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FOREST SCHOOL AND MENTAL WELLBEING

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Summary of the Portfolio

Section A

A review of the empirical literature was carried out to investigate the impact of nature interventions on wellbeing in children and young people. Twelve studies were found to meet inclusion criteria for the review: five studies with children under 12, and seven studies involving adolescents. A number of outcomes relating to wellbeing were discussed, including self-esteem and confidence, positive and negative affect, stress reduction and restoration, social benefits, and resilience. Findings related to wellbeing outcomes were synthesised and critiqued, and research and clinical implications discussed.

Section B

A mixed methods study investigated the effect of forest school on the mental wellbeing, resilience, and nature connectedness of young people. Self-report questionnaires were administered pre- and post-forest school and qualitative data gathered on participants' experiences of forest school. Findings suggested a positive relationship between engaging in forest school and resilience. A differential effect of gender was found, with male participants showing significant improvements compared to female participants for wellbeing, resilience and nature connectedness. Regression analysis showed that wellbeing was predicted by early environmental experiences, resilience and connectedness to nature. Implications for clinical practice and directions for future research were discussed.

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Section A: Literature Review

Nature interventions and wellbeing in children and young people: A literature review

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Abstract

Research suggests that experience of the natural environment may have a range of beneficial outcomes, particularly for children and young people. A systematic review of the peer-reviewed empirical literature focused on research involving direct interaction with nature amongst children and young people and its impact on wellbeing. PsycINFO, MEDLINE, ERIC and Google Scholar were searched for relevant findings and specific inclusion criteria applied. Twelve papers were identified for inclusion in the review, within two domains: early and middle childhood, and adolescence. Within these domains, a range of wellbeing outcomes were identified and grouped into thematic areas of: self-esteem and confidence, positive and negative affect, stress reduction and restoration, social benefits, and resilience. Findings were synthesised and studies were quality appraised using appropriate quality control tools. Recommendations for further research and clinical implications were outlined.

Keywords: nature, wellbeing, resilience, children, young people

Introduction

Since the emergence of the field of ecopsychology in the 1960s (Greenway, 1999) there has been growing interest in the link between connection to the natural environment and wellbeing. In his review of ecotherapy research, Chalquist (2009) posits that individuals are increasingly disconnected from the natural world which can lead to a variety of difficulties including anxiety and depression. He further suggests that reconnecting to the natural world can alleviate these symptoms and allow for improved wellbeing through enhanced self-esteem and joy. Wellbeing is problematic to define, with numerous definitions existing, however research has tended to distinguish between two perspectives: hedonic and eudemonic wellbeing. Ryan and Deci (2001) distinguish hedonic wellbeing as focusing on happiness and the attainment of pleasure and avoidance of pain, whereas eudemonic wellbeing encompasses meaning and self-realisation, and the process of living a fulfilled life. Wellbeing is also thought to be closely linked to self-esteem and self-compassion, (Neff, 2011) and resilience (Fonagy, Steele, Steele, Higgitt & Target, 1994; Mental Health Strategic Partnership, 2013).

Theoretical Background

Wilson (1984) proposed the biophilia hypothesis, suggesting that humans have an innate need to affiliate with nature, arguing that the biophilic instinct emerges from early childhood onward. It is posited that this affiliation has become biologically encoded due to human evolution and people's dependence on the natural environment over time, which has shaped our physical, emotional and cognitive processes (Kellert & Wilson, 1993). Kellert, Heerwagen and Mador (2008) posit that despite modern life involving less connection with nature, people's physical and emotional wellbeing still remains highly dependent on contact with the natural environment. However, research has shown that not all children feel an

affiliation with nature (Hand et al., 2016), and Kahn (1997) details how some individuals experience nature as threatening and even psychologically harmful at times. This can perhaps be explained by Kellert and Wilson's (1993) description of biophilia as being reliant on learning and experience in order for it to become functional. This is further reflected in research showing that the frequency of woodland visits in adults is related to the frequency of woodland visits in childhood (Ward Thompson et al., 2004), and children who have not experienced natural environments in early years experiencing these environments as threatening in later life (Milligan & Bingley, 2007).

Two theories underpinned by the biophilia hypothesis have been suggested for the beneficial effects of nature contact on wellbeing. These are attention-restoration theory (Kaplan & Kaplan, 1989; Kaplan, 1995) and stress reduction theory (Ulrich, 1983). Attention-restoration theory suggests that the natural environment has a restorative quality that allows for recovery from directed attention fatigue (Kaplan & Kaplan, 1989). Directed attention has been defined as requiring effort and controlling distraction, and is susceptible to fatigue after prolonged mental effort (Kaplan, 1995). From an evolutionary perspective, this would have proved useful, ensuring that rather than paying attention to one thing for a long period of time, people were instead vigilant and alert to their surroundings. However, as humans have evolved it has become increasingly necessary to rely on direct attention, which can then lead to fatigue (Kaplan, 1995). In contrast to direct attention, fascination is an involuntary form of attention requiring no effort and a distinction has been made between hard fascination and soft fascination (Kaplan, 1995). Soft fascination (which can come from looking at a scenic view) allows space for reflection and thus can be highly restorative, whereas hard fascination (such as watching violence) doesn't allow for thinking about anything else, providing distraction only in the short term (Kaplan & Berman, 2010). Attention-restoration theory has been supported by research with schoolchildren, which

suggests that contact with nature helps to restore depleted ability to concentrate and impacts on stress reduction (Ohly et al., 2016). Research lends support for this theory in different populations, including children (Taylor & Kuo, 2009), adults (Cimprich, 1993), and older adults (Ottosson & Grahn, 2005).

Ulrich's (1983) psycho-physiological stress reduction theory focuses on the impact of nature on physiological and emotional components, as well as cognitive functioning. Ulrich posits that natural environments can have a restorative effect, involving a shift towards a more positive emotional state, a positive change in physiological activity levels, and sustained attention, and is supported by a variety of research (e.g. Honold, Lakes, Beyer & Van der Meer, 2016; Ulrich, 1984; Ulrich et al., 1991).

A psychodynamic perspective can also be considered to aid understanding around humans' relationship with nature. It has been argued that human interaction with the natural environment can be viewed as a projection of unconscious needs, and ecopsychology can help to reawaken the ecological unconscious which has been repressed in today's modern world (Roszak, Gomes & Kanner, 1995). It has also been posited that the relationships humans form with nature can be understood in terms of their early attachments, with nature operating as a secure base which can provide comfort and allow people to maintain positive mood states and shift negative ones (Jordan, 2009). This implies that childhood is an important time to engage with nature, in order that a positive relationship with nature can develop. The ability for nature to provide a comforting and positive experience is further reflected in Maslow's (1964) description of peak experiences, which he described as deeply moving experiences that are magical in quality, and research has suggested that peak experiences occur in natural environments (Chenoweth & Gobster, 1990).

Children and Nature

People all experience nature differently and may attain a sense of wellbeing from nature for very different reasons (Cattell, Dines, Gesler & Curtis, 2008) and thus it is important to consider the distinct benefits that children and young people may gain from nature, in contrast to adults. Nillson, Baines and Konijnendik (2007) identifies children as a key group who may have specific needs that can be benefited by nature, arguing that it is necessary to consider these specific needs, such as risk concerns that may impact on how children access natural environments.

Beneficial effects of the natural environment.

Physical wellbeing. A large amount of research looking at nature interaction amongst children and young people has tended to look at the link to physical health and activity (e.g. Dyment & Bell, 2008) and highlighted the benefits of nature in tackling obesity (Cleland et al., 2008; Potwarka, Kaczynski & Flack, 2008). Links between the natural environment and improved motor development have also begun to emerge, with research suggesting that the natural elements within outdoor spaces help facilitate the development of motor skills (Fjortoft, 2001), particularly balance and coordination (Fjortoft, 2004).

Mental wellbeing. The relationship between nature and mental health and wellbeing in children and young people is gaining increasing interest in research. Korpela and Hartig (1996) posit that nature helps to provide young people with a space to release tension and aid self-regulation (Korpela, Hartig, Kaiser & Fuhrer, 2001). Wells and Evans (2003) found that views of nature were associated with reduced levels of stress and increased ability to focus (Wells, 2000). This relationship between improved focus and possible enhanced cognitive ability as a result of contact with nature is reflected in a growing body of research linking the

natural environment with improved ADHD symptoms, due to an increase in concentration levels (Taylor, Kuo & Sullivan, 2001; Taylor & Kuo, 2009).

Negative effects of the natural environment. Despite most research finding beneficial effects of the natural environment on children and young people's wellbeing, it is important to note that research has also highlighted potential downsides. For example, Milligan and Bingley (2007) detail how some of the children in their study looking at the impact of woodlands on mental wellbeing experienced the woodland as scary, leading to feelings of anxiety or claustrophobia, and Burgess (1996) found that woodland areas were sometimes viewed as places of increased risk of attack.

Effect of age. Wilson (2011) proposes that the way in which children and young people connect with nature will change over time and different approaches are necessary depending on the age of children, with younger children requiring an approach focusing on active exploration in the environment, and multi-sensory play and exploration (Ballantyne & Packer, 2009; Kola-Olusanya, 2005). As children become older, it is argued that the emphasis should be on shared decision making with adults regarding environmental problems (Schusler, Krasny, Peters & Decker, 2009), ensuring that children's sense of self-efficacy is nurtured and their participation with the environment taken seriously (Blanchet-Cohen, 2008). The importance of nature interaction prior to age 11 has been highlighted as a crucial time in shaping environmental attitudes and behaviours which then continue to adulthood (Wells & Lekies, 2006).

