an individual than intrinsic goals. A number of studies have provided support for this theory (see Sheldon, Ryan, Deci & Kasser, 2004).

Weinstein et al. (2009) carried out three studies investigating the effect of immersion in nature on life aspirations and whether connectedness to nature mediates this relationship. In two studies participants reported aspirations before and after being exposed to images of natural and non-natural environments and listening to a guided imagery script encouraging them to attend to their environment, in the second of these two studies participants also completed an economic decision task, indicative of value aspirations. In the third study participants were taken into a lab where the presence or absence of plants was manipulated, participants in this study also completed the economic decision task. Participants reported their level of immersion in the environment using an adapted version of the Player Experience of Needs Satisfaction Physical Presence Scale (Ryan, Rigby & Przybylski, 2006). Two studies showed that participants exposed to nature experienced significantly more connectedness with immersion in nature (this relationship verged on significance in the exposure to plants study). Two of the three studies also showed that connectedness to nature decreased with immersion in the non-nature conditions. All studies showed that participants valued intrinsic goals more and extrinsic goals less after exposure to nature, these effects remained once biased responding and positive affect elicited by the environment were controlled for. Both connectedness to nature and autonomy were investigated as mediators of the relationship between the nature-immersion interaction and aspirations, both were shown to independently and robustly predict higher intrinsic and lower extrinsic aspirations. These findings, given the brief exposure to limited nature in a lab setting, suggest promise of broader and more enduring effects in "real life" settings (Weinstein et al., 2009).

Vitality. Vitality refers to feeling alive and energetic, it has been proposed as a characteristic of psychologically healthy, fully functioning individuals and has been described as a central indicator of eudaimonic wellbeing (Ryan & Frederick, 1997; Nix, Ryan, Manly & Deci, 1999). Three papers investigated associations between connectedness

to nature and vitality. Zelenski and Nisbet (2012) found that the Nature Relatedness Scale and Inclusion of Nature in Self Scale were related to vitality in student and community samples. Cervinka et al. (2011) also demonstrated a significant correlation between a single-item measure of nature connectedness and vitality, controlling for the effects of age and gender.

Nisbet et al. (2011) conducted a longitudinal study of students taking environmental courses and measured their nature relatedness and wellbeing compared to controls. They predicted that developing ecological understanding through participation in the course would facilitate nature relatedness. Participants were not randomly allocated to experiment or control groups. Change scores were utilized to attempt to control for between group differences, the relative changes in wellbeing and nature relatedness over time were investigated. The results indicated that students in environmental classes displayed higher nature relatedness at the start of the term (as would be expected), they did not increase in nature relatedness significantly over time; however, the control group decreased in nature relatedness significantly, which was attributed to a change of season, resulting in shorter days, poorer weather and less time outside. At both assessment points (the beginning and end of the autumn term) significant correlations were found on all measures of wellbeing (except for negative affect) and vitality with nature relatedness. Nature relatedness was found to mediate the relationship between education and vitality, but not other measures of wellbeing. The changes observed were relative, rather than absolute; the authors noted that it was impressive that something as little as difference in coursework predicted any and change in wellbeing.

Ability to reflect. It has been hypothesised that exposure to nature may enhance an individual's ability to reflect (think through and gain perspective on a life problem; Kaplan & Kaplan, 1989). The ability to reflect is central to the development of autonomy, as it enables

considered choices to be made, and is therefore necessary for eudaimonic wellbeing (Ryan et al., 2006). Mayer et al. (2009) found that participants exposed to natural environments were significantly more able to reflect on a life problem than those exposed to urban environments, these effects were more pronounced when exposed to actual nature than to virtual nature. Using regression analysis they found that state connectedness to nature significantly predicted ability to reflect.

Howell et al. (2009) investigated a link between connectedness to nature and mindfulness in two studies. Mindfulness has been described as "paying attention in a particular way; on purpose, in the present moment and non-judgementally" (Kabat-Zinn, 1994, p. 4). A number of studies have linked mindfulness to psychological wellbeing (see Keng, Smoski & Robins, 2011 for a review). The findings were variable, the Connectedness to Nature Scale did not correlate with mindfulness as measured using the Mindful Attention Awareness Scale (Brown & Ryan, 2003) in one study, but did in a second study; however, two other measures of connectedness to nature were not related to mindfulness in this study. All three measures of connectedness to nature were significantly correlated with the Awareness Scale of the Philadelphia Mindfulness Scale (Cardaciotto, Herbert, Forman, Moitra & Farrow, 2008) in study 2, but none of the measures correlated to the Acceptance Scale, suggesting that connectedness to nature is associated with awareness of experiences in nature, rather than non-judgmental acceptance of these experiences (Howell et al., 2011).

Restoration and resilience. Correlational studies have indicated a relationship between connectedness to nature and the perceived restorative quality of nature in students in Taiwan who were shown an image of a familiar natural scene (Tang & Chang, 2011) and between connectedness to nature and psychological resilience in students at universities associated with high socio-economic status, but not those associated with low socio-economic status, in the USA (Ingulli & Lindbloom, 2013). The latter result should be

interpreted with caution due to self-selection bias and small sample sizes, but may suggest a moderating effect of socio-economic status.

Body image. Hennigan (2010) investigated the therapeutic potential of time in nature in a qualitative study focusing on the implications for body image. It has been suggested that connectedness to nature can help women to transform their body image by connecting to their own bodies, with the aid of Earth as a metaphor (Arnold, 1994). Hennigan interviewed 12 women about their experiences of their bodies whilst spending time in nature. The authors reported that the positive impact on body image reported in nature was not due to the particular activities undertaken, but rather to the experience of connectedness to nature.

Limitations

There are a number of limitations to this evidence base. Many of the studies are correlational therefore conclusions about causation cannot be drawn, although consistent correlations found across a number of studies and populations strengthen findings. It may be that other factors that are not being measured are responsible for changes in both connectedness to nature and wellbeing. Many studies have been carried out with student populations, who may have different ideas about what constitutes wellbeing than the general population (Nisbet et al., 2011) which limits the generalizability of the findings. Few studies controlled for possible confounding variables or for socially desirable responding, which may have been pertinent due to the reliance on self-report measures. Only one study (Cervinka et al., 2012) controlled for demographic variables, which Luck et al. (2011) indicated are related to connectedness to nature. Most studies were cross-sectional, measuring connectedness to nature and wellbeing at one time point; however, these variables are dynamic, investigation of changes in the relationship between them over time would be useful.

There are also limitations to measures employed in these studies. Perrin and Benassi (2009) critiqued the Connectedness to Nature Scale, suggesting it measures cognitive beliefs

about nature connectedness rather than an emotional connection to nature. Two single-item measures of connectedness to nature were employed, which may not be as reliable as multi-item scales in the measurement of complex constructs (Loo, 2002). There is evidence that four of the six wellbeing dimensions measured by Ryff's Psychological Wellbeing Scales are virtually indistinguishable (Springer & Hauser, 2006).

Conclusions

The evidence that connectedness to nature promotes hedonic conceptualisations of wellbeing is mixed. Some studies have supported a correlation between satisfaction with life and connectedness to nature, although this was not consistent. The relationship between trait level connectedness to nature and positive mood was also inconsistent, more robust evidence was found of a relationship between state level nature connectedness and positive mood. Mayer et al. (2009) demonstrated that connectedness to nature was a least a partial mediator of the relationship between exposure to nature and positive affect. Zelenski and Nisbet (2012) provided some evidence that the relationship between connectedness to nature and positive mood is distinct from other types of subjective connectedness.

An association between nature connectedness and eudaimonic wellbeing was more robustly supported. Correlational evidence indicated that autonomy, personal growth, purpose in life, self-acceptance, meaningfulness, awareness in nature, resilience and perceived restorativeness were related to connectedness to nature. Experimental studies found greater intrinsic motivation and ability to reflect following exposure to nature, and these relationships were mediated by connectedness to nature. Nature relatedness was shown to mediate the relationship between environmental education and increased vitality. Qualitative evidence suggested the experience of connectedness to nature improved body image.

Implications

A United Nations (2008) paper reported that 2008 was the first time more than half of the worlds' population lived in urban areas, this is a number that is set to keep increasing. The disconnection from nature that this may engender could have a negative effect on individuals' wellbeing, and ways to countermand these effects warrant exploration. There is now a substantial evidence base advocating for the benefits of nature exposure on wellbeing, and connectedness to nature is one way in which nature may confer positive effects. Further exploration of the mechanisms through which nature enhances wellbeing and how nature exposure can be utilized for both therapeutic and public health purposes are needed. Many studies discussed here have investigated connectedness to nature at trait level, or following minimal nature exposure. Research investigating whether individuals who spend significantly more time interacting with nature (such as those who work outdoors or are involved with gardening) report higher levels of wellbeing, and whether this relationship is mediated by connectedness to nature would be beneficial.

Ecotherapy interventions could provide an adjunct to mainstream mental health interventions, and may be a welcome alternative for some service-users. A drive towards green interventions can be seen currently in initiatives such as the Green Gym and Ecominds; however, in order for this momentum to be carried forward into healthcare policy and service development, more substantial supporting evidence is required.

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Investigating the Wellbeing of Allotment Gardeners

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Abstract

Background: The potential for green interventions to promote mental wellbeing and reduce mental distress is increasingly being recognised (Mind, 2007). Preliminary evidence suggests that allotment gardening activities may have a significant effect on mental wellbeing, but a paucity of research, particularly in non-clinical populations, has been highlighted (Partridge, 2010).

Method: A cross-sectional online survey of 171 allotment gardeners was conducted. Measures of subjective wellbeing (quality of life), eudaimonic wellbeing, connectedness to nature and preference for solitude were administered. Qualitative data were also collected through open-ended questions.

Results: Allotment gardeners' scores on measures of environmental quality of life and eudaimonic wellbeing were significantly higher than those reported in the literature, but social quality of life was lower in allotment gardeners. Regression analysis showed that time spent on the allotment during summer predicted eudaimonic wellbeing. This relationship was fully mediated by feelings of connectedness to nature. A relationship was observed between spending time on the allotment and preference for solitude. Four main themes emerged from the qualitative data: allotments provided a space of one's own, meaningful activity, increased feelings of connectedness, and improved physical and mental health.

Conclusions: The results suggest that allotment gardening is associated with increased eudaimonic wellbeing, but not subjective wellbeing (also referred to as hedonic wellbeing). Furthermore, a mechanism through which allotment gardening enhances wellbeing is suggested: increased connectedness to nature. Limitations of the current study and clinical and research implications are discussed.

Keywords: allotment gardening, connectedness to nature, wellbeing, eudaimonia.

Over recent years there has been a movement away from conceptualising mental health as the absence of mental illness and towards a view of mental health as positive, conceived in some cases as a state of flourishing, encompassing social, psychological and emotional wellbeing (Keyes, 2002; 2005). There has been a shift in ethos of mental health services in the UK towards a social wellbeing approach, with a focus on promoting positive mental health and wellbeing across society (British Psychological Association, 2009). There has also been a shift in government policy, promoting wellbeing has become a key part of both mental health and public health strategies (Department of Health, 2011; Department of Health, 2010). The social and economic benefits of improving the mental health and wellbeing of the population have been emphasised (Department of Health, 2011). This study investigates the relationship between allotment gardening and wellbeing.

Wellbeing

Contemporary theories of wellbeing fall into two philosophical traditions: the hedonic tradition and the eudaimonic tradition (Ryan & Deci, 2001; Waterman, 1993). In the hedonic tradition wellbeing is equated with subjective feelings of pleasure. The model of subjective wellbeing (Diener, 1984), a term often used interchangeably with hedonic wellbeing (Kahneman, Diener & Schwartz, 1999), falls into this tradition. Diener described subjective wellbeing as the experience of high levels of positive affect, low levels of negative affect and high life satisfaction. More recently the definition has been refined to describe valuations individuals make about their lives, events happening to them, their bodies and minds, and their life circumstances (Diener, 2006).

The eudaimonic tradition is rooted in ideas of a life well lived originally discussed by Aristotle in Nichomachean Ethics (2000/4th Century BCE). Central to this idea is living in a manner true to oneself. Waterman (1993) described the subjective experience of eudaimonia as personal expressiveness. In the eudaimonic tradition emphasis is placed on a way of living

that is intrinsically worthwhile, choosing life goals that provide meaning and purpose, rather than on mental state or positive feeling.

Self-determination theory is a model of eudaimonia proposed by Deci and Ryan (2000). It emphasises the pursuit of intrinsic goals (those which are inherently rewarding to pursue), such as personal growth, relationships and bettering the community, rather than extrinsic goals, such as fame or wealth (Kasser & Ryan, 1996). Intrinsic goals are thought to fulfil three basic psychological needs for autonomy, competence and relatedness. The need for autonomy is fulfilled if an individual has choice in their activities and perceives them as congruent with the self, the need for competence pertains to a sense of efficacy in both internal and external environments, and the need for relatedness is fulfilled through being connected to and cared about by significant others.

Another model associated with the eudaimonic tradition is the model of psychological wellbeing (Ryff 1989; Ryff & Singer, 2008), which identifies six core dimensions essential for quality of life: autonomy, environmental mastery, personal growth, positive relations with others, purpose in life and self-acceptance. However, it has been questioned whether this model represents a model of flourishing as conceptualised in a eudaimonic framework (Waterman et al., 2010), it has been suggested that psychological wellbeing describes a number of processes that mediate the relationship between having intrinsic goals and physical and psychological wellness, similar to basic psychological need satisfaction (Ryan, Huta & Deci, 2006).

There is a growing evidence base supporting the benefits to wellbeing of exposure to nature at various levels (e.g. Bell et al., 2008; Ulrich et al., 1991; Weich, Twigg & Lewis, 2006). A number of theories have been proposed to explain the relationship between the experience of the natural environment and wellbeing. Wilson's (1984) biophilia hypothesis suggests that as we have been deeply enmeshed in nature through our evolution, we have an

innate desire to affiliate with nature. Kaplan's (1995) attention restoration theory suggests the fascination, or involuntary attention, at the core of the plant-person relationship is restorative. Ulrich's (1983) psycho-physiological stress reduction theory emphasises the benefits of contact with nature to physiological and emotional functioning.

The construct of connectedness to nature, an individual's belief about the extent to which they are emotionally connected to, or in community with, the natural world has been explored in relation to its association with wellbeing benefits. Some studies have found a link between connectedness to nature and hedonic aspects of wellbeing, including life satisfaction (Mayer & Franz, 2004; Nisbet, Zelenski & Murphy, 2011) and positive mood (Mayer, Frantz, Bruehlman-Senecal & Dolliver, 2009, Nisbet & Zelenski, 2011), although this relationship has not been consistently observed (see Section A). Relationships between connectedness to nature and aspects of eudaimonic wellbeing have also been demonstrated, including purpose in life (Cervinka, Roderer & Hefler, 2012), intrinsic aspirations (Weinstein, Przybylski & Ryan, 2009), vitality (Nisbet et al., 2011), autonomy (Weinstein et al., 2009) and ability to reflect (Mayer et al., 2009), which Ryan et al. (2006) describe as an integral aspect of autonomous decision making.

In modern Western society, where people are increasingly living in urban environments (United Nations, 2008), some authors have raised concerns about the detrimental effect separation from nature could have on mental health (e.g. Passmore, 2011). Mind (2007) has called for increased recognition of green interventions as cost-effective and clinically valid interventions for promoting wellbeing and reducing mental distress.

Allotment Gardening

There is a long history of allotment gardening in the UK, dating back to Anglo-Saxon times (Opperman, 2004). Recently there has been a renewed surge of interest in allotments, as people are increasingly opting for greener lifestyles (Witlshire & Burn, 2008). A number

of health and wellbeing benefits of allotment gardening have been claimed, including relaxing effects of interacting with nature, increased physical activity and community cohesion (Hope & Ellis, 2009). However, despite much anecdotal material in support of the wellbeing benefits of allotment gardening, research in this area is still in its infancy (Partridge, 2010).

Much of the research into allotment gardening to date has been in the form of qualitative investigations of social and therapeutic horticulture for people with mental health difficulties. These investigations have highlighted possible wellbeing benefits. Fieldhouse (2003) reported participants experiences of social and therapeutic horticulture were consistent with both Kaplan's (1995) attention restoration theory and flow; a subjective psychological state accompanying absorption in an activity, characterised by self-motivation, enjoyment and feelings of self-worth and competence (Csikszentmihalyi, 1990). Flow is associated with eudaimonic wellbeing (Waterman, Schwartz & Conti, 2008; Waterman et al., 2003). The literature on social and therapeutic horticulture reports common themes of facilitating wellbeing in individuals with mental health difficulties through an affirming and inclusive social milieu, the development of skills and social networks, and the restorative environment (Diament & Waterhouse, 2010; Fieldhouse, 2003; Galvin, Sharples, Hume & Dumbrell, 2000; Sempik, Aldridge & Becker, 2003).

Similar themes have been reported in non-clinical populations. Milligan, Gatrell and Bingley (2004) identified a sense of satisfaction, achievement and aesthetic pleasure experienced by older allotment gardeners. Community gardeners reported nutritional benefits of consuming produce from the garden, increased exercise, improved mental health and increased community cohesion (Kingsley, Townsend & Henderson-Wilson, 2009; Wakefield, Yeudall, Taron, Reynolds & Skinner, 2007). Fathers have reported developing

stronger relationships with their children through spending time together on the allotment (Mason & Conneeley, 2012).

Quantitative research is sparse, but indicates allotment gardening may benefit hedonic wellbeing. A study of allotment holders in the Netherlands reported that gardening was significantly better than reading as an activity for reducing stress (measured using salivary cortisol levels) and improving positive mood (van den Berg & Custers, 2011). Van den Berg, Winstrum-Westra, de Vries and van Dillen (2010) found that older allotment gardeners scored better than a control group of their neighbours on measures of life satisfaction and loneliness. There were no significant differences between younger allotment gardeners and controls, which van den Berg et al. attributed to older gardeners being more active on their allotments.

The Present Study

Partridge (2010) emphasised the need for both qualitative and quantitative research into the health benefits of allotment gardening, which could support projects to promote wellbeing and provide a wider range of treatment options for people with mental health difficulties. The present study aimed to investigate the relationship between allotment gardening and both hedonic and eudaimonic wellbeing in a sample of allotment gardeners from the UK. It has been proposed that wellbeing benefits of nature contact are related to increased feelings of connectedness to nature, therefore this was also investigated. The theme of social connection has been cited in much of the previous research in this area, the current study explored whether allotment gardeners display a preference for solitude or socialisation.

Hypotheses

The following hypotheses were proposed in this study:

1. Participants who have been allotment gardening for longer and those who spend greater amounts of time on their allotment will report higher levels of connectedness to nature.
2. Participants who have been allotment gardening for longer and those who spend greater amounts of time on their allotment will report higher levels of wellbeing.
3. Feeling connected to nature will mediate the relationship between time spent on the allotment and wellbeing outcomes.
4. Allotment gardeners will report significantly higher scores on measures of wellbeing than the general population.
5. An association will exist between preference for solitude and time spent on the allotment.
6. Allotment holders will report a positive impact of time spent on their allotment on their wellbeing.

Method

Design

A mixed-methods design was utilized, employing a cross-sectional online survey to administer measures of connectedness to nature, preference for solitude, eudaimonic wellbeing and subjective wellbeing, and including open-ended questions to capture wellbeing benefits other than those measured. Allotment gardeners' scores on wellbeing measures were compared with scores reported in the general population.

Participants

One hundred and seventy one allotment gardeners took part in this study. The mean age of participants was 50 years (range = 24-78 years). Twenty-four per cent lived in the centre of a town or city, 55% lived in the suburbs and 21% lived in a rural area. The mean length of time allotment gardening was 7 years (range = 0-44 years). On average, participants spent 12 hours on their allotments in the summer (range = 1-50 hours) and 4 hours in the winter (range = 0-40 hours). The majority of time at the allotment was spent on gardening and maintenance activities (mean = 72%). Participants spent an average of 9% of their time on activities such as sitting, reading and enjoying their allotments; 8% on social activities; 2% on administrative activities and 3% on other activities.

Seventy-eight per cent of allotment gardeners engaged in physical activities other than those undertaken on their allotments. Seventy-nine per cent engaged in other gardening activities and 83% reported taking part in cultural activities, such as going to the theatre, concerts and galleries. Sixteen per cent of participants responded "yes" to the question "Are you currently ill?"

Table 1 below shows the social and demographic characteristics of participants.

Table 1. Social and demographic characteristics of participants.

	Frequency	**Percentage**
Age in years (n=168)		
18-30	6	3.5
31-40	31	18.1
41-50	56	32.7
51-60	40	23.4
61-70	31	18.1
71+	4	2.3
Gender (n=171)		
male	55	32.2
female	116	67.8
Ethnicity (n=168)		
White	165	96.5
Indian	1	0.6
Other	2	1.2
Marital status (n=167)		
Single/separated/divorced/widowed	42	24.6
Married or living as married	125	73.1
Education level (n=168)		
Secondary	24	14
Tertiary	145	84.8
Employment status (n=171)		
Full-time work	81	47.4
Part-time work	30	17.5
Student	4	2.3
Retired	30	17.5
Unemployed	9	5.3
House person	4	2.3
Other	13	7.6
Household income (n=160)		
< £5,000	10	5.8
£5,000 - £14,999	19	11.1
£15,000 - £29,999	45	26.3
£30,000 +	86	50.3

Measures

A copy of the online survey can be found in Appendix C. Responses to all measures (excluding demographic and open-ended questions) were given on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree), items were reverse scored where appropriate, and scores were summed to provide a total for the scale, unless otherwise indicated below.

Gardening and activity questions. The first page of the survey included questions about gardening and other activities participants were involved in. Participants were asked how long they had been allotment gardening, how much time they spent on their allotment in both summer and winter, and what percentage of their time they spent on various activities on the allotment (gardening and maintenance; sitting, reading and enjoying; social activities; administrative activities; other activities). Participants were also asked whether they participated in other gardening, physical or cultural activities, and how frequently.

Connectedness to Nature. The Connectedness to Nature Scale (Mayer & Franz, 2004) was used to measure nature connectedness. It was designed to measure trait levels of feeling connected to the natural world. It contains 14 items which investigate the extent to which participants see themselves as part of the natural world and feel emotionally connected to it. Example items are "I think of the natural world as a community to which I belong" and "I often feel part of the web of life". Participants are instructed to answer the questions in terms of how they generally feel, that there are no right and wrong answers, and to state honestly and candidly what they are presently experiencing.

Mayer and Franz (2004) examined the reliability and validity of the Connectedness to Nature Scale in five studies. They reported good internal consistency (α=0.84) and test-retest reliability ($r = .78$, $p < .01$). Scores were shown to correlate with other measures of the extent to which individuals see themselves as part of the natural world, including the New

Ecological Paradigm Scale (Dunlap, Van Liere, Mertig & Jones, 2000) and the Inclusion of Nature in Self Scale (Shultz, 2001).

Eudaimonic Wellbeing. The Questionnaire for Eudaimonic Wellbeing (Waterman et al., 2010) is 21-item scale that was developed to measure eudaimonic aspects of wellbeing. Items assess six aspects of eudaimonic wellbeing: self-discovery ("I believe I have discovered who I really am"); perceived development of one's best potentials ("I believe I know what my best potentials are and I try to develop them wherever possible"); a sense of purpose and meaning ("I can say that I have found my purpose in life"); investment of significant effort in pursuit of excellence ("I feel best when I am doing something worth investing a great deal of effort in"); intense involvement in activities ("I find I get intensely involved in many of the things I do each day") and enjoyment of activities as personally expressive ("It is more important that I really enjoy what I do than that others are impressed by it"). Participants are instructed to respond according to how things are actually going, rather than how they wish them to be.