Previous Reviews

Several reviews have focused on the implication of children's contact with nature (e.g. Charles & Senauer, 2010; Munoz, 2009; Parsons, 2007), however these have not focused specifically on the link with mental wellbeing. Furthermore, these reviews did not detail a

clear inclusion criteria or search strategy or include assessment of study quality. To address this, Gill (2011) conducted a systematized review to investigate the benefits of nature experiences for children, concluding that the majority of studies suggested that nature helped to promote children's healthy development, well-being and positive environmental attitudes. It appeared that studies reporting playful engagement styles showed the most beneficial outcomes, suggesting that it is necessary for children's engagement with nature to be playful and hands-on. Gill's review also highlighted a link between positive views about nature as an adult and time spent in nature as a child, suggesting a far-reaching impact of nature experiences in childhood.

Although this review highlighted some interesting findings regarding the impact of children's connection with nature, it can be criticised for its search strategy, which involved trawling through existing literature reviews (from 2003 - 2010) rather than conducting a full systematic search of databases to identify existing literature; thus there is a risk that relevant studies may have been missed. The review also omitted independent checks of the assessments of study quality, which is normally done to ensure consistency, and utilised a very basic quality assessment tool.

Within the area of public health there have been a number of reports calling for increasing children and young people's interaction with nature, with recommendations made to encourage outdoor play (Children's Play Council, 2002), incorporate nature into outdoor play areas (Groves & McNish, 2008; Office of the Deputy Prime Minister, 2003) and open up wild spaces to enhance physical and emotional development of young people (Travlou, 2006). EcoMinds (2013) is an initiative which aims to improve physical and mental wellbeing through ecotherapy projects. They emphasise the importance of providing ecotherapy interventions for children, as half of lifetime cases of mental illness begin by age 14 (Kessler et al., 2007), and this is reflected in the fact that 10% of EcoMinds projects are exclusively

for children and young people (EcoMinds, 2013). There has been a call for schools to integrate nature into the curriculum, with school gardening being an area that could offer potential beneficial outcomes for physical and mental wellbeing (Ohly et al., 2016).

Rationale for Current Review

As detailed above, there is a growing evidence base linking nature experiences in childhood with wellbeing, but it is still not clear exactly what aspects of wellbeing are impacted by being in nature. The Health Council of the Netherlands (2005) suggested several possible ways that nature has a beneficial impact on wellbeing, including recovery or restoration from stress and attention fatigue, improved levels of exercise, facilitation of social contact, promotion of healthy child development, and promotion of personal development and sense of purpose. Further investigation is warranted to increase understanding of the link between nature experiences and wellbeing specifically for children and young people.

The present review aimed to:

1) Gain an increased understanding of the relationship between experiences of nature in childhood and wellbeing.

2) Provide a summary of the current empirical research.

3) Review the methodology of the studies identified in this review and provide a critical appraisal of their findings.

4) Highlight the research and clinical implications from the existing literature.

Methodology

Search Strategy

To identify relevant studies, a systematic review of empirical papers published up to January 2017 was conducted. PsycINFO, MEDLINE, and ERIC were searched using search terms based on those used in existing literature. The search terms were: [natural environment* *or* outdoor* *or* wood*] *and* [wellbeing *or* well-being *or* mental health] *and* [child* *or* youth* *or* teen* *or* adolescen* *or* young people]. Following this, hand-searching of the reference sections of relevant papers was carried out and an internet search using Google Scholar was conducted. Identified titles and their abstracts were then examined to determine if they met the inclusion criteria. The search strategy yielded 1042 references across all databases.

Inclusion and Exclusion Criteria

The present review focused on papers in peer-reviewed journals which described some form of outdoor intervention that included contact with the natural environment and its impact on wellbeing. A broad classification for wellbeing was employed, based on definitions encompassing affect and functioning (Aked, Marks, Cordon & Thompson, 2008), self-esteem (Neff, 2011), resilience (Mental Health Strategic Partnership, 2013), and social resources (Fredrickson, 2004). Any studies reporting outcomes related to these areas were included in the review.

Studies were excluded if they focused specifically on the link between physical activity and wellbeing as this has a large evidence base (see Lubans, Plotnikoff & Lubans, 2012, for a review). Articles focusing specifically on outdoor adventure therapy programs for at-risk

youth in the US were also excluded, as this area has a distinct well-reviewed literature base (see West & Crompton, 2001, for a review).

Full inclusion and exclusion criteria can be seen in Table 1 and a flowchart depicting the search process can be seen in Figure 1.

Table 1

Summary of Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
Available in the English language	Main focus on physical activity
Published in a peer-reviewed journal	Reports adventure therapy for at-risk youth in the US
Includes participants under 18 years old	Dissertation abstracts or book chapters
Reports a nature intervention that involves direct contact with nature	
Refers to wellbeing outcomes	
Any country	
Any date	

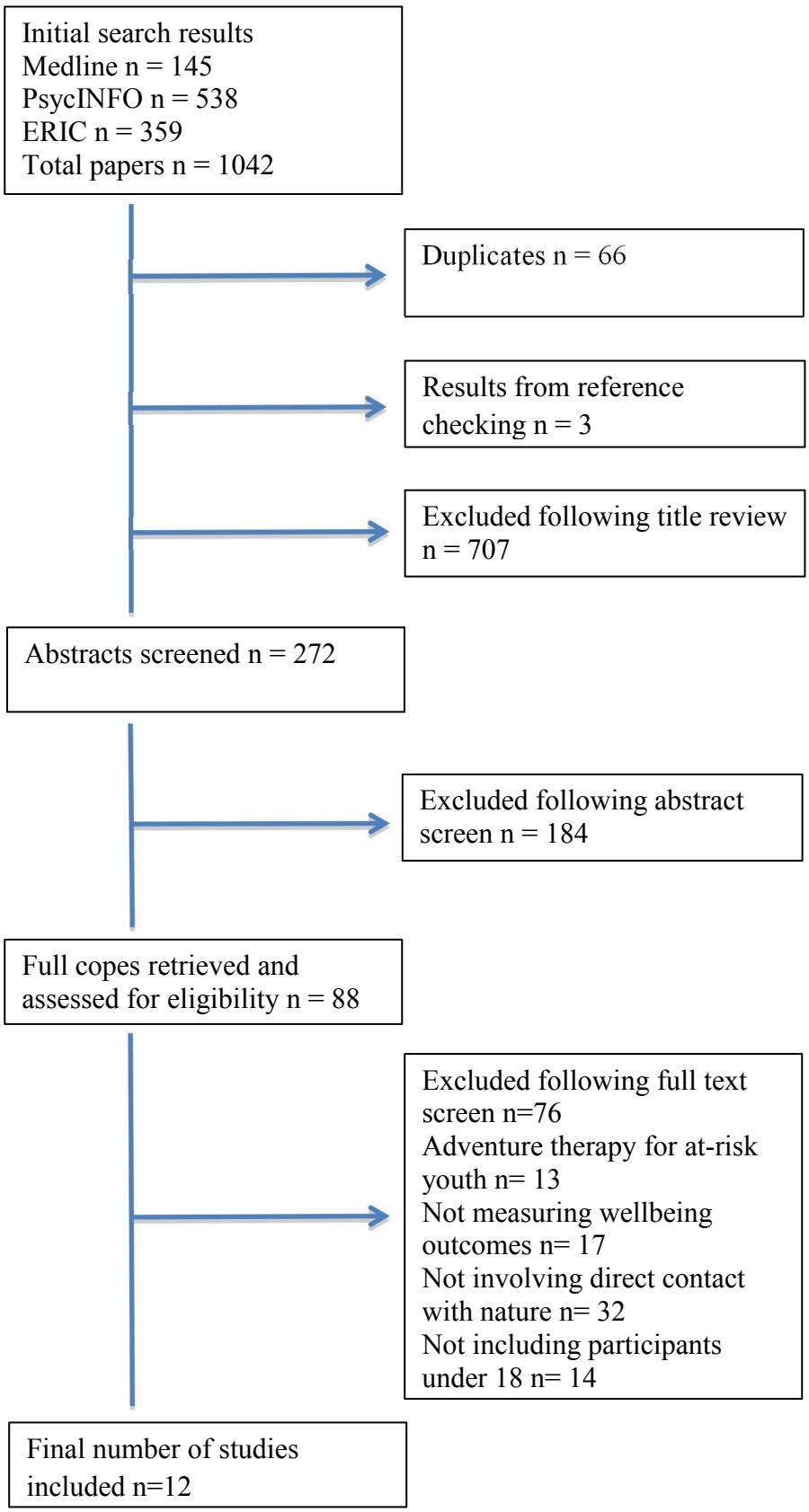

Figure 1. Flowchart showing the literature search process

Data Extraction and Analysis

In order to extract relevant information from the papers and synthesise the data, a data extraction sheet based on the Cochrane Consumers and Communication Group (2015) data extraction template was used for all studies meeting the inclusion criteria.