The Questionnaire for Eudaimonic Wellbeing was validated on two ethnically diverse samples of college students from across the United States (a total of 7,334 students) and was found to have good internal consistency (α=0.86). Scores were found to correlate with other measures of identity commitment and wellbeing (Waterman et al., 2010).

Preference for Solitude. Four items from Burger's (1995) Preference for Solitude Scale were included to investigate allotment gardeners' preference for solitude or socialisation. The Preference for Solitude Scale contains pairs of statements and participants are asked to select the one that describes them best from each pair. Items enquire about the extent to which participants prefer to spend time alone or with others, for example "I try to structure my day so that I always have some time to myself" or "I try to structure my day so

that I always am doing something with someone." Burger (1995) reports the scale has adequate internal consistency ($\alpha = .73$) and test-retest reliability ($r = .72$).

Subjective Wellbeing. The WHOQOL-BREF (WHOQOL Group, 1998), a measure of quality of life, is often used as a measure of subjective wellbeing (Hawthorne, Herrman & Murphy, 2006). Quality of life is defined as: "An individual's perception of their position in life, in the context of the culture and value systems in which they live, and in relation to their goals, expectations, standards and concerns" (WHOQOL Group, 1995, p. 1404). A review of the theoretical and methodological development of the concepts of subjective wellbeing and quality of life found them to be virtually synonymous (Camfield & Skevington, 2008), therefore the WHOQOL-BREF is used here as a measure of subjective wellbeing.

The WHOQOL-BREF provides a measure of quality of life across four domains: physical (activities of daily living, energy levels, mobility, pain and discomfort, sleep and rest); psychological (body image and appearance, positive and negative feelings, spirituality, self-esteem, thinking and concentration); social (social support, personal relationships and sexual relationships) and environment (financial resources, physical environment, safety and security, health and social care, participation in leisure activities). The WHOQOL-BREF is a well-established measure, a British version of the instrument has been developed and population norms are available (Skevington & McCrate, 2012).

The WHOQOL-BREF contains 26 items enquiring "how much", "how often", "how completely", "how good" or "how satisfied" the respondent felt over the last two weeks, for example, "How much do you feel that pain prevents you from doing what you need to do?", "How satisfied are you with your personal relationships?". Items are answered on a five-point Likert scale with higher scores reflecting increased satisfaction or ability to experience things. Scores for each domain are computed by taking the mean of items comprising that

domain. Domain scores are then transformed to scale scores using the following formula: Scale score = (domain score – 4) x (100/16).

Psychometric properties of the WHOQOL-BREF were investigated in a sample of over 11,000 adults from 23 countries. The WHOQOL-BREF was shown to have good internal consistency (α =.68 - .82) and performed well in tests of validity (Skevington, Lofty & Connell, 2004).

Demographic questions. A number of demographic questions are included in the WHOQOL-BREF, copyright stipulations require that the questionnaire is not altered in any way, therefore further demographic questions relevant to this study were included separately at the end of the online survey.

Qualitative questions. At the end of the survey participants were given an opportunity to state in their own words why they took up allotment gardening and how they felt it benefited them. Three specific questions were asked: "Why did you take up allotment gardening?" "What do you enjoy most about allotment gardening?" and "How do you think allotment gardening impacts your wellbeing?"

Procedure

Piloting the survey. The survey was hosted by Bristol Online Surveys. Prior to going live it was piloted with three people, two of whom were allotment gardeners. Feedback about the experience of completing the survey was generally positive. Two people indicated that they did not like the response scale for the preference for solitude measure, one commented "I found the black-white nature of the solitude questions a bit irritating and wanted a middle ground, because I didn't feel either reflected me". Following this feedback it was decided to change the format of responses to these questions to a five-point Likert scale on which participants could indicate the extent to which they agreed or disagreed with each statement.

Ethics approval. Ethics approval was granted by the Social and Applied Sciences Ethics panel at Canterbury Christ Church University (see Appendix D). The first page of the survey provided information about the research and contact details in case of questions or concerns. Participants were informed that they could withdraw from the survey at any time and their responses would not be used. Participants indicated their consent before progressing onto the survey. An incentive of entering a prize-draw to win one of two £25 vouchers for an online gardening supply company was offered to participants, they were asked to provide their email address if they wished to be included in the prize draw. Survey data were stored anonymously; identifying information, including email addresses, were removed before transferring the information into a spread sheet on a password protected computer, to which only the lead researcher had access. There was an option to request a final report by emailing the lead researcher. A copy of the report was sent to the ethics panel that approved the study and is included in Appendix E.

Recruitment of participants. Participants were recruited through allotment gardeners' associations and online allotment gardeners' groups and forums. Regional representatives of the National Allotment Society and representatives of allotment associations were contacted via email and informed about the research. They were asked if they would be willing to forward an email containing a link to the survey to group members. Moderators of online forums were approached with a request to post information about the project on their site, those that agreed included a number of facebook groups and an online forum called 'Down the Allotment'. A copy of the recruitment advert is included in Appendix F.

Data collection. Data collection took place between September and November of 2012. Two hundred and twenty two people started the survey, 209 proceeded to the second page (the Connectedness to Nature Scale) and 199 continued onto the third page (the Questionnaire for Eudaimonic Wellbeing). A further 4 participants dropped out on the

preference for solitude page, 13 on the WHOQOL-BREF page and 11 on the demographic information page. A total of 171 allotment gardeners completed the survey. Only data from complete surveys were used in the analysis.

Data Analysis

Quantitative analysis. Statistical analyses were primarily conducted using SPSS version 19 (version 20 was used to conduct robust t-tests). Box-plots were used to check the data for outliers. Exploratory analyses were undertaken to check that the distributions of variables met parametric assumptions, through examining histograms and P-P plots, calculating z scores for skewness and kurtosis, and use of the Kolmogorov-Smirnov test. Where data did not meet parametric assumptions, non-parametric alternatives or robust tests were used, as recommended by Field (2009).

Relationships between demographic, independent and dependant variables were explored using bivariate, biserial and point-biserial correlations, as appropriate, to check for potential confounders. Bivariate correlations using Spearman's rho (r_s) were calculated to investigate relationships between predictor and dependent variables. Two-tailed tests were employed to investigate the relationship between preference for solitude and other variables, all other correlations were one-tailed.

Differences between wellbeing scores reported by allotment gardeners and those reported in the literature for the general population were investigated using one-sample t-tests. Skevington and McCrate (2012) reported average scores for each WHOQOL-BREF domain in samples of both healthy individuals and people with various health conditions in the UK. Mean scores reported by allotment gardeners in this study were compared with those reported for healthy individuals (N = 1324-1328). Scores on the WHOQOL-BREF did not meet parametric assumptions in this study, therefore robust t-tests were carried out employing bootstrapping. Bootstrapping allows the shape of the sampling distribution to be estimated

through generating smaller samples and statistics of interest from the data. Bootstrapping analyses were performed using 10,000 samples and bias corrected and accelerated confidence intervals [BCa CI] (Hayes, 2009).

A series of regression equations were used to test whether connectedness to nature mediated the relationship between time on the allotment and wellbeing, following the causal steps strategy outlined by Baron and Kenny (1986). Mediation exists when an independent variable affects a dependent variable indirectly, through an intervening variable. In order for mediation to have occurred, there must be a relationship between the independent and dependent variables (path c), the independent variable must significantly influence the mediator (path a), the mediator should significantly influence the dependent variable (path b), and when the mediator is controlled for the relationship between the independent and dependent variables (path c') should be eliminated (full mediation) or reduced (partial mediation).

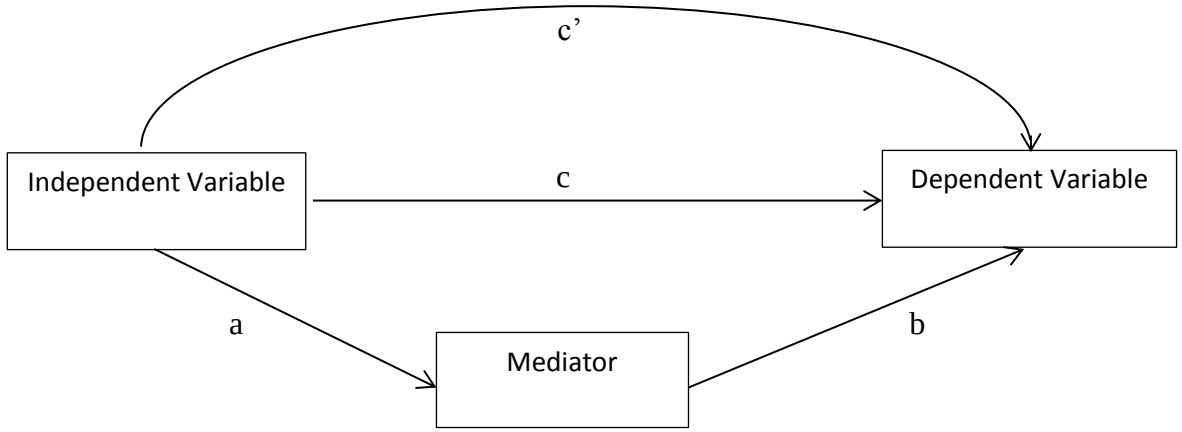

Figure 1. Representation of a mediation model.

Although Baron and Kenny's method is often used, it has been criticised due to the possibility of Type 1 and Type II errors occurring (MacKinnon, Lockwood, Hoffman, West & Sheets, 2002; Preacher & Hayes 2004). Preacher and Hayes (2008) recommend

bootstrapping as a method of testing for indirect effects, an approach that has more power and reasonable control over Type 1 error rates. A SPSS macro described by Preacher and Hayes (2008) was therefore used to bootstrap the indirect effects of time spent on the allotment on wellbeing.

Power analyses. Power calculations for regression analysis were made using methods outlined in Field (2009). For a regression analysis with two predictors, Green (1991) recommended a minimum sample size of 106. Miles and Shevlin (2001) recommended that to achieve a medium effect size (.5), with a high level of power (.8; Cohen, 1988), a minimum sample size of 70 was required. To conduct an independent samples t-test with a medium effect size and a high level of power, 51 participants were needed. All of these requirements were met.

Qualitative analysis. An inductive thematic analysis of responses to open-ended questions was conducted. The analysis followed the six phases outlined by Braun and Clark (2006): 1) responses were collated and read by the author in order to become familiar with the data; 2) initial codes were generated; 3) codes were sorted into potential themes; 4) themes were reviewed in relation to both the coded extracts and the data set as a whole; 5) themes were further refined and named; 6) a report of the analysis was produced. As part of quality assurance supervisors reviewed coding and theme development.

Results

Exploratory Analyses

Parametric assumptions. The Kolmogorov-Smirnov test showed that two measures met parametric assumptions, the Connectedness to Nature Scale and the Questionnaire for Eudaimonic Wellbeing. The preference for solitude measure, $D(171) = 0.07$, $p < 0.05$, and the four quality of life domains; physical, $D(171) = 0.12$, $p < 0.01$; psychological, $D(171) = 0.12$, $p < 0.01$; social, $D(171) = 0.13$, $p < 0.01$ and environmental, $D(171) = 0.11$, $p < 0.01$, were all significantly non-normal. Histograms of these measures alongside z scores for skewness and kurtosis can be found in Appendix G. Responses to questions about the amount of time spent on the allotment did not meet parametric assumptions.

Internal consistency of measures. Cronbach's alpha was calculated to estimate the internal consistency (the degree to which each item of a measure measured a latent construct) of measures in the current study. Kline (1999) suggests that an alpha value of 0.7 or above represents adequate internal consistency, all met this threshold (Connectedness to Nature Scale: $\alpha = .85$; Questionnaire for Eudaimonic Wellbeing: $\alpha = .82$; preference for solitude: $\alpha = .76$; WHOQOL-BREF physical: $\alpha = .82$; psychological: $\alpha = .8$; social: $\alpha = .71$; environmental: $\alpha = .79$).

Demographics. To calculate biserial and point-biserial correlations, variables which were nominal or ordinal in nature were transformed into dichotomous variables. Six demographic variables were transformed: relationship status (married or living as married/other), ethnicity (British/other), employment status (in full or part-time work/ other), household income (under £30,000/over £30,000), education level (up to secondary school/ further or higher education) and location of home (urban or sub-urban/rural). Frequencies of engaging in physical or other gardening activities were also recoded (at least weekly/less than

weekly), as was the frequency of engaging in cultural activities (at least monthly/less than monthly).

Relationships with predictor variables. Length of time as an allotment gardener was positively associated with age ($r_s = .34$, $p < .01$). Hours spent on the allotment were associated with relationship status ($r_b = -.21$, $p < .05$ summer; $r_b = -.27$, $p < .01$ winter), employment status ($r_b = -.2$, $p < .01$ summer), education level ($r_b = -.31$, $p < .01$ summer), income ($r_b = -.37$, $p < .01$ summer; $r_b = .3$, $p < .01$ winter) and participation in other gardening activities ($r_b = .2$, $p < .01$ summer). This indicates that gardeners who spent more time on their allotments were more likely to be single, not in employment, educated up to secondary level, have a lower income and to participate in other gardening activities at least once a week. Greater connectedness to nature was associated with lower income ($r_b = -.23$, $p < .05$) and more time in education ($r_b = .23$, $p < .05$). No other significant relationships were observed between demographic and predictor variables.

Relationships with dependent variables. Increased physical quality of life was related to engaging in other gardening activities ($r_b = .17$, $p < .05$). Higher social quality of life was associated with lower income ($r_b = -.27$, $p < .01$) and identifying as non-British ($r_b = -.44$, $p < .05$). Environmental quality of life was associated with engaging in other gardening activities ($r_b = .27$, $p < .01$), income ($r_b = .24$, $p < .05$) and age ($r_s = .23$, $p < .01$).

Correlational Analyses (hypotheses 1, 2 and 5)

No relationships were observed between the length of time participants had been allotment gardening and outcome measures. Allotment gardeners who spent more time on their plots reported significantly higher connectedness to nature ($p < .01$) and lower social quality of life ($p < .05$). Participants who spent more time on their allotments in summer reported higher preference for solitude ($p < .05$). A significant relationship was observed between connectedness to nature and both eudaimonic wellbeing and psychological quality of

life ($p < .01$). Spearman's correlations between predictor and dependent variables are displayed in Table 2.

Table 2. Correlations between dependent and independent variables.

	Eudaimonic Wellbeing	Physical QOL	Psychological QOL	Social QOL	Environmental QOL	CN	PFS
Years gardening	-0.024	-0.084	0.008	-0.12	0.084	0.032	0.025
Hours_summer	0.091	0.095	-0.026	-0.155*	-0.104	0.205**	0.189*
Hours_winter	0.021	-0.026	-0.061	-0.15*	-0.096	0.131**	0.129
CN	0.486**	0.078	0.18**	0.065	0.091	-	0.132
PFS	-0.019	-0.09	-0.147	-0.08	-0.039	0.132	-

Note: *p< 0.05, **p< 0.01
CN: connectedness to nature; PFS: preference for solitude; QOL: quality of life

Mediational Analyses (hypothesis 3)

Scores on the Connectedness to Nature Scale were significantly associated with time spent on the allotment and scores on the Questionnaire for Eudaimonic Wellbeing and the WHOQOL-BREF psychological scale, therefore mediational analyses were performed to investigate whether connectedness to nature mediated the relationship between time spent on the allotment and each of these outcome variables. Time spent on the allotment in summer was used in these analyses as most allotment activity occurs in summer and the correlation with connectedness to nature was greater than for winter.

Predictor variables were not substantially correlated ($r > .9$), tolerance and VIF statistics also confirmed that multicollinearity was not a concern. Casewise diagnostics showed that residuals were within acceptable limits, indicating the data represented a fairly accurate model. Mahalanobis distances for two cases were just outside acceptable limits (Barnett & Lewis, 1978) indicating that these cases were outliers. However, the values of Cook's distances and DFBeta statistics for these two cases were less than one, indicating that they did not unduly influence the model. Histograms and P-P plots indicated a normal

distribution of residuals, and assumptions of linearity and homoscedasticity appeared to be met.

Psychological quality of life. Regression analysis indicated that scores on the Connectedness to Nature Scale significantly predicted psychological quality of life ($\beta = .16$, $t = 2.12$, $p < .05$). However, time spent on the allotment did not ($\beta = .01$, $t = .08$), therefore the conditions for mediation were not met and the analysis was not performed.

Eudaimonic wellbeing. In the first step of the regression analysis time on the allotment was shown to be a significant predictor of connectedness to nature (path a; $R^2 = .07$). In the second step connectedness to nature was found to significantly predict eudaimonic wellbeing (path b; $R^2 = .23$). In the third step, time on the allotment was also shown to significantly predict increased eudaimonic wellbeing scores (path c; $R^2 = .06$). In the final stage of the analysis (path c') time on the allotment and connectedness to nature were entered together as predictors of eudaimonic wellbeing. As can be seen in Table 3 below, when connectedness to nature was entered as a mediator, the relationship between time on the allotment and eudaimonic wellbeing was reduced to non-significance, suggesting that full mediation had occurred (Baron & Kenny, 1986).

Table 3. Regression analyses to test whether connectedness to nature mediated the relationship between time on the allotment and eudaimonic wellbeing.

	β	**S.E.**	**T**	**sig**
Path a	0.27	0.06	3.7	0.000
Path b	0.48	0.08	7.05	0.000
Path c	0.25	0.68	3.41	0.001
Path c'	0.13	0.06	1.91	0.058

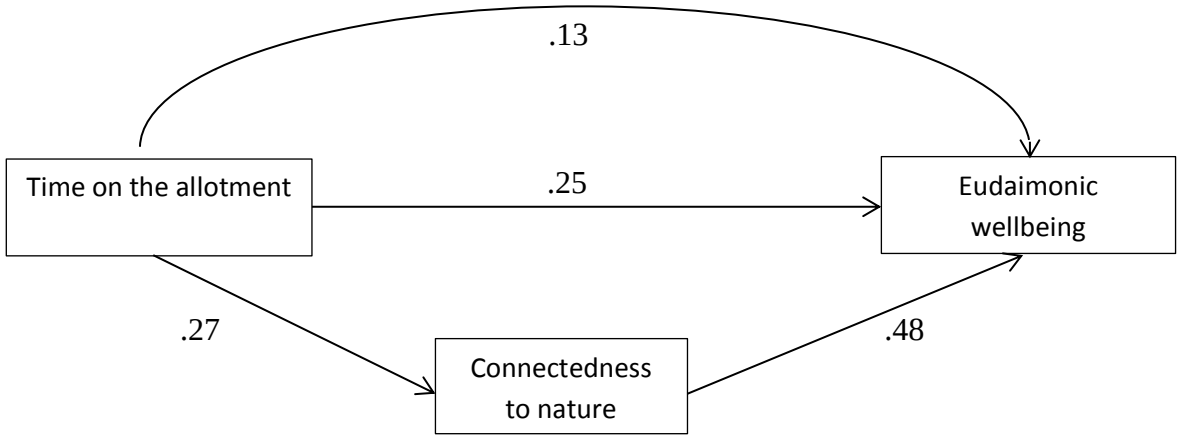

Figure 2. Results of mediation analy*ses. Values shown are standardised β coefficients*.

A test for the significance of the indirect pathway using bootstrapping supported these results, showing a significant difference between c and c' ($Z = 3.21$, $p < .001$, 95% BCa CI .06 - .18).

Comparison of Means (hypothesis 4)

The table below displays outcomes of robust t-tests comparing mean scores on wellbeing measures in this study to those reported in the literature for the general population. Allotment gardeners' mean social quality of life score was significantly lower ($p < .05$) than the mean reported by Skevington and McCrate (2012), although the effect size was small. Mean environmental quality of life was significantly higher ($p < .01$), with a medium effect size. The mean of the Questionnaire for Eudaimonic Wellbeing was significantly higher ($p < .01$) than that reported by Waterman et al. (2010), representing a large effect size; however, some caution must be used when interpreting this result as the mean reported by Waterman et al. was taken from a sample of college students in the United States.

Table 4. Outcome of robust t-tests.

	Mean (this study)	SE	Bca CI	Mean (comparison)	t(170)	r
Physical QOL	76.32	1.29	73.79 - 78.86	76.49	-0.13	0.01
Psychological QOL	68.64	1.23	66.16 - 71.13	67.82	0.67	0.05
Social QOL	67.01	1.53	64.04 - 68.88	70.52	-2.29	0.17
Environmental QOL	72.44	1.15	70.18 - 74.63	68.2	3.7	0.27
Eudaimonic WB	78.66	0.63	76.94 - 79.42	54.65	37.49	0.94

Note: *p< 0.05, **p< 0.01, ***p< 0.001
QOL: quality of life; WB: wellbeing

Thematic Analysis (hypothesis 6)

Four broad themes emerged from the data and are described below. Thematic maps and further examples are included in Appendix H.

1. My space. This theme related to the increased physical space having an allotment provided participants and what this enabled participants to do. An important aspect of the theme was a sense of ownership of the allotment and the autonomy this allowed, through having choice of food variety and production methods. The allotment also provided a space to get away from every life to relax, unwind and reflect.

> P3: *"...always wanted a space to grow plants and build a shed and be away from everyday life. I can be alone and relax and it's my space to create a garden that I enjoy."*

> P1: *"...* A little piece of land that is all mine, a little piece of peace and quiet that is all mine and the pleasu*re of growing something to eat."*

> P155: *"*I think we all need to feel we have some control over some aspect of our lives and I'm in charge of my allotment plot.*"*

2. Feeling connected. Connectedness emerged as a theme across several domains: feeling connected to nature; connected to family (through spending time together on the allotment); to the past (particularly to childhood experiences of gardening) and to the diverse community on the allotment.

> P12:*"*Having an allotment has changed my life for the better, I now have a social life, *new friends…*all families should have an allotment, and you *'*re putting something back *into the community."*

> P78: *"*I love the smell of nature, its colours and sound. I feel lucky I am able to be in contact with the insects, birds, foxes and frogs. I like the process of the seeds getting into plants.*"*

> P132: *"*The lifestyle it brings, we get out to the plot once a day, with the kids, and work together. I can teach my daughter about where food comes from, about nature and the seasons.*"*

> P102: *"*My dad always had one when I was a child and I loved being there with him.*"*

3. Health. A number of participants described the benefits to physical health of increased exercise, access to fresh air and eating healthy food from the allotment. Benefits to mental health were also reported, such as improved mood. Some participants described how having an allotment aided their recovery from physical or mental illness.

> P111: *"*Keeps me fit - digging, weeding move muscles that I wouldn't necessarily use in the gym*"*

> P71: *"*It makes me feel happy. I am so energized & inspired by even a short time spent in the allotment. It clears my mind, and sometimes if I am down, it completely eliminates feelings of despair.*"*

> P11: *"*As a sufferer of mental illness, the allotment gives me something to focus on, it keeps my mind and body active in a positive way. I have spent my entire life unable to sleep or concentrate for very long, I do not cope with social situations very well. Since I have had my plot I am so tired from the physical work I sleep very well, and can concentrate because my mind isn*'t as hyper active…*now all I think about is my plot waiting for me, my heaven, my creation and I instantly feel better because there is something worth being alive for*"*

> P42: *"*Four years ago I was critically ill *recovering from a brain tumour…recovering* from the surgery I needed was very hard and seemed like a mountain at times, the allotment gave me a pla*ce to reach, a goal to achieve…*I don't think I would be as well as I am today if I hadn't had the plot.*"*

4. Meaningful Activity. A number of participants reported that their allotment gave them a focus or a sense of purpose. For some this was to eat better food or save money, others felt it was an activity aligned to their values (such as living more sustainably). Growing your own food was described as a positive challenge and an opportunity for learning

and skill development. Participants talked about the joy of gardening and described feelings of accomplishment and satisfaction from seeing their hard work come to fruition.