A variety of heterogeneous methodologies were utilised across the studies, necessitating a range of quality assessment tools. Quantitative studies were critiqued using the Effective Public Health Practice Project (EPHPP, 2010) quality assessment tool for Quantitative Studies (Appendix A). Qualitative studies were appraised using the critical appraisal template for qualitative studies from the Critical Appraisal Skills Programme (CASP, 2017; Appendix B) and criteria suggested by Yardley (2000).

Structure of Review

The search identified studies across a range of ages, and thus the review has been organised into two broad areas of early (under 6 years) and middle childhood (between 6-12 years old, as defined by Collins, 1984), and adolescence. Interventions within each respective age group are described and findings within these domains grouped into themes related to wellbeing outcomes and summarised. Due to the scope of this review, only those outcomes related to wellbeing are reported.

Results

Using the methodology reported above, a total of 12 studies looking at the relationship between nature experience amongst children or young people were identified. Five were quantitative; one of these being a randomised control trial (Greenwood & Gatersleben, 2016), and the remaining four utilising a pretest-posttest design (Barton, Bragg, Pretty, Roberts & Wood, 2016; Hinds, 2011; Kaplan, 1984; Kelz, Evans & Roderer, 2015). The remaining

seven studies utilised qualitative designs, using qualitative interviews and case studies (Berger, 2008; Davidson, 2001; Doucette, 2004; McArdle, Harrison & Harrison, 2013; Milligan & Bingley, 2007; Passy, 2014; Roe & Aspinall, 2011).

A summary table of all the studies can be found in Table 2.

Table 2

Summary of Studies Reviewed

Stage of childhood	Author (year)	Country	Sample	Nature intervention	Methodology and measures	Main findings
Early and middle childhood	Berger (2008)	Israel	n=11 (M=9, F=2) Age:7-9 (with learning difficulties)	Therapeutic educational programme. Duration: 2 hour weekly for 1 year.	Qualitative interviews, grounded theory analysis.	The empowering approach of the nature programme allowed for development of self-esteem and self-confidence.
	Doucette (2004)	Canada	n=8 (M=7, F=1) Age: 9-13 (described as 'behaviourally challenged')	Outdoor walk and talk intervention. Duration: 45 minutes weekly for 6 weeks.	Qualitative interviews, phenomenological approach.	Participants experienced more feelings of self-efficacy and wellbeing following the intervention.
	McArdle, Harrison & Harrison (2013)	UK	n=10 (M=6, F=4) Age: 4-5 (from	Nature Nurture project in woodland. Duration: 1	Qualitative observation using PERIK observation scale, ethnographic	The nurturing and positive approach to the programme contributes to development of

			disadvantaged backgrounds)	afternoon weekly for 10 weeks.	case studies.	resilient personality factors.
	Passy (2014)	UK	n=87 Age: primary school	School gardens.	Qualitative interviews, case studies.	The garden provided a space that was calm and a sense of pride, pleasure, enjoyment and generated feelings of happiness.
	Roe & Aspinall (2011)	UK	n=8 (M=8) Age: 10-12 (with severe trauma and mental disorder).	Forest school in grounds of residential school. Duration: 3 hours weekly for 6 months.	Qualitative observations, ethnographic.	Increase in positive affective responses to the forest setting over time, accompanied by increased trust, exploratory activity and social cohesion.
Adolescence	Barton, Bragg, Pretty, Roberts & Wood (2016)	UK	n=130 (M=57, F=75) Age: 11-18	Wilderness expedition in South Africa or Scotland .	Quantitative, pretest-posttest design using Rosenberg's Self-Esteem Scale	Self-esteem and connectedness to nature scores improved pre-post expedition. Male

			Duration: Between 5 and 11 days.	(Rosenberg, 1965).	self-esteem scores were higher at the start but female self-esteem scores showed the greatest increase.
Davidson (2001)	New Zealand	n=10 (M=10) Age: 17-19	Outdoor education class. Duration: 6 weeks.	Qualitative observation and interviews, case studies.	Key themes of building confidence and mental strength, freedom of choice, and enjoyment of overcoming challenges.
Greenwood & Gatersleben (2016)	UK	n=120 (M=54, F=66) Age: 16-18	Unfamiliar outdoor setting containing natural elements. Duration: 20 minutes.	Quantitative, randomised controlled trial, mood measured using Inventory of Personal Reactions (Zuckerman, 1977) and physiological and cognitive changes measured.	After spending time in an outdoor setting, teenagers' concentration and positive affect improved more than after spending time in the indoor setting.

Hinds (2011)	UK	n=25 (M=12, F=13) Age:12-15 (some participants from a Pupil Referral Unit)	Educational woodland experience. Duration: Between 2 and 5 nights.	Quantitative, pretest-posttest design using measures of sociability, self-esteem and confidence. Qualitative free responses.	Participants generally reported stronger environmental identities, more positive natural environmental attitudes, and greater competency at the end of their outdoor experience.
Kaplan (1984)	US	n=17 Age: adolescents	Wilderness experience. Duration: 9 days.	Quantitative, pretest-posttest design, questionnaire measuring mood and feelings.	Participants reflected more positive moods and feelings at the end of the trip and a greater sense of confidence, composure and wellbeing.
Kelz, Evans & Roderer (2015)	Austria	N=133 Age:13-15	Renovation of school-yard to include elements of nature.	Quantitative, pretest-posttest design using measures of physiological	The greening of the school-yard significantly diminished pupils' physiological

				stress and psychological wellbeing (the Basler Well-Being Questionnaire, the Recovery-Stress Questionnaire and the Perceived Restorativeness Scale).	stress and enhanced their psychological wellbeing. Participants also perceived the environment as more restorative following the redesign.
Milligan & Bingley (2007)	UK	n=16 (M=4, F=12) Age:16-21	Woodland workshop involving woodland walk and coppice craft session. Duration: 1 day.	Qualitative, focus groups and interviews.	Young people who had used woodland as safe, nurturing and enjoyable places to play as children were amongst those most likely to use the woodland for stress relief. For some participants, woodland was viewed as a scary space.

Early and Middle Childhood

The studies identified within this age group were conducted in a range of countries and tended to include participants identified as having behavioural difficulties. The earliest reported study was conducted by Doucette (2004) in Canada with eight students aged between 9 and 13 years who were assessed as behaviourally challenged and took part in a 6 week walk and talk intervention in an outdoor environment (encompassing counselling, ecopsychology and physiological components). Berger's (2008) study was conducted in Israel with children aged between 7 and 9 years with learning and behavioural difficulties and involved a therapeutic educational session that took place in a natural setting within or near the school grounds. Roe and Aspinall's (2011) study involved boys aged between 10 and 12 years with experience of severe trauma, who were attending a weekly forest school in the grounds of a specialist residential school in the Scottish countryside. Only one of the studies identified was with children under the age of 6 (McArdle et al., 2016), looking at the impact of a woodland intervention with children from challenging backgrounds in Scotland. All the studies were with participants who the authors described as having additional needs, with the exception of Passy's (2014) study. Passy (2014) conducted research with 10 primary schools with school gardens with each school visited twice to carry out interviews to discuss the impact of the gardens on children's learning, behaviour and wellbeing.

Wellbeing outcomes in early and middle childhood. A range of outcomes relating to wellbeing were reported by the studies and they were grouped and synthesised under the following thematic domains.

Self-esteem and confidence. Using a grounded theory analysis, Berger (2008) identified strengthened self-esteem and confidence following a therapeutic nature intervention. They posit that this was facilitated by the empowering approach of the programme, which allowed

participants to succeed at tasks and receive an acknowledgement of this achievement. Through a case study, they detail how this was particularly valuable for a child with severe behavioural issues, who was able to take on a leadership role and have the opportunity to do something he was good at; something which did not happen in the indoor learning environment. Doucette (2004) details how through utilising attachment theory to integrate counselling and walking outdoors, the aim of the intervention was to help improve the self-esteem of participants through becoming connected with both the counsellor and the outdoors. Through description of case studies, Doucette (2004) highlights how utilising life skills techniques discussed in the intervention helped one of the participant's self-esteem to increase considerably. However, it is important to note that this appears to be based on observation rather than any empirical measure, although Doucette argues it was also echoed in the comments of the participant's teacher and family members. Again through illustration of case studies, Roe and Aspinall (2011) highlight how the participants in their study grew in confidence, demonstrated by increased exploration of the forest environment.

Positive affect. Roe and Aspinall (2011) used a case study approach to map changes in emotional behaviour over the course of a forest school intervention, and noted a change in positive affect in the forest. They argue that this was helped by the activities that took place in the forest, such as the construction of dens and shelters, and the opportunity for both time alone and time with others which helped with mood regulation amongst the participants in their study who had suffered trauma. However, although their findings showed positive mood outcomes from the forest setting, it is not possible to attribute this change to the forest setting, as there was not a comparative study that took place in the classroom. Passy (2014) highlighted comments from participants in her study detailing the pleasure and happiness that pupils gained from simply looking at the school garden and being outside of the classroom, as

well as gaining enjoyment from the gardening tasks. The calming effect of the school garden was also commented on, particularly for those pupils with behavioural difficulties.

Negative affect. Roe and Aspinall (2011) identified many emotional reactions participants had to the forest setting and classified these in different categories. Not all of these were positive, and some of the affective reactions noticed included anger, fear, disgust and sadness. However, they note that there were many more positive affective reactions to the forest than negative, concluding that the forest setting has much to offer in assisting with behavioural control, as the recorded outbursts of anger were very low in this setting, particularly when compared to behaviour that occurred in the school setting.