> P28: *"*Gives me a purpose, something to get out of bed for, an excuse for not having a television, pleasure of planting a seed and watching it grow into something you can eat feels good.*"*
>
> P154: *"*There is a certain sense of achievement walking up the garden path with a basket full of beautiful fruit and veg that goes straight into the kitchen to be prepared for dinner. You really appreciate the fruits of your labour and feel like you are giving something back, (if only something tiny) by knowing it has come a few foot to the dinner plate instead of hundreds of miles.*"*
>
> P115: *"Sitting and looking at the work I've done! A*lso picking things and eating them that even*ing and saying 'I grew that!'"*
>
> P36: *"I*t feeds my soul! I love planting, tending, harvesting, planning, weeding, composting, learning about new plants and new gardening techniques. I feel pride in *what I grow."*

Discussion

A significant relationship was observed between hours participants spent on their allotments each week in both summer and winter and connectedness to nature, providing some support for hypothesis one. Time spent on the allotment was not positively associated with wellbeing outcomes and a significant negative relationship was observed between hours on the allotment and social quality of life scores, indicating that time on the allotment is associated with poorer subjective wellbeing in the social domain. Correlational analysis did not support hypothesis two; however, regression analysis revealed that time on the allotment in summer was a significant predictor of eudaimonic wellbeing and this relationship was fully mediated by connectedness to nature, providing some support for hypothesis two and fully supporting hypothesis three. Time on the allotment in summer was associated with greater preference for solitude, supporting hypothesis five.

A comparison of mean scores on wellbeing measures in this study with those reported for the general population partially supported hypothesis four. Allotment gardeners reported significantly lower social quality of life, but higher environmental quality of life and eudaimonic wellbeing. The difference in eudaimonic wellbeing scores was highly significant ($p < .001$); however, this should be interpreted with caution as populations were of different ages and nationalities.

In responses to open-ended questions the vast majority of participants reported that allotment gardening supported their wellbeing. The benefits of allotment gardening described by participants included participation in meaningful activity, providing purpose, challenge and a sense of accomplishment; increased feelings of connectedness to others and to the natural world; a space of one's own, allowing greater control over food and a place to get away and reflect; and improved physical and mental health.

Subjective Wellbeing

This study did not find convincing evidence that allotment gardening improves hedonic aspects of wellbeing. This may explain why van den Berg et al. (2010) did not find that younger allotment gardeners reported greater wellbeing than controls, as measures of hedonic wellbeing were used. Van den Berg et al. did report improved life satisfaction in older allotment gardeners. In the current study greater satisfaction was reported within the environment domain only, which encompasses physical surroundings, access to relaxation and leisure activities, and opportunities to learn and develop skills. Higher scores on this scale were congruent with the qualitative descriptions of benefits of allotment gardening. Sixteen per cent of participants in this study reported that they were currently ill; differences in subjective wellbeing scores may have been minimised as the comparison sample was comprised of healthy individuals.

A surprising outcome of this study was the negative association between time on the allotment and social quality of life scores, which were also significantly lower than scores reported by healthy individuals in the general population. This was unexpected given that a connection with other gardeners was an often cited benefit of allotment gardening in previous studies. The social domain of the WHOQOL-BREF is comprised of fewer items than other domains; satisfaction with personal relationships, sex and support from friends are assessed in three questions. Correlational analysis indicated that spending more time on the allotment was associated with not being in a relationship, this may have contributed to lower social quality of life scores for participants who spent greater amounts of time on their allotment. In addition, time on the allotment in summer was associated with a greater preference for solitude. It is feasible that individuals who preferred to be alone spent less time cultivating relationships and derived less satisfaction from this area.

Eudaimonic Wellbeing

Central to the theory of eudaimonia is choosing life goals that provide meaning and purpose, the motivation for which is the value inherent in the activity, rather than the subjective experiences accompanying it. Eudaimonic activities are likely to involve the investment of a great deal of effort and make full use of an individual's skills and talents (Waterman et al., 2010). Qualitative data suggested that allotment gardening provided such an activity for participants in this study, as well as an opportunity for the basic psychological needs described in self-determination theory, for autonomy, competence and relatedness, to be satisfied. Quantitative findings indicated that time on the allotment predicted eudaimonic wellbeing and allotment gardeners' eudaimonic wellbeing scores were significantly higher than those reported in the literature. Taken together, these findings suggest that allotment gardening may positively impact eudaimonic wellbeing.

A number of participants described their passion for gardening or a love of being in nature and seeing things grow. An important aspect of eudaimonic activity is that it is personally meaningful and is in keeping with the talents, abilities and preferences of the individual. Engaging in a eudaimonic activity is an act of self-expression (Waterman et al., 2010). Therefore, although benefits to eudaimonic wellbeing have been observed in this study, these benefits may only be possible if allotment gardening is an activity consistent with one's talents and potentials. It emerged from the qualitative data that allotment gardening can support wellbeing in a number of ways, including through physical activity, contact with nature, social connection, escape from the pressures of daily life and the sense of accomplishment in growing one's own food. The allotment is a versatile environment which has the potential to appeal to a variety of people in different ways.

Connectedness to Nature

Results of this study support the literature documenting an association between connectedness to nature and eudaimonic wellbeing (e.g. Cervinka et al., 2012; Nisbet et al., 2011; Weinstein et al., 2009). Connectedness to nature was also associated with psychological quality of life scores, a measure of subjective wellbeing encompassing positive and negative feelings, self-esteem, thinking and concentration, and body image. Connectedness to nature mediated the relationship between allotment gardening and eudaimonic wellbeing, and is a possible mechanism through which allotment gardening can impact wellbeing. It emerged from qualitative data that connectedness to nature was a valued aspect of allotment gardening.

Preference for Solitude

Participants who spent more time on their allotments in summer reported greater preference for solitude. Preference for solitude has been conceptualised in both positive and negative ways. It has been linked to social anxiety (Burger, 1995) and also associated with inner peace, spirituality, creativity and problem solving (Long, Seburn, Averill & More, 2003). Maslow (1970) suggested the need for solitude is a characteristic of a self-actualised person. The allotment may provide a space to engage with more positive aspects of solitude, some of which were described by participants. The lack of relationship between preference for solitude and wellbeing may relate to the fact that there are different reasons people prefer to be alone.

Limitations

There are a number of limitations to the current study. Firstly the study relied on self-report measures, which are susceptible to unrepresentative reporting due to social desirability, acquiescence or fatigue. These issues may be further exacerbated when research is conducted over the internet as the researcher has no control over the conditions under which the

questionnaires are completed or the identity of participants (Hewson, Yule, Laurent & Vogel, 2003).

Another potential issue with internet research is the representativeness of the sample, as only those allotment gardeners with access to the internet, who utilised online gardening forums (through which recruitment occurred), will have had the opportunity to participate in this study. Participants did not represent a diverse group with regard to ethnicity as 96% identified as white. Two thirds of participants were female, half reported having a household income above £30, 000 annually and 85% were educated to tertiary level. Given these characteristics, the current sample is not representative of the population as a whole and the generalizability of the results is limited. A number of participants dropped out of the study before completing the survey, those who completed may have specific attributes, such as a desire to promote allotment gardening, that introduce further bias into the research.

Much of the current research was correlational in design, therefore assumptions about causation cannot be drawn. Mean scores on some measures were compared with those reported in the general population, but caution must be taken when interpreting these findings as populations may not be directly comparable, and participants were not randomised into allotment gardener and control groups. The validity of the preference for solitude measure used in this study has not been thoroughly investigated, therefore conclusions related to this measure are limited.

Implications

No associations between years of allotment gardening and outcome measures were observed in this study. This finding is encouraging as it suggests that wellbeing may be impacted through spending time on an allotment over the short-term, and does not require years of gardening experience.

Allotment gardening necessitates both access to a plot and a significant investment of time. Ways of making it more accessible require consideration, through allotment sharing projects, offering allotment gardening on prescription, or incorporating allotment activities into therapy, for example.

Results of this study suggest that increasing connectedness to nature may have a positive impact on wellbeing. There are a number of simple adaptations to therapeutic work which have the potential to improve connectedness to nature, such as increasing access to green space for mental health clients, keeping plants in therapy rooms or using nature-orientated guided imagery with clients. Eco-psychologists have advocated asking clients about their relationship with the natural world as part of a comprehensive assessment (Milton, 2009) and conducting therapeutic sessions outdoors (Priest, 2007).

There is much scope for further research into allotment gardening interventions and interventions to increase connectedness to nature. A randomised controlled trial comparing an allotment gardening intervention with a talking therapy would provide important information about the therapeutic value of allotment gardening and permit stronger conclusions about the impact of allotment gardening to be drawn. Greater understanding of aspects of allotment gardening that confer wellbeing benefits would be valuable, future research could compare outcomes for solitary allotment gardeners with those who share a plot or engage in community gardening to investigate the impact of socialising on the allotment.

Conclusions

This study investigated the wellbeing of allotment gardeners. A relationship between allotment gardening and hedonic wellbeing was not supported; however, there was support for a relationship between spending time on an allotment and eudaimonic wellbeing. Allotment gardeners' scores on a measure of eudaimonic wellbeing were significantly higher than those reported in the literature and spending more time on the allotment during the summer predicted higher eudaimonic wellbeing. Qualitative data also suggested an association between allotment gardening and eudaimonic wellbeing, through descriptions of allotment gardening as a meaningful activity which supports basic psychological needs for autonomy, competence and relatedness. The relationship between time on the allotment and eudaimonic wellbeing was mediated by increased feelings of connectedness to nature. Conclusions that can be drawn from this study are limited due to the lack of control group and sampling bias.

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Section C

Critical Appraisal

Word Count: 1986

1. What research skills have you learned and what research abilities have you developed from undertaking this project and what do you think you need to learn further?

Having not conducted any research since completing my undergraduate dissertation over ten years ago, this project was a significant undertaking for me. Learning has occurred at every stage of the process and as a result I have much more confidence in my ability to conduct research in future as part of my professional role. One of the most important things I have discovered though this piece of work is an enjoyment of doing research.

I found the process of developing a research proposal quite challenging, narrowing down from a vast array of possibility to one specific project took a significant amount of time. These choices were somewhat aided by 'real world' limitations, such as finding a supervisor aligned to the area of interest and willing to take on the project. During this stage I learnt the value of discussing ideas with colleagues and other professionals, their input was helpful and opened up new avenues to explore. I considered a number of different project designs, but focusing on the evidence base, and maximising the potential contribution my project could make, helped me focus my ideas.

Once an online survey design had been decided upon, much thought went into choosing appropriate measures. There were some measures which initially appeared a good fit for this project, but were not robust enough or whose underlying constructs had been challenged in the literature. I now feel much more confident in my ability to select appropriate measures. Through writing up research and ethics proposals, I developed sensitivity to ethical considerations relevant to research projects and an understanding of the processes involved in gaining ethical approval.

I have learned some of the technical aspects of conducting online surveys, as well as gained greater understanding of the advantages and disadvantages of the internet as a medium for conducting research. I invested a significant amount of time in re-familiarising myself

with SPSS and statistical analysis from my undergraduate training, and furthering my understanding of the particular areas relevant to the current project, such as regression analysis. I am now able to manage a large data set, screen the data and undertake exploratory analysis, as well as conduct specific statistical analysis. I would like to continue to develop and build on these skills.

I had some experience of conducting a thematic analysis from the Quality Improvement Project I carried out during my first year of training. I was able to apply this learning to a larger data set and gain further experience of qualitative analysis. There are a number of advantages to conducting research online, such as time-efficiency and access to participants from a wide geographical area (Hewson, Yule, Laurent & Vogel, 2003); however, my experience of internet research in this project was that it did not feel very personal, due to the limited contact with participants. Through the process of analysing the qualitative data I felt much more connected to participants in this study, I felt that conducting the qualitative analysis added richness to both the research process and findings. I would like to explore qualitative research further as a result. The qualitative and quantitative aspects of this project complimented each other well and I would certainly utilise a mixed-methods design again.

Finally, conducting this project over an extended time period and balancing the demands of the project with those of clinical and other academic work required development of my planning and time-management skills, which I am sure will be useful in future endeavours.

2. If you were able to do this project again, what would you do differently and why?

I undertook this research project due to my interest in the natural world and how people's relationships with the natural world impact wellbeing. I am not an allotment gardener myself and I have not been involved in growing my own fruit and vegetables. On reflection, I came into this project with a slightly naïve and idealised view of allotment gardening. Contact with allotment gardeners and with the literature on the subject has made me more aware of the difficulties and frustrations inherent in allotment gardening, as well as the joys. If I were to do this project again I might ask a question to more specifically address difficult aspects and negative impacts of allotment gardening. The question asked in the current survey was "How do you think allotment gardening impact your wellbeing?", but the introduction to the open-ended questions section referred to "benefits" of allotment gardening, which may have lead participants to focus on positive impacts only. A question to address challenging aspects of allotment gardening may have added to the understanding of why it is associated with eudaimonic, but not hedonic, aspects of wellbeing.

Before beginning this project I was not familiar with technological aspects of conducting internet research or aspects of website design, so I chose to keep the delivery of the internet survey simple, using an established internet survey tool. However, through investing more time in this aspect of the project (and borrowing on the expertise of others), it could have been possible to build a webpage to host the survey. This would have permitted more control of the look of the survey site, to make it more appealing to allotment gardeners (by including images of allotments, for example). My attempts to add images to the survey site used in this project were abandoned as they did not fit well within the framework of the site and looked unappealing. The ability to add images to the site would have also enabled the incorporation of a single-item measure of connectedness to nature containing Venn diagrams (the Inclusion of Nature in Self Scale; Schultz, 2002) into the survey.

The use of social networking sites for recruitment of participants worked well in this study, if I were to conduct the study again I would have focussed on these sites from the outset and included more networking sites, such as Twitter, to further aid recruitment.

Due to the lack of personal contact in the administration of the internet survey, I received very little feedback from participants about their experience of using the survey. In hindsight, it would have been useful to add a question at the end of the survey to ask participants for feedback. This feedback could have aided my learning and the development of future online projects.

Twenty three per cent of participants dropped out before completing the survey. A pop-up window could have been used to provide non-completers with an opportunity to leave feedback. Basic demographic information could also have been requested in this window to investigate differences between completers and non-completers. Some participants dropped-out close to the end of the survey, inclusion of a visual indicator of survey progress has been recommended for online research (Schonlau, Fricker & Elliot, 2002) and could have encouraged those participants to continue to the end.

3. As a consequence of doing this study, would you do anything differently, in regards to making clinical recommendations or changing clinical practice, and why?

I was interested in this research area because of my own enjoyment of the outdoors and of being in nature. A number of years ago I trained to lead outdoor camping and wilderness expeditions and have worked taking young people outdoors with various organisations, most recently with a community psychology organisation I worked in prior to starting clinical training. However, through immersing myself in both the theoretical and empirical literature on the subject, and conducting this research, I have developed a much more comprehensive understanding of the possible benefits of nature. Undertaking this project has caused me to reflect in more depth on my own experiences of being in nature and how they have impacted me. For example, when reading reports by participants in Hennigan's (2010) study of the therapeutic effect on being in nature for improving body image, I drew parallels with my own experiences of increased feelings of self-acceptance, empowerment and confidence in natural environments. I have also witnessed young people I have worked with relax and seem to flourish in the outdoors and seen natural environments facilitate group cohesion. These factors combined have given me a strong desire to take ideas from ecotherapy forward into my clinical work.

Mind (2007) called for ecotherapy to be recognised as a valid treatment option for people experiencing mental health difficulties. In the current climate this may not be possible in many mental health services, but promoting thinking about alternative ways of working through conversations with colleagues and linking in with organisations such as Ecotherapy UK would be feasible. EcoMinds fund a number of gardening projects and other green interventions, becoming familiar with projects set up locally and increasing awareness of these as a resource for clients would be valuable. This project has made me more aware of getting out in nature as a way of supporting my own wellbeing, in order to better manage the

demands of clinical work. In some cases it may be appropriate to think with clients about their relationship with nature and ways of increasing interaction with nature that may support wellbeing.

Undertaking this project has caused me question some basic assumptions I held about therapy, such as that it has to take place indoors. The Centre for Ecotherapy and Nature Based Psychotherapy run a number of Continuing Professional Development courses, I would be interested to participate in these in future to help think further about how to introduce these ideas into clinical practice.

4. If you were to undertake further research in this area what would that research project seek to answer and how would you go about doing it?

I have considered a number of ideas for further research through the process of this project. Conducting the literature review in Section A highlighted that despite the growing body of evidence suggesting the benefits of interaction with nature, little is currently understood of the mechanisms that mediate this relationship. There are a number of ways these mechanisms could be investigated. A qualitative approach could add depth to our understanding of how the human relationship with nature affects wellbeing (Hinds, 2011). Individuals who spend time in nature could be interviewed about aspects of their experience in nature that contribute to their wellbeing, or asked to keep diaries of their experiences in nature. Diaries and transcripts of interviews could be analysed using a grounded theory approach (Strauss & Corbin, 1998) to build a model of the mechanisms that mediate benefits to wellbeing of exposure to nature.

Alternatively, or subsequently, potential mediators could be investigated individually, using a quantitative approach. Howell and Passmore (2013) suggested that nature affiliation may facilitate an increased sense of social connectedness and fulfil relatedness need more generally. Qualitative findings from the current study provide support for this idea. A study could employ measures of loneliness, social connectedness and general connectedness, administered at baseline and following a nature immersion experience, to investigate these relationships. Much of the research on connectedness to nature reviewed in Section A was cross-sectional, a longitudinal study could further increase our understanding of these relationships and how they change over time.

A randomised controlled trial of an allotment gardening intervention would add much weight to the findings that allotment gardening can support wellbeing. Some participants in the current study reported that working on their allotment improved feelings of low mood and

despair. Allotment gardening activities could be offered to individuals reporting low mood on waitlists for mainstream mental health treatment. Measures of mood and wellbeing could be administered at the point of referral, during and following participation in allotment gardening activities. A control group of waitlist participants not offered an allotment gardening intervention could be included for comparison. This study would provide useful information on the effectiveness of an allotment gardening intervention for individuals experiencing low mood.

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Section D

Appendices

Appendix A

Literature Review Search Methodology

A search was performed on the following electronic databases:

- Ovid Platform: PsycINFO, Medline
- EBSCO Host Platform: CINHAL
- Web of Knowledge: Web of Science

Search terms were chosen based on those used in the literature. The following terms were searched:

natur* adj2 connect* OR environment* adj2 connect* OR natur* adj2 relat* OR environment* adj2 relat*
OR natur* adj2 affiliat* OR environment* adj2 affiliat* OR natur* adj2 affinity OR environment* adj2 affinity

AND

wellbeing OR well-being OR mental health

*indicates truncation

Manual searches of the reference sections of relevant papers and an internet search of 'Google Scholar' were also conducted. The titles and abstracts of studies identified in search results were examined for relevance.

Inclusion and Exclusion Criteria

Studies were included if they were journal articles written in the English language which investigated the relationship between connectedness to nature and wellbeing. Studies which investigated links between environmental identity and wellbeing were excluded from the results. Environmental identity has been described as "the meanings that one attributes to the self as they relate to the environment…ranging from nonexploitative and supportive to exploitative and nonsupportive of the environment." (Stets & Biga, 2003, p. 406). Although there is some indication that environmental identity may be related to connectedness to nature (Hinds & Sparks, 2008; Milton, 2002), they are different constructs.

References

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Appendix B: Table of Studies

Study	Participants	Design	Outcomes Investigated	Main Findings
Cervinka, Roderer & Hefler, 2012	94 (54 female, 40 male, aged 17-82)	correlational	connectedness to nature and current mood	No significant correlation.
	119 (63 female, 56 male, aged 18-80)	correlational	connectedness to nature and satisfaction with life	No significant correlation.
	118 (50 female, 68 male, aged 15-87)	correlational	connectedness to nature, physical wellbeing, psychological wellbeing and environmental quality	When controlling for age and gender, meaningfulness significantly correlated with connectedness to nature, vitality and psychological wellbeing correlated with a single item nature connectedness measure.
	115 (62 female, 53 male, aged 19-79)	correlational	connectedness to nature and personality	
	101 (55 female, 46 male, aged 18-80)	correlational	connectedness to nature, vitality, emotional role-function and mental wellbeing	
Hennigan, 2010	12 women aged 24-54	qualitative study	investigated effect of time spent in nature on body image	Time in nature improved body image by distancing women from cultural context, increasing embodied experiences and supporting connection to nature.
Howell, Dolpho, Pussmore & Buro, 2011	452 psychology students	correlational	connectedness to nature, wellbeing, mindfulness, desirable responding	Psychological wellbeing and social wellbeing were significantly correlated with nature connectedness, when controlling for social desirability. Mindfulness and emotional wellbeing were not correlated.
	275 psychology students	correlational	connectedness to nature, wellbeing, mindfulness, desirable responding, identity	Three connectedness to nature scales were associated with psychological and social wellbeing, two correlated with emotional wellbeing. Significant correlation found between mindfulness and wellbeing.
Ingulli & Lindbloom, 2013	150 (94 female, 54 male, 19 at state university, 29 at private arts college)	correlational	connected to nature and psychological resilience	Overall moderately positive correlation. Significant correlations found at locations associated with high socio-economic status, but not at those associated with low socio-economic status.
Luck, Davidson, Boxhall and Smallbone, 2011	over 1000 residents in 36 neighbourhoods	correlational	wellbeing, connectedness to nature, natural features in neighbourhood (e.g.vegetation, species abundance)	Neighbourhood wellbeing associated with a range of natural features.
Mayer & Franz, 2004	135 adults approached in the community	correlational	connectedness to nature and subjective wellbeing	Small positive correlation between life satisfaction and connectedness to nature.
Mayer, Frantz, Bruehlman-Senecal & Dolliver, 2009	76 students taking a psychology course (51 female, 22 male)	participants asked to reflect in natural or urban settings	attentional capacity, affect, nature connectedness, situational self-awareness, ability to reflect	Connectedness to nature partially mediated effect of condition on wellbeing.
	92 students taking a psychology course (61 female, 28 male, 3 unknown)	randomly assigned to virtual nature, virtual urban or actual nature conditions	attentional capacity, affect, nature connectedness, situational self-awareness, ability to reflect	State nature connectedness a strong mediator of exposure to nature/wellbeing effects.
	64 students taking a psychology course (33 female, 29 male, 2 unknown)	participants randomly assigned to real or virtual nature conditions	attentional capacity, affect, nature connectedness, situational self-awareness, ability to reflect	greater psychological benefits found in actual rather than virtual nature and greater ability to reflect. Some evidence of connectedness to nature as a mediator.