Stress reduction and restoration. Roe and Aspinall (2011) note that both staff and pupils visibly became less stressed in the forest, and consistent with restorative theory, fascination and anticipation featured highly in the forest setting. McArdle et al., (2016) adopted the PERIK observation scale (Mayr & Ulich, 2009) to observe and assess the impact of a nature intervention on wellbeing. One of the dimensions of the PERIK model is emotional stability and coping with stress, and they argue that this was strongly identifiable in the case studies of the children observed in their study.

Social benefits. Social relationships tended to improve over the course of the nature interventions. Berger (2008) identified one of the potential benefits of nature therapy for children with learning difficulties as being the process of group building and development of positive communication skills amongst participants in a group setting. This was further reflected in Doucette's (2004) study where an improvement in social skills was observed for two of the participants. Roe and Aspinall (2011) also indicate an increase in social cohesion amongst participants in their study, demonstrated by a movement over time towards the social aspect of the camp fire in the forest setting, and improved relationships with staff and

peers over time. McArdle et al., (2016) presented their findings in three case studies of children, highlighting experiences that were typical of the programme. They noted the social benefits of taking part in a nature intervention, describing a case study where improvements were seen in social communication with other children and adults following participation in the programme. In a separate case study they outlined the development of one of the boy's social skills over the course of the nature intervention, which they argued was evident through his engagement of his peers in imaginative play.

Resilience. McArdle et al., (2016) detailed changes in one boy's ability to cope with change, confidence and ability to play with others, which they argue encourages resilience. They posit that their findings support a relationship between resilience and the outdoor intervention, describing how through being encouraged to take small risks and push boundaries, this helped contribute to the development of resilience in their sample. They argue that self-efficacy and problem-solving ability, (which have been conceptualised as components of resilience; Schwarzer & Warner, 2012) were also evident through children's play and learning that took place over the course of the programme.

Adolescence

Seven papers identified in this review reported studies conducted with adolescents (Barton et al., 2016; Davidson, 2001; Greenwood & Gatersleben, 2016; Hinds, 2011; Kaplan, 1984; Kelz et al., 2015; Milligan & Bingley, 2007). Two of the studies reported wilderness expeditions in Scotland, South Africa and the US, (Barton et al., 2016; Kaplan, 1984) and two reported outdoor education programs in New Zealand and the UK (Davidson, 2001; Hinds, 2011). These studies reported interventions involving total immersion in nature for several successive days or weeks and utilised pretest-posttest designs (with the exception of Davidson's study which employed a qualitative design). The potential therapeutic effects of

woodland settings in the UK was explored in a study by Milligan and Bingley (2007), which considered the impact of early childhood experiences of woodland on accessing woodland later in life. Participants in their study took part in a one day workshop involving a woodland walk and craft session in an area of woodland, followed by a therapeutic craft session in a rural village.

In contrast to the above studies which placed participants in unfamiliar outdoor environments, two of the studies looked at the impact of familiar outdoor environments on aspects of wellbeing (Greenwood & Gatersleben, 2016; Kelz et al., 2015). Greenwood and Gatersleben (2016) looked at everyday environments in the UK that teenagers might find themselves in and compared the effect of familiar indoor or outdoor settings on aspects of wellbeing. Kelz et al., (2015) looked at the influence of renovating a school-yard to enhance opportunity for contact with nature in Austria, comparing this school with two comparison schools where no changes were being made.

Wellbeing outcomes in adolescence.

Self-esteem and confidence. Barton et al., (2016) reported statistically significant increases in self-esteem over time, as measured by Rosenberg's Self-Esteem Scale (Rosenberg, 1965), indicating a positive effect of a wilderness expedition on adolescent self-esteem. Interestingly they also found that males had higher levels of self-esteem at the start but female self-esteem showed the most increase following the wilderness expedition, suggesting that contact with natural environments may be particularly important for promoting female self-esteem in adolescence. Barton et al., (2016) posit that this may be due to the wilderness environment providing opportunities for perseverance and determination and generate feelings of accomplishment and pride. Hinds (2011) also included four items from Rosenberg's Self-Esteem Scale (Rosenberg, 1965) in his study, however found no

significant differences in levels of self-esteem at the end of the nature intervention. He suggests that this could be due to the dynamic nature of self-esteem and the intervention not explicitly including an element of self-esteem directed therapy. It may also be the case that the scale used lacks the sensitivity to detect changes amongst young people and a measure specifically for use with school-age children would have been more appropriate (Chiu, 1988). However, although no changes in self-esteem were found using Rosenberg's Self-Esteem Scale, the free responses of participants in Hinds' (2011) study suggested they felt more confident following the experience.

Through a 6-week observation and interview process, Davidson (2001) identified a key theme around building confidence and mental strength, using case study examples to illustrate how the outdoor education program described in the study helped the participants to build confidence in pushing personal achievement limits, and encourage perseverance and success. The theme of developing confidence was also identified by Milligan and Bingley (2007) who noted that participants commented on how they developed a sense of confidence through being able to decide what the risks were in a woodland environment and face challenges.

Positive affect. In Kaplan's (1984) study, participants rated more positive moods and feelings on questionnaires at the end of the wilderness expedition compared with the start, leading Kaplan to conclude that the intervention had led to a greater sense of confidence, composure and wellbeing, and a decreased sense of feeling hassled. However, the sample used in this study included both adolescents and adults, and from the data reported, a true breakdown of the results is not possible, making it difficult to ascertain the experience of adolescents as compared with adults. Kelz et al., (2015) used the intra-psychic balance subscale of the Basler Wellbeing Questionnaire (Hobi, 1985) which requires respondents to indicate on a 7-point scale how they feel in that moment on a range of statements. They found

that after renovation of a school-yard to include natural features, pupils had significantly higher scores compared to the measurement taken at an earlier time point, and in comparison with a control school. Greenwood and Gatersleben (2016) used Zuckerman's Inventory of Personal Reaction (Zuckerman, 1977) to measure positive affect, finding an improvement in positive affect following being in nature, particularly when with a friend compared with being alone.

Negative affect. As with the studies focusing on younger age groups, the majority of studies with adolescents tended to identify positive effects of nature on aspects of wellbeing. However, Milligan and Bingley (2007) note that some of the participants in their study experienced anxiety and uncertainty in the woodland environment, which they link to the influence of both parental anxiety and the media. They also identified how certain types of woodland, such as those that were enclosed and dark could be experienced as intimidating by some participants, and concerns about dirt and insects could adversely affect the potential therapeutic effects of the woodland.

Stress reduction and restoration. Participants in Greenwood and Gatersleben's (2016) study were given a series of stressor tasks to complete before then being randomly assigned to either an indoor or outdoor environment and physiological, cognitive and affective measures of restoration taken. Results indicated that those participants in an outdoor setting showed greater restoration, experiencing an improvement in concentration compared with spending time in an indoor setting. However, the authors note that the positive outcomes may not be entirely attributable to the positive effects of the outdoor environment, but also due to the negative impact of being in a windowless classroom. Furthermore, there were no significant differences found in participants' levels of blood pressure, which was taken as a measure of physiological restoration. Kelz et al., (2015) also took measures of physiological stress and used the Perceived Restorativeness Scale (Hartig, Korpela, Evans & Garling, 1997)

to assess restorative qualities of a greener outdoor school-yard, and the Recovery-Stress Questionnaire (Kallus, 1995). They found that levels of physiological stress (as measured by blood pressure) were lower following restoration of the school-yard, and compared with control schools which had not undergone a redesign. Pupils' scores on the Recovery-Stress Questionnaire had marginally significantly increased following the restoration, and perceived restoration increased pre- to post-renovation for two of the subscales: compatibility and fascination. The use of two different scales (looking at both current and situational wellbeing states) to measure any increase in wellbeing is a strength of this study, lending more weight to its conclusions that psychological wellbeing was enhanced following the renovation.

The effect of a woodland setting on stress was explored by Milligan and Bingley (2007) who noted that participants in their study highlighted a strategy to cope with a stressful situation being to find a place where they could be alone, and many participants reflected on how the woodland offered a peaceful place to help relieve stress. Participants in the study also outlined a number of outdoor activities that they felt had restorative value, including walking or simply sitting in a favourite place outdoors.

Social benefits. Hinds (2011) included a measure of sociability into his study, which included six items from the International Personality Item Pool (Goldberg, 1999), however there were no significant effects found for sociability following the nature intervention. Hinds (2011) describes how this may be due to the natural environment promoting a desire for solitude. However, results are inconsistent with Greenwood and Gatersleben's (2016) study which found that being with a friend, compared with being alone or playing a game on a mobile phone, had positive restorative effects.

Resilience. A central theme identified by Davidson (2001) was the enjoyment of overcoming challenges and subsequently feeling competent and positive about themselves.

The importance of competence in enhancing resilience has been well documented in research (e.g. Brooks & Goldstein, 2008; Prince-Embury, 2014). A link between nature interventions and increased competence was further indicated by Hinds' (2011) research, with significant differences found for competence (as measured by the Basic Need Satisfaction Scale, Ryan & Deci, 2000) at the end of the outdoor nature education program.

Methodological Issues

Many methodological issues were identified and the critique below was informed by the EPHPP (2010) quality assessment tool for quantitative studies, the CASP (2017) qualitative checklist, and criteria suggested by Yardley (2000), which include sensitivity to context, commitment and rigour, transparency and coherence, and impact and importance.

For each quantitative study, component ratings of strong, moderate or weak were given for selection bias, study design, confounders, blinding, data collection, withdrawals and dropouts. Following this a global rating was then assigned of either strong (no weak ratings), moderate (one weak rating) or weak (two or more weak ratings). Ratings were double checked by research supervisors to ensure there was no discrepancy between ratings. The component ratings can be seen in Table 3. With the exception of Kelz et al., (2015), all the quantitative studies were rated as weak using the EPHPP quality assessment tool, with the component ratings for 'confounders' and 'withdrawals and dropouts' commonly rated as weak (for four out of five of the studies).

Table 3

Quality Appraisal of Included Quantitative Studies

Author (year)	EHPP criteria for quantitative studies						
	Selection bias	Study design	Confounders	Blinding	Data collection	Withdrawals and dropouts	Overall rating
Barton et al., (2016)	Weak	Moderate	Weak	Moderate	Strong	Weak	Weak
Greenwood & Gatersleben (2016)	Weak	Strong	Weak	Moderate	Strong	Weak	Weak
Hinds (2011)	Moderate	Moderate	Weak	Moderate	Strong	Weak	Weak
Kaplan (1984)	Moderate	Moderate	Weak	Moderate	Moderate	Weak	Weak
Kelz et al., (2015)	Moderate	Moderate	Strong	Moderate	Moderate	Moderate	Strong

Control groups. Only two studies (Greenwood & Gatersleben, 2016; Kelz et al., 2015) included control or comparison groups. A lack of comparison or control groups means that inferences about the causality of positive changes in wellbeing are limited. Even in the study by Kelz et al., (2015) which included two comparison schools, there were difficulties with these, as they were different types of secondary school from the experimental school and thus there may have been significant differences existing between participants at the schools.

Confounding factors. There are a number of confounding factors that may have impacted on the effect of nature exposure that was being investigated by the papers. The papers described nature interventions that involved the young people engaging in novel and

fun activities in the context of forming supportive group relationships. It is difficult therefore to conclude that beneficial impacts observed in the studies were due directly to the natural environment, and not to the effect of the empowering quality of the activities and interventions offered. Further research utilising comparison groups would be needed to consider the contribution of these factors on wellbeing and help distinguish them from the effect of nature exposure on wellbeing.

Follow-up. All of the quantitative studies lacked the inclusion of follow-up measures, although several studies (e.g. Doucette, 2004; Hinds, 2011; Kaplan, 1984) did acknowledge this as a limitation. A longitudinal design could have improved the studies, allowing for longer term changes to be identified and more light shed on the effectiveness of nature interventions. Only Milligan and Bingley (2007) had a longitudinal aspect to their study, including a follow-up interview one month after their nature workshop, however this is still a relatively short length of time after their intervention and thus does not allow for the identification of any longer-term change.

Sample. Eleven studies were conducted in Western countries with a predominantly white sample, with the only exception to this being the study conducted by Berger (2008) in Israel. This therefore limits generalisability of the studies to wider populations. Sample sizes varied across studies, with some of the quantitative studies using large sample sizes (Barton et al., 2016; Greenwood & Gatersleben; Kelz et al., 2015), however they did not report details on whether the study reached power. All studies with younger age groups had very small sample sizes (with the exception of Passy, 2014) thus limiting their generalisability.

Quantitative methods. Five of the quantitative studies adopted pretest-posttest designs, with only one study involving random assignment to comparison or control groups (Greenwood & Gatersleben, 2016). Studies which failed to randomly assign participants to

groups did not account for any confounding variables, thus preventing the ability to infer a causal relationship between nature and wellbeing.

Self-report questionnaires. The reliance of the quantitative studies on self-report questionnaires, and the lack of controlling for or discussing socially desirable responding is a limitation of the research base. Barton et al., (2016) detailed how the questionnaires used in their study may have been subject to a ceiling and floor effect, potentially not allowing any improvement experienced by participants to be fully quantified. Some of the studies relied solely on self-report measures, (Barton et al., 2016; Kaplan, 1984), however others did combine outcome measures with observations or qualitative methods, (e.g. Hinds, 2011) thereby recognising the limitations of relying solely on self-report measures to capture the complexity of the concept of wellbeing.

Qualitative methods. The qualitative studies used a range of analyses, that varied considerably in the quality of their description of analytic process. Davidson (2001) provided a clear description of the qualitative methodology used, as did Berger (2008), using grounded theory analyses which was appropriate for the small sample size. However, in Passy's (2010) study, the reporting of the qualitative analysis was poor, with a lack of detailed description of analytic process or quality assurance, therefore lacking in commitment and rigour, (Yardley, 2000). Passy (2010) further failed to give consideration to limitations of the methods used that may have affected the results, thus weakening the overall quality of the study (Wallace, Croucher, Quilgars & Baldwin, 2004). In Passy's (2010) study, the lack of information about agreement of themes and cross-validation of themes arguably compromises the overall quality of the study as it means the authors' preconceptions may have biased the themes decided on (Silverman, 2011).

In line with CASP (2017) criteria, the relationship between researcher and participants was adequately considered by Davidson (2001), who acknowledged the impact of his own perspective on the data collection process and interpretation of events. McArdle et al., (2013) also took this into account through the keeping of a reflexive diary in order to monitor the influence of the researcher's own participation in the data collection process on what was observed.

Quality Assessment Critique

It is important to note that there are limitations to the quality criteria used, with much debate and little consensus reached on how best to judge quality, particularly within the qualitative approach, given the variation in methodological orientation (Hammersley, 2007). Hammersley (2007) highlights two contrasting definitions for quality criteria, the first centring on a set of explicit criteria relating to the validity of the findings, and the second focusing on considerations that should be taken into account when judging quality, which is not explicit but gains meaning through the particular context. He argues that with qualitative studies, a reliance on judgement is inevitable and quality cannot be determined by a set of concrete criteria, instead positing that guidelines for qualitative research are preferable. Others have called for a continuum of quality criteria, rather than accepting the current quantitative-qualitative dichotomy (Rolfe, 2006).

Although the assessment of quality in qualitative studies is very different to that of quantitative studies, one theme that encompasses both domains is that of transparency, which has been defined as having three dimensions: data, analytic and production transparency (American Political Science Association, 2012). These dimensions grant readers access to data used to support empirical claims, provide access to information about data analysis, and allow access to information about the selection of evidence, in order to encourage less biased research (Moravcsik, 2014).

Discussion

Summary

This review identified research on outdoor nature interventions and the impact of these on wellbeing outcomes for children and young people. All of the studies identified with children under 12 years were qualitative studies, whereas the studies with adolescents tended to be quantitative. The studies reviewed suggest that a range of nature interventions have positive outcomes for wellbeing across all ages, specifically seeming to impact on self-esteem and confidence, positive affect, stress reduction and restoration, social benefits, and resilience. However, results were sometimes inconsistent for these aspects of wellbeing, such as self-esteem, with some studies (e.g. Barton et al., 2016; Berger, 2008) finding improvements in self-esteem, but others (e.g. Hinds, 2011) showing no increase, perhaps due to the dynamic nature of self-esteem in adolescents, rather than it being a static construct, (Baldwin & Hoffman, 2002).

Any negative outcomes of nature interventions were largely ignored by the research, however two of the studies (Milligan & Bingley, 2007; Roe & Aspinall, 2011) did highlight how some participants in their studies experienced negative reactions to natural settings. Roe and Aspinall (2011) detail participants' experience of anger, fear, disgust and sadness in the forest setting (however the authors note that these negative affective reactions were observed far less than the positive affective reactions). The reason for some participants having negative experiences of natural settings may be due to the influence of parental anxiety and the media in portraying outdoor natural areas such as woodland as dangerous spaces where people are at risk from attack (Milligan & Bingley, 2007).

The natural environments that participants had contact with in the studies varied considerably, ranging from familiar natural spaces (such as school gardens and familiar

outdoor areas) to wilderness experiences in other countries. The content of the interventions also varied considerably, with some of the nature interventions involving an explicit therapeutic aspect, and others not. It is unclear from this review whether the therapeutic aspect of these interventions leads to an increased beneficial impact on wellbeing, or whether simply being in the natural environment is enough to bring about improvements in wellbeing.

Research Implications

Due to the methodological issues identified, current evidence for the link between nature and wellbeing in children and young people is limited, however the range of wellbeing aspects identified in the research indicates that future research is warranted. Future research including a control group or utilising a randomised control trial design would be recommended to strengthen existing findings and help to establish a causal relationship between nature interventions and wellbeing. Further research into the mechanisms through which nature affects wellbeing for children and young people could also be of interest, particularly the possible mediating effect of connectedness to nature, as this has been suggested to play a role in the relationship between nature and wellbeing in adults (Webber, Hinds & Camic, 2015). Kazdin (2007) details how important mediators are for developing meaningful and targeted therapeutic interventions, and thus identifying the mediating effect of connectedness to nature could be of useful clinical value for nature interventions.

The research identified in this review highlighted a range of different measures used to investigate wellbeing outcomes, thus highlighting the challenges involved in operationalising and measuring wellbeing. Some of the studies utilised more objective outcome measures to look at aspects related to wellbeing, such as physiological stress reduction through the measurement of blood pressure (Greenwood & Gatersleben, 2016; Kelz et al., 2015) and it may be that these more objective measures are useful to include in future research alongside

subjective measures of wellbeing. To investigate any longer-term effect of nature programmes on wellbeing, there is also a need for longitudinal aspects to be integrated into research designs.