SECTION D: APPENDICES

Study	Participants	Design	Outcomes Investigated	Main Findings
Nisbet & Zelenski, 2011	150 students (85 female, 56 male, 9 unspecified, aged 16-48)	participants randomly assigned to indoor or outdoor walking routes and to be forecasters or experiencers of emotions	positive and negative affect, soft fascination, relaxation, inclusion of nature in self	Walking outdoors produced better moods than walking indoors. Participants did not anticipate difference in mood in different conditions.
	80 students		positive and negative affect, inclusion of nature in self	Outdoor walkers experienced greater nature relatedness, this effect was mediated by positive mood. Outdoor walkers underestimated positive mood, indoor walkers overestimated post-walk mood.
Nisbet, Zelenski & Murphy, 2011	184 students (124 female, 60 males, mean age = 19.5)	correlational	nature relatedness, psychological wellbeing, affect, satisfaction with life, environmental attitudes	Positive affect, autonomy and personal growth positively related to nature relatedness, negative affect, life satisfaction and some psychological wellbeing scales were not.
	145 executives (56 female, 87 male, mean age = 42)	online survey	nature relatedness, psychological wellbeing, affect, satisfaction with life, environmental attitudes	
	170 undergraduate students (107 female, 63 male, mean age = 19)	quasi-experimental design, participants enrolled in environmental or non-environmental courses	nature relatedness, psychological wellbeing, affect, vitality	Environmental group's nature relatedness did not increase significantly, but significant decrease in non-environmental group. Positive correlations found between nature relatedness and wellbeing variables.
Tang & Chang, 2011	99 students (51 female, 48 male, aged 19-25)	correlational	perceived restorativeness, connectedness to nature and willingness to engage with nature	Higher connectedness to nature associated with higher perception of restorative qualities of nature.
Weinstein, Przybylski & Ryan, 2009	112 adults (70 women, 42 men, aged 18-25)	participants randomly assigned to watch slides of natural or non-natural settings	connectedness to nature, autonomy, aspirations, immersion, positive affect	Nature connectedness increased when more immersed in nature, nature connectedness and autonomy fully mediated the effects of nature exposure on intrinsic and extrinsic aspirations.
	85 students (55 women, 34 men, aged 18-32)	participants randomly assigned to watch slides of natural or non-natural settings	connectedness to nature, autonomy, aspirations, immersion, positive affect and an economic decision task to measure value aspirations	As above.
	75 students (41 women, 31 men, aged 18-24)	participants randomly assigned to complete questionnaires in a lab containing plants or a lab without plants	connectedness to nature, autonomy, aspirations, immersion, positive affect and an economic decision task to measure value aspirations	Participants felt more connected to nature when immersed in nature, nature connectedness and autonomy fully mediated the effects of nature exposure on intrinsic and extrinsic aspirations. Nature connectedness mediated the effect of setting on generosity.
Zelenski & Nisbet, 2012	331 students, 415 community	correlational	nature relatedness, general connectedness, happiness and wellbeing indicators	Nature relatedness remained a predictor of most happiness indicators when controlling for other forms of connectedness.
	204 recruited online	correlational	happiness indicators, connectedness indicators, attachment styles, loneliness, wellbeing	

Appendix C

Online Survey

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Appendix D

Ethics Approval Letter

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Appendix E

Summary Report Provided to Participants and the Ethics Panel

Re: Online Survey Study Investigating the Wellbeing of Allotment Gardeners

Dear Allotment Gardener,

Many thanks for your participation in the above study. The study is now complete and I am writing to let you know the results.

Background Information

Many people say that allotment gardening promotes better health and wellbeing, but little research has been conducted to investigate this. Research evidence can support the use of allotment gardening to promote positive wellbeing or as an intervention for people experiencing mental distress.

This study looked at two types of wellbeing: hedonic wellbeing and eudaimonic wellbeing. Hedonic wellbeing refers to feelings of happiness and satisfaction with life. Eudaimonic wellbeing is about a way of living that is personally expressive. It comes from having meaningful goals, in line with a person's skills and abilities.

The Current Study

171 allotment gardeners completed an online survey. The survey asked how much time they spent on their allotment and what activities they were involved in there. It included measures of the two types of wellbeing described above, a measure of connectedness to nature and a measure of preference for solitude. There were also three open-ended questions to give participants a chance to describe how allotment gardening impacted their wellbeing.

The Findings

- Allotment gardeners scored higher on measures of eudaimonic wellbeing and satisfaction with their environment than the general population. They scored lower on a measure of social quality of life.
- Spending more time on the allotment in the summer predicted higher levels of eudaimonic wellbeing.
- Participants who spent more time on their allotment reported feeling more connected to nature.
- One way allotment gardening increased eudaimonic wellbeing was through increasing feelings of connectedness to nature.
- Participants who spent more time on their allotment reported greater preference for solitude, but preference for solitude was not associated with wellbeing.

- Four main themes emerged from the responses to open-ended questions:

    1) Having an allotment provided participants with a space of their own to get away from the stresses of everyday life and to create a garden they wanted. It allowed more control over the quality and production of food.
    2) Spending time at the allotment increased feelings of connectedness: to nature, to family (through spending time together on the allotment), to the past (particularly to childhood experiences of gardening) and to the community.
    3) The allotment provided meaningful activity, a positive challenge and feelings of enjoyment and satisfaction from seeing hard work come to fruition.
    4) Having an allotment benefitted physical and mental health, and for some participants, helped in their recovery from illness.

Conclusions and Implications

The results indicate that allotment gardening supports eudaimonic aspects of wellbeing. This may be because it provides meaningful activity and helps to fulfil basic psychological needs for relatedness, autonomy and competence. Evidence of a relationship between allotment gardening and hedonic wellbeing was not found.

No association was seen between number of years of gardening and wellbeing, which indicates that positive benefits can be gained through allotment gardening in the short-term and do not need to be built up over years of gardening.

Preference for solitude has both positive and negative connotations. Some people prefer to be alone due to social anxieties, for others, being alone may be associated with seeking inner peace, spirituality, creativity and problem solving. The allotment may provide a space for the more positive aspects of solitude, some of which were described by participants.

Overall, this study indicates wellbeing benefits of allotment gardening. For many people having an allotment is not feasible, as it requires access to a plot and a significant investment of time. Ways of making allotment gardening more accessible need to be considered, such as through community allotment sharing projects, offering allotment gardening on prescription, or offering allotment activities therapeutically.

Appendix F

Recruitment Advert

The following message was placed on online allotment gardening forums and emailed to allotment gardeners:

Hello. My name is Jo Webber. I am carrying out a research project investigating the wellbeing and quality of life of allotment gardeners as part of my doctoral training in clinical psychology at Canterbury Christ Church University.

I am looking for individuals who have an allotment garden to complete an anonymous online survey, taking approximately 10-15 minutes. Everyone who takes part will have the opportunity to win one of two £25 vouchers for an online gardening supply centre. For more information about the research, and to complete the survey, please visit https://survey.canterbury.ac.uk/allotmentgardening.

Your interest and participation in this project are much appreciated. If you know of others who may be interested in this research or willing to complete the survey, please feel free to forward the link to them.

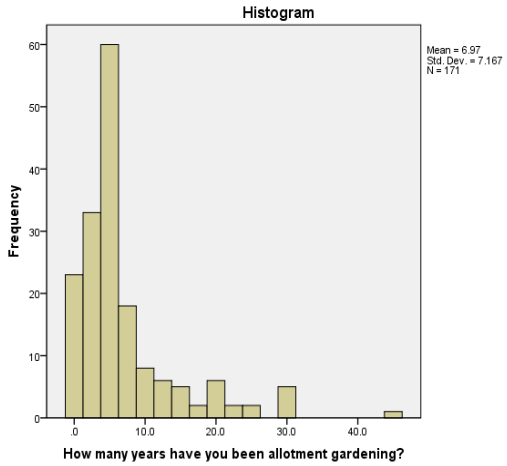
Many thanks.

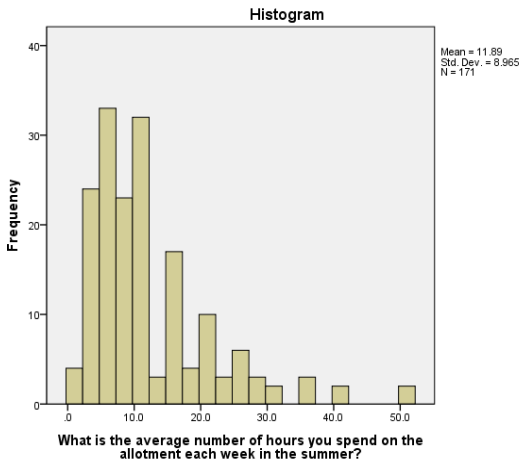
Appendix G

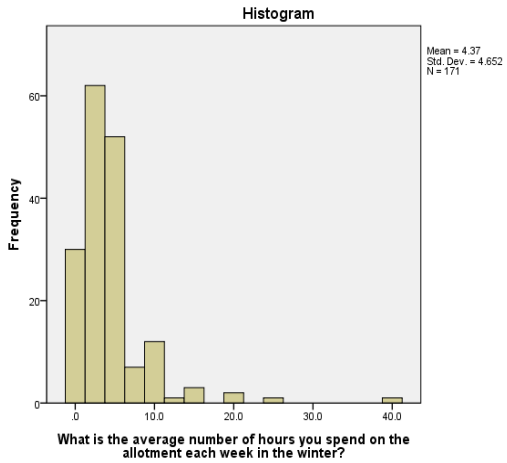
Histograms and Values for Skewness and Kurtosis

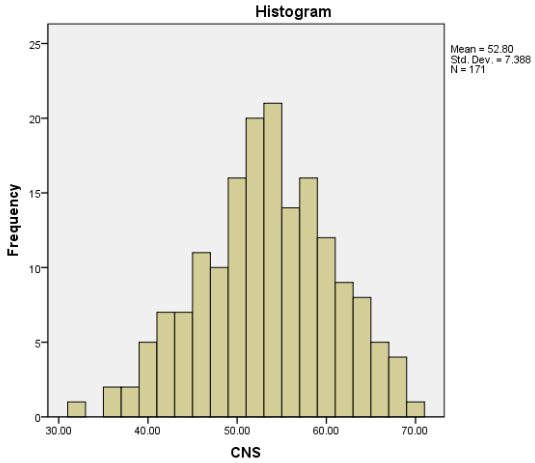
	skewness	kurtosis	z (skewness)	z (kurtosis)
years_gardening	2.28	5.9	12.26	15.99
hours_summer	1.78	3.77	9.57	10.22
hours_winter	3.82	22.16	20.54	60.05
CNS	-0.16	-0.27	-0.86	-0.73
QEWB	0.01	-0.06	0.54	-0.16
PFS	-0.06	1.26	-0.32	3.41
QOL-P	-1.16	1.79	-6.24	4.85
QOL-S	-0.42	0.07	-2.26	0.19
QOL-Psy	-0.76	0.72	-4.09	1.95
QOL-E	-0.73	0.48	-3.92	1.30

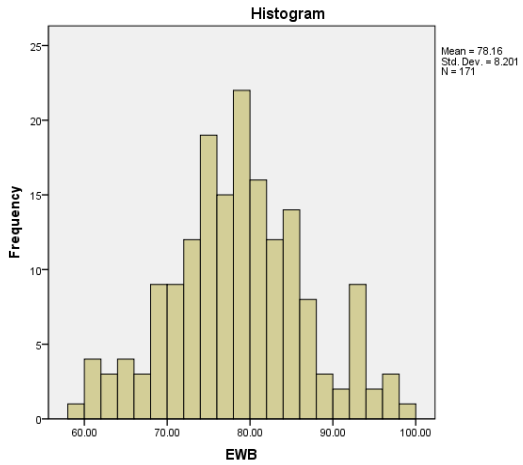
Field (2009) suggests that in small samples (< 200) absolute values for z scores above 1.96 represent a significant deviation from normal ($p < .05$).