The current research identified in this review focused on a range of interventions in natural settings, and future research could also focus on the differing impacts of settings in offering wellbeing benefits. It may be that some natural settings, such as dense woodland are experienced as more threatening (Milligan & Bingley, 2007) than other natural settings, and thus further research could help ascertain whether certain natural environments are more therapeutic than others. The effect of specific types of nature intervention commonly used with children and young people, such as wilderness programmes or forest schools could also be looked at in more depth to enhance understanding of the impact of certain environments on wellbeing.

There is clearly a need for more quantitative studies, as all of the studies with the younger age groups utilised qualitative methodologies. Although more quantitative studies were carried out with adolescents, these were all rated as weak in terms of their quality control (cf. Kelz et al., 2015). The need for studies focusing more broadly on children and young people, rather than just those with additional needs was highlighted by this review, as there tended to be a focus on children and young people with behavioural difficulties. Studies with the general population that allow for comparison between different groups of children and young people, (such as those with special educational needs) could help to draw out whether nature interventions are particularly beneficial to specific groups.

Clinical Implications

From the research cited, it appears that for most of the participants in the 12 studies, natural environments provided beneficial outcomes on a range of wellbeing outcomes. Much

of the research indicated the potential of nature interventions amongst individuals with behaviour difficulties, and thus there may be the potential for clinical psychologists to utilise nature interventions in their work with children and adolescents with mental health difficulties. Ecotherapy interventions are becoming increasingly popular for adult populations (Chalquist, 2009; EcoMinds, 2013) and this review provides support for the potential therapeutic value of natural settings when working with children and young people. It is particularly promising that even in the studies where the nature intervention was relatively brief in duration (e.g. Greenwood & Gatersleben, 2016; Hinds, 2011; Milligan & Bingley, 2007) beneficial impacts on wellbeing were still observed, suggesting even short-term exposure to nature may have a positive effect.

Conclusions

The current review aimed to investigate the evidence relating to wellbeing outcomes of nature interventions provided in a range of settings for children and young people. Research tended to focus on participants with additional needs, such as children and young people with behavioural difficulties, and the majority of studies were with adolescent and young adult populations rather than younger children. A range of positive outcomes relating to wellbeing were indicated, including improvements in self-esteem and self-confidence, positive affect, stress reduction and restoration, social benefits, and resilience. Although the evidence was overwhelmingly positive, some negative impacts of nature interventions were touched on by the research, including feelings of fear, uncertainty and disgust. A number of methodological issues with the studies were discussed and critiqued. More research is needed which improves on the methodological issues identified, in order to further elucidate the link between natural environments and wellbeing in children and young people.

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Section B: Empirical Study

Investigating the effect of forest school on the mental wellbeing, resilience and environmental connectedness of young people

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Abstract

Background: There has been growing interest in forest school's utility as an intervention for building social skills, self-confidence and self-esteem. Given the diverse array of research regarding the benefits of contact with nature and the paucity of forest school research, the present study investigated the relationship between forest school participation, wellbeing, resilience and nature connectedness.

Method: A mixed methods crossover design was employed, involving 130 participants. Measures of wellbeing, resilience and connectedness to nature were administered pre- and post-forest school. Qualitative data was also collected.

Results: Results indicated significant improvements over time for resilience scores following forest school. Gender effects were found, with male participants showing significant improvements in wellbeing, resilience and connectedness to nature. Early environmental experiences, resilience and connectedness to nature were found to predict mental wellbeing.

Conclusions: The findings provide initial evidence for the potential of forest school in providing beneficial outcomes for resiliency in young people.

Keywords: Forest school, nature connection, wellbeing, resilience, young people

Introduction

Nature and Wellbeing

Wellbeing is a complex concept, with the numerous definitions in existence lacking consistency. Modern definitions of wellbeing tend to emphasise its multi-dimensionality (Dodge, Daly, Huyton & Sanders, 2012), focusing on components such as life satisfaction, and positive and negative affect (Diener & Suh, 1997). Research into wellbeing has often distinguished between hedonic and eudemonic wellbeing. Hedonic approaches tend to define wellbeing as being dependent on the attainment of pleasure and avoidance of pain and equates wellbeing with happiness (Kahneman, Diener & Schwarz, 1999). In contrast, eudemonia focuses on the process of living a fulfilled life (Ryan, Huta & Deci, 2008), encompassing aspects such as meaning and self-realisation (Ryan & Deci, 2001) and may be defined as the actualisation of human potential and fulfilment of one's true self (Waterman, 1993).

Mental health has been defined as encompassing symptoms of both hedonia and eudemonia (Keyes, 2002), rather than merely being the absence of mental illness (Ryff & Singer, 1998). Resilience has also been focused on in terms of its role in preventing the onset of mental health difficulties (Fonagy, Steele, Steele, Higgitt & Target, 1994) and the relationship between resilience and wellbeing has been well documented, with arguments made that activities promoting wellbeing can directly affect the resilience of a person (Mental Health Strategic Partnership, 2013). Resilience has been defined as "a process of strength development" (Smith, 2006, p.31) and adjustment to the challenges of life (Cummins & Wooden, 2013). It has been further suggested that resilience can be viewed as the ability to maintain wellbeing when faced with adversity (Mental Health Strategic Partnership, 2013). Resilience has also been linked to self-esteem, with a range of research describing resilient

individuals as having high self-esteem, self-confidence and a belief in one's own self-efficacy (Richmond & Beardslee, 1988; Rutter, 1987). Mguni, Bacon and Brown (2012) propose that wellbeing represents a psychological state at a specific time point, whereas resilience is a dynamic concept, encompassing both the past and the future, with resilience determining how likely a person may be to cope with future challenges.

Research has also suggested that a person's wellbeing is dependent on having meaning in life (Morgan & Farsides, 2009) and a link between early childhood nature experiences and greater personal meaning in people's lives has been found (Gross & Lane, 2008; Lohr & Pearson-Mims, 2005). There has been a growing interest in the relationship between the natural environment and wellbeing (e.g. Hinds & Sparks, 2009; Sohr, 2001), with research suggesting that early experiences of nature can impact positively on mental wellbeing in young people (New Economics Foundation, 2006). A large amount of research regarding the beneficial impact of nature to children has been conducted outside the UK, focusing heavily on the US (Roe & Aspinall, 2011). As evidence suggests that wellbeing in the UK decreases as children get older, dropping significantly at secondary school age (Chanfreau et al., 2013; New Economics Foundation, 2004), there is a need for empirical research focusing specifically on this population.

A differential effect of gender has also been observed in research looking at the association between nature and wellbeing. Research has highlighted that boys tend to be more physically active than girls (Blatchford, Baines & Pellegrini, 2003) and may have a greater appreciation of physical activity (Ridgers, Stratton, & Fairclough, 2006). Fiskum and Jacobsen (2012) suggest that this may result in boys gaining greater benefit from nature interventions, due to the increased physical activity that these interventions often entail. This is supported by research that indicated a significant decrease in mental health difficulties

amongst boys, compared with no change for girls, following an outdoor education intervention (Gustafsson, Szczepanski, Nelson & Gustafsson, 2011).

Psychological theory can be drawn on to further expand understanding around the impact of the natural environment on wellbeing. The biophilia hypothesis suggests that we have an innate need to affiliate with nature which is rooted in our evolutionary development (Wilson, 1984), and it underpins two dominant theories that help explain the psychological benefits of nature. Attention-restoration theory (Kaplan & Kaplan, 1989; Kaplan, 1995) posits that exposure to natural environments has a restorative effect, as it encourages more effortless brain function that allows for recovery from directed attention fatigue (Ohly et al., 2016). In contrast to this, stress reduction theory (Ulrich, 1983) focuses on emotional and physiological processes, suggesting that natural environments can have beneficial effects for physiological recovery and relaxation.

Connectedness to Nature

Connectedness to nature has been defined as a sense of oneness with the natural world, encompassing an individual's affective and experiential connection to nature (Mayer & Frantz, 2004), and consisting of cognitive, affective and behavioural components (Schultz, 2002). Research has pointed to a strong link between nature connectedness and wellbeing, with concepts such as life satisfaction (Mayer & Frantz, 2004), sense of purpose (Cervinka, Roderer & Hefler, 2012) and positive mood (Mayer, Frantz, Bruehlman-Senecal & Dolliver, 2009) being linked to increased connectedness to nature. Passmore (2011) has argued that neglecting our relationship with nature could have detrimental effects on mental health and wellbeing, pointing to an array of literature highlighting a relationship between nature connection and various aspects of wellbeing, including vitality, positive affect and life satisfaction (Capaldi, Dopko & Zelenski, 2014) and sense of meaning in life (Howell, Dopko,

Passmore & Buro, 2011). It has been suggested that the relationship between nature connection and wellbeing may be mediated by meaning in life, with people who have high levels of nature connectedness gaining more meaning from this connection with nature and thus subsequently increasing their wellbeing (Saraglou, Buxant, & Tilquin, 2008). Furthermore, Howell et al., (2011) found an association between nature connectedness and mindfulness (defined as the tendency to be highly aware of one's internal and external experiences; Cardaciotto, Herbert, Forman, Moitra & Farrow, 2008), hypothesising that the enhanced sensory experience of being in nature may result in greater connection to nature amongst individuals who are more mindful. However, due to the cross-sectional nature of the studies conducted by Howell et al., (2011) it is not possible to draw any conclusions regarding the causality of this relationship. It has been argued that connection to nature may be most strongly related to eudemonia, as it involves finding a sense of meaning in something outside of one's self (Howell et al., 2011; Nisbet, Zelenski & Murphy, 2011).

It has been suggested that connectedness to nature may act as a mediator of nature's effect on wellbeing (Mayer et al., 2009) and help contribute to wellbeing through sustaining positive emotions (Nisbet et al., 2011). Cheng and Monroe (2012) looked specifically at connection to nature amongst children and proposed that it consists of enjoyment of nature, empathy for creatures, sense of oneness, and sense of responsibility, and is stronger if children have previous experience in nature.

With the time that people spend in nature declining (Charles & Louv, 2009), and the emergence of terms such as nature deficit disorder to describe the detrimental behavioural and emotional effects of alienation from the natural world (Louv, 2005), there is arguably more need than ever for increased focus on interventions that offer contact with the natural world in order to promote wellbeing (Mind, 2007). This has been reflected in an array of therapeutic programmes being offered in natural settings, including therapeutic gardening

(Grahn et al., 2007), incorporating nature into the therapeutic alliance in psychotherapy, and using nature as a resource to foster wellbeing (Berger & McLeod, 2006).

Forest School

There are an increasing number of forest schools in the UK, which claim to offer hands-on experiences in woodland environments to children and young people, fostering the development of confidence and self-esteem (Forestry Commission Wales, 2009). The forest school approach emphasises the importance of contact with nature from an early age (Grahn, 1996). Forest schools vary in the activities undertaken, which may involve exploring the woodland setting, learning about wildlife and using teamwork skills (O'Brien & Murray, 2007), and can be linked to the national curriculum (Massey, 2005). Although the content of these activities vary, they should be led by qualified forest school leaders who are supported by teachers or teaching assistants, with teachers often encouraged to train as forest school leaders (O'Brien & Murray, 2007). The concept of forest school first developed in Scandinavia in the 1950s and spread to the UK in the mid-1990s (Murray & O'Brien, 2005). Forest school was initially offered to pre-school children, and the majority of forest schools tend to be run for children and young people in full-time education, however its predominance is growing and it is now offered in a variety of settings outside of nurseries and primary schools (Cree & McCree, 2013), such as to teenagers and adults with emotional and behavioural difficulties (O'Brien & Murray, 2007).

It has been suggested that being in a woodland space can have beneficial effects on mental health and provide a relaxing, soothing space and an escape from stressful situations (Bingley & Milligan, 2004). Recently, there has been growing interest in forest school's utility as an intervention for those with mental health needs, supported by evidence that has highlighted the beneficial effects of forest school on areas that may contribute to wellbeing,

such as social development, self-confidence and self-esteem (Forestry Commission Wales, 2009; Massey, 2005). Research has also started to explore the link between forest school and resilience, pointing to an improvement in resilience following engagement in forest school programmes (Horseman, 2011). Murray and O'Brien (2005) concluded that children developed increased confidence following forest school, demonstrated through the children initiating new activities and displaying increased independence and leadership. However, it is important to note that a large proportion of the literature on forest schools tends to take the form of qualitative evaluations of existing programmes, seldom employing more rigorous methods of research design, and focusing more on behavioural change and the impact for educational settings rather than considering the effect on psychological wellbeing (e.g. Murray & O'Brien, 2005; Swarbrick, Eastwood & Tutton, 2004). Resilience has been highlighted as an area that may be impacted on by forest school, however this has been more in the context of learning and physical health (Forestry Commission Wales, 2009) and less on the role of resilience in regards to wellbeing, despite it being suggested that the two concepts are strongly linked (Mental Health Strategic Partnership, 2013; Mguni, Bacon & Brown, 2012).

The Present Study

There is a paucity of research that has employed experimental designs to investigate the relationship between wellbeing and the natural environment. There seems to be an "accepted truth" (Cook, Velmans & Haughton, 2012, p. 38) that forest schools have a positive impact on areas such as resilience, however there is a lack of concrete empirical evidence to support this. The present study aimed to investigate the relationship between forest school and wellbeing and resilience in a sample of young people in the UK. Connectedness to nature was also investigated, as previous research has suggested this may act as a mediator in the relationship between nature contact and wellbeing (Mayer et al., 2009). The early

environmental experiences of young people in this study was also considered, as whether people experience the natural environment in a positive way has been found to be influenced by their experience of nature as a child (Milligan & Bingley, 2007).

Hypotheses. The following hypotheses were proposed:

H1. Participants attending forest school will report higher levels of mental wellbeing, resilience, and connectedness to nature after their experience, and when compared to the wait list control group.

H2. Male participants attending forest school will report higher levels of mental wellbeing, resilience, and connectedness to nature after their experience compared with female participants.

H3. Participants' levels of early environmental experiences, resilience, and connectedness to nature will predict their levels of mental wellbeing.

Method

Design

A mixed methods crossover design was conducted with measures of wellbeing, resilience, and connectedness to nature administered at two time points (pre- and post-forest school) for all participants. Measures were administered at an additional third time point (three months after the completion of forest school) for approximately half of the sample. Formal randomisation was not possible due to the school's scheduling; children were, however, randomly assigned to classes within the school. The staff and students were not informed of the research aims. A qualitative open-ended question was also completed after the young people had finished forest school.

Participants

A total of 130 young people (males = 70) took part in this study, with seven students excluded due to incomplete data at both time points (giving a final sample of 123). The sample consisted of students aged 11 and 12 who had taken part in a five-day forest school programme (one day each week over five weeks) at a school in an urban area of the South-East of England. The school is a community comprehensive secondary school with 1,600 pupils aged 11-18 years of mixed gender (52% male; 48% female). The majority of pupils at the school are of White British ethnicity, with 21% of pupils from a Black and Minority Ethnic (BME) background.

Measures

Five quantitative measures were utilised. Items on each measure were rated on a five-point scale [1 = agree strongly – 5 = disagree strongly] unless otherwise indicated, and reverse scored where appropriate.

Mental wellbeing. Mental wellbeing was measured by The Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS; Tennant et al., 2007; Appendix C). It consists of 14 items (T1 $\alpha = .97$, T2 $\alpha = .94$) which cover different aspects of eudemonic and hedonic mental wellbeing and are worded positively. Participants are asked to rate their responses based on their experience over the last two weeks. Example items include “I’ve been feeling good about myself” and “I’ve been dealing with problems well”. The WEMWBS was chosen as it has good construct validity and strong internal consistency (Clarke et al., 2011) and has been validated for use with teenagers (Clarke et al., 2011). It has also been found to be responsive to changes occurring in a range of short-term interventions with different populations (Kuyken et al., 2013; Maheswaran, Weich, Powell & Stewart-Brown, 2012). Furthermore, it has been suggested that due to covering both eudemonic and hedonic dimensions this means

it is more able to detect changes in mental wellbeing (Maheswaran et al., 2012).

Resilience. Resilience was measured using the Sense of Mastery (SoM) scale from the Resiliency Scales for Children and Adolescents (RSCA; Prince-Embury, 2006). These scales are suitable for the age range of 9-18 years old, have good internal consistency and good content validity (Prince-Embury, 2006). The Sense of Mastery scale has 20 items (T1 $\alpha = .89$, T2 $\alpha = .92$) that cover both strengths and vulnerabilities, and consists of the subscales of optimism, self-efficacy and adaptability. Example items include "I am good at figuring things out" and "I can learn from my mistakes". It has been used as both a screening tool and to monitor progress and outcomes, and assess treatment outcome (Naglieri, Lebuffe & Ross, 2013; Prince-Embury, 2013).

Nature connectedness. The Connection to Nature Index (CNI; Cheng & Monroe, 2012; Appendix D) was used to measure connectedness to nature. It consists of 16 items (T1 $\alpha = .90$, T2 $\alpha = .91$), which measure how connected people feel to the natural world. Example items include "humans are part of the natural world" and "being in the natural environment makes me feel peaceful". The CNI has high internal consistency when used with children aged between 8 and 12 (Bragg, Wood, Barton & Pretty, 2013). Significant positive correlations have been found between scores on the CNI and variables that indicate an important affective attitude toward nature, suggesting the CNI is a valid measure, (Cheng & Monroe, 2012). Cheng and Monroe (2012) intended one of the uses of the CNI to be programme evaluation as it can be useful for determining change over a period of months, however due to it being a trait measure it may not be responsive to shorter term change. Therefore, six further items were included to measure connection to nature, which were taken from the Monitor of Engagement with the Natural Environment survey, (MENE; Natural England, 2015; Appendix E). These items (T1 $\alpha = .92$, T2 $\alpha = .93$) focus on affective states, as it was expected these would be more responsive to short-term change.

Early environmental experiences. A measure of early environmental experiences (EEE; Appendix F) was included at time 1. This consisted of four items (α = .62) on a 7-point Likert scale.

Qualitative experience question. An open-ended qualitative experience component to the research was administered after completion of forest school. This asked participants to write whatever they chose to about their experience of forest school (Appendix G).