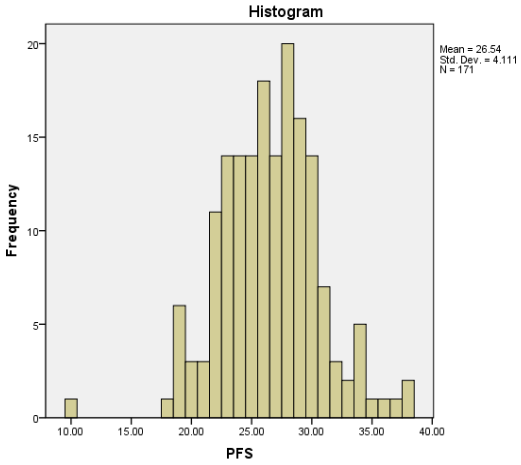


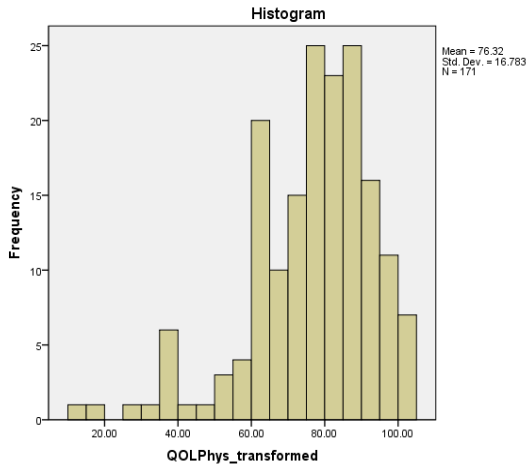


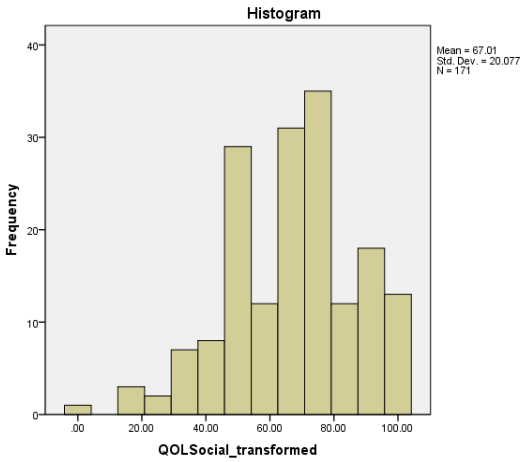


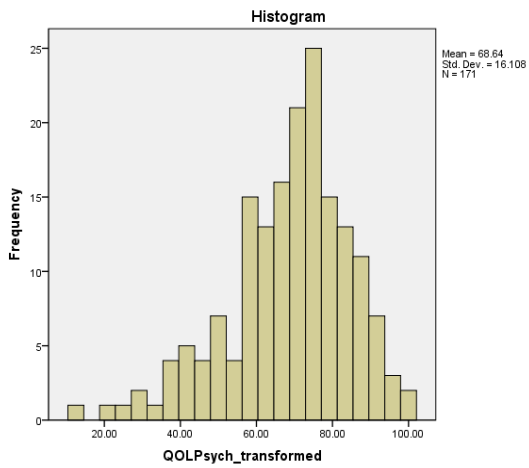


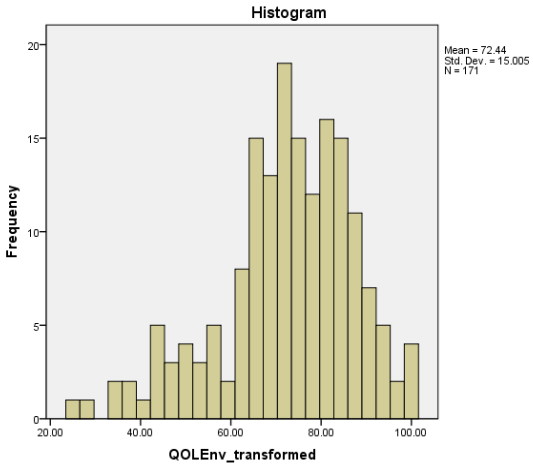












Reference

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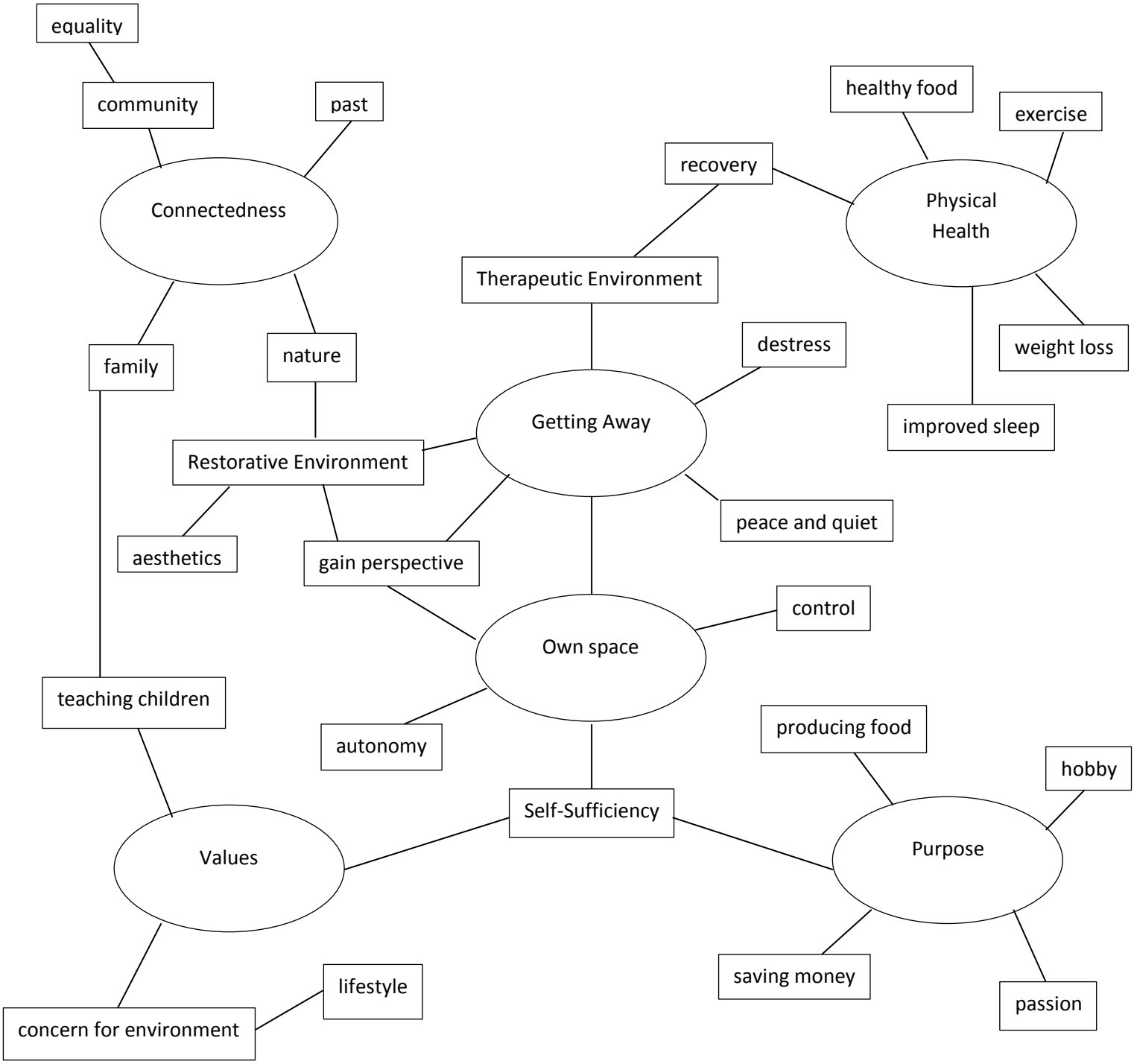
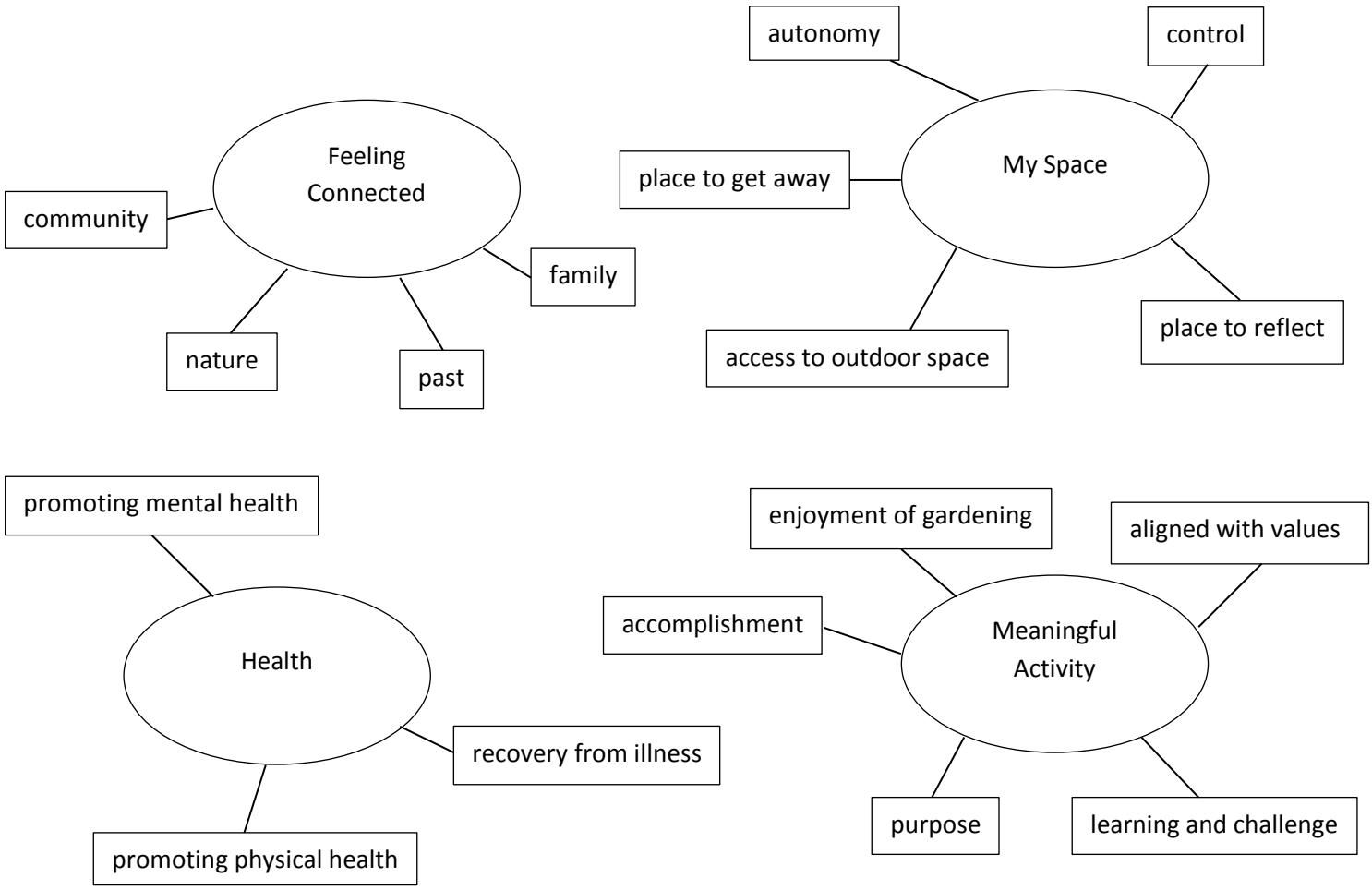
Appendix H

Thematic Analysis

Appendix H1: Initial Thematic Map



Appendix H2: Final Thematic Map



Appendix H3: Descriptions of themes and examples from the data

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Appendix I: Guidelines for Journal Submission

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