Procedure

Pilot. Prior to the experimental study being carried out, a group of year 7 students (N = 15) at the school who had just taken part in the forest school programme were consulted. They provided feedback on the wording of the qualitative experience question and their advice was sought on the accessibility of the information sheet and consent form, and changes made accordingly, with simpler language being used. The measures for wellbeing, resilience and connection to nature were also piloted with the students and following their feedback, the word "optimistic" on the WEMWBS was substituted for the wording "hopeful and confident about the future". Teachers at the school were consulted regarding the suitability of the questionnaires for the age range of the target population and were in agreement that they were appropriate for use with this age group.

Ethical considerations. Ethics approval was gained from a Canterbury Christ Church University ethics panel (Appendices H and I). The issues identified at the initial review by the ethics panel were addressed and documented before full approval was gained. Information sheets (Appendices J and K) provided information about the research and contact details in case of any questions, and informed consent was obtained from the parents of the students who were taking part in forest school (Appendix L). Assent was gained from the students and they were informed that they could withdraw from the process at any time (Appendix M). No

incentives or payment was offered to participants in return for taking part in the research. The research took place in normal school hours, in order to minimise disruption to the participants' daily routines. Data was stored anonymously with any identifying information removed and stored electronically in an encrypted spreadsheet on a password protected computer.

Data collection. The process of data collection took place between September 2015 and May 2016. In total 123 students completed the questionnaires at two or more time points.

Data Analysis

Quantitative analysis. SPSS version 22 was used to conduct all statistical analyses. Data was checked for normality to determine if parametric assumptions were met. Paired-sample *t*-tests were performed on the data to test the size and significance of the differences between time 1 and time 2 (for the whole sample). Independent sample *t*-tests were carried out to test the size and significance of the differences between participants who had attended forest school and participants in the wait list control group. A repeated-measures analysis of variance (ANOVA) was conducted for the data available at three time points (approximately half the sample). Paired-sample *t*-tests were then performed to test the size and significance of the differences between these three time points. A regression analysis was then conducted to test whether connection to nature and sense of mastery predicted wellbeing.

Power analysis. An a priori power calculation was conducted using GPower3 statistical software (Faul, Erdfelder, Lang & Buchner, 2007). This indicated that to detect a medium effect size (.30), with a desired power of 0.8 and alpha .05, 90 participants would be required.

Qualitative analysis. An inductive thematic analysis was utilised following Braun and Clarke's (2006) approach, in order that the themes identified were strongly linked to the data

(Patton, 2002). Coding of data was audited by research supervisors and any differences of opinion were discussed and agreement reached on the final themes.

Results

Tests for Normality

Shapiro-Wilk tests for normality of distribution were conducted (Appendix N), as recommended by Thode (2002). Visual inspection of histograms (Appendix O), Q-Q plots and calculation of skewness and kurtosis z scores confirmed normal distribution of data for the WEMWBS and SoM at all time points. Data for the MENE, CNI and EEE significantly deviated from normality, yet, considering the real-world example, sample size and the extent of the non-normality found (Appendices N and O), these are arguably acceptable (Field, 2009). However, caution must be applied to the interpretation of the present findings given these analyses.

Tests of Difference

The main analysis tested for differences between time 1 (pre-forest school) and time 2 (post-forest school) using *t*-tests. All results are based on one-tailed tests. Initial results indicated that only SoM significantly increased over time, $t(123), = 2.19$, $p = .015$, $d = .19$, with no significant differences over time for MENE, WEMWBS and CNI. Therefore, hypothesis 1 was only partially supported (Table 1).

Table 1

Tests of Difference Over Time

Variable	Mean (SD)		Number of participants	*t*	df	Sig. Level (1-tailed)	Effect size (Cohen's *d*)
	Time 1	Time 2					
WEMWBS	3.76 (.59)	3.83 (.59)	123	-1.43	122	.078	.12
MENE	3.85 (.92)	3.94 (.89)	122	-1.52	121	.066	.10
CNI	3.99 (.63)	3.99 (.65)	123	.06	122	.476	.00
SoM	3.72 (.56)	3.83 (.61)	123	-2.19	122	.015	.19

Note. SD = standard deviation; df = degrees of freedom

Secondary analyses revealed that there were gender effects that had impacted the initial results. Despite females having larger mean scores for almost all measures, only males showed significant positive increases over time for all of the variables, with the exception of the CNI (see Appendix P for full results). Therefore, hypothesis 2, that male participants attending forest school will report higher levels of mental wellbeing, resilience and connectedness to nature after their experience compared with female participants, was supported. Independent-samples *t*-tests were carried out to test for differences on the outcome measures between participants who had just completed forest school, and participants in the wait-list comparison group who were yet to start forest school. Results indicated that there were no significant differences between groups.

Longitudinal Analyses:

Further longitudinal data (time 3) was collected for approximately half of the sample (N = 55) 12 weeks after the completion of forest school. A repeated measures ANOVA with time (time 1, 2 and 3) as a within-subjects factor revealed a significant main effect of time on WEMWBS scores ($F(1.78, 217.07) = 4.75$, $p = .01$) and SoM scores ($F(1.71, 208.50) = 13.07$, $p < .001$). No significant main effect of time was found for scores on the MENE ($F(1.98, 239.71) = .72$, $p = .48$) or CNI ($F(1.85, 225.63) = 1.31$, $p = .27$). Full results can be seen below in Table 2.

Table 2

Repeated Measures ANOVA

Variable	Sum of squares	*df*	Mean square	*F*	Sig. Level (1-tailed)
WEMWBS	1.65	1.78	.93	4.75	.012
SoM	4.27	1.71	2.45	13.07	.000
MENE	.34	1.98	.17	.72	.487
CNI	.34	1.85	.18	1.31	.271

Pairwise comparisons revealed that there were significant differences between SoM scores at time 1 and time 2, and WEMWBS and SoM scores at time 1 and time 3. Bonferroni corrections (Bland & Altman, 1995) were applied in order to reduce the risk of inflation of type 1 error. Mauchly's test indicated that the assumption of sphericity had been violated in

all cases, therefore degrees of freedom were corrected using Huynh-Feldt estimates of sphericity.

Interestingly, *t*-tests revealed that longitudinal effects were more pronounced for males (N = 34) than for females (N = 21). Females maintained significantly higher levels of SoM at time 3 ($t(20), = -2.61, p = .009$; M = 3.84, SD = 0.75) compared with time 1 (M = 3.49, SD = 0.53), whereas males maintained significantly higher levels of WEMWBS ($t(33), = -2.94, p = .003$), SoM ($t(33), = -3.89, p < .001$), and MENE ($t(33), = -1.72, p = .05$) at time 3 (WEWMBS: M = 3.87, SD = 0.56; SoM: M = 3.95, SD = 0.66; MENE: M = 3.90, SD = 0.80) compared with time 1 (WEMWBS: M = 3.56, SD = 0.66; SoM: M = 3.54, SD = 0.51; MENE: M = 3.67, SD = 0.92).

Regression Analysis

A multiple regression was conducted to establish the utility of a proposed model to predict wellbeing within the current sample. Pearson product-moment correlations were computed to assess the relationship between variables at time 1 and time 2 (Table 3). At both time points, the correlation between the CNI and MENE was very high (r = .87 at time 1; r = .91 at time 2), however tolerance and VIF levels were in the acceptable range, allowing us to conclude that multicollinearity was not a concern (Field, 2009). There were no overly high relationships between the other variables.

Only the MENE was chosen for inclusion in the model, as the CNI and MENE were highly correlated (Table 3). The MENE was chosen as results indicated it was potentially the most sensitive measure at detecting differences over time (Table 1). A further analysis was also conducted including both the MENE and CNI, and it was found that inclusion of the CNI did not make a significant difference to the overall variance explained.

MENE, EEE and SoM were incorporated into the model and found to be significant predictors of wellbeing, $F(3, 119) = 47.10$, $p < .001$, explaining 54% of the variance, indicating that greater early environmental experiences, connection to nature and sense of mastery were associated with higher levels of wellbeing. Moreover, there were significant independent effects of SoM ($\beta = .60$, $t = 8.90$, $p < .001$), MENE ($\beta = .15$, $t = 2.12$, $p = .036$) and EEE ($\beta = .18$, $t = 2.66$, $p = .009$). Therefore, hypothesis 3, that participants' levels of early environmental experiences, resilience and connectedness to nature will predict their levels of mental wellbeing, was supported.

In addition to these variables, dummy variables were computed for gender, special educational needs, and English as an additional language, however they were found to have no additional predictive effect on the model.

Table 3

Pearson's Inter-Correlations Between Variables

	Gender	EEE	WEMWBS	MENE	CNI	SOM
Gender	-	.15*	.17*	.25**	.22**	.04
EEE	.15*	-	.29***	.37***	.36***	.27***
WEMWBS	.06	.37***	-	.35***	.33***	.70***
MENE	.17*	.35***	.43***	-	.87***	.38***
CNI	.18*	.37***	.45***	.91***	-	.37***
SoM	.01	.23**	.69***	.37***	.40***	-

Note. *p ≤ .05; **p ≤ .01; ***p ≤ .001 (all significance values are 1-tailed). Time 1 correlations are above the diagonal and time 2 below (N=123).

Qualitative Analysis

A brief thematic analysis was conducted on the qualitative data, due to the amount of data being quite limited. A thematic map (Figure 1) was constructed with four broad themes identified in total.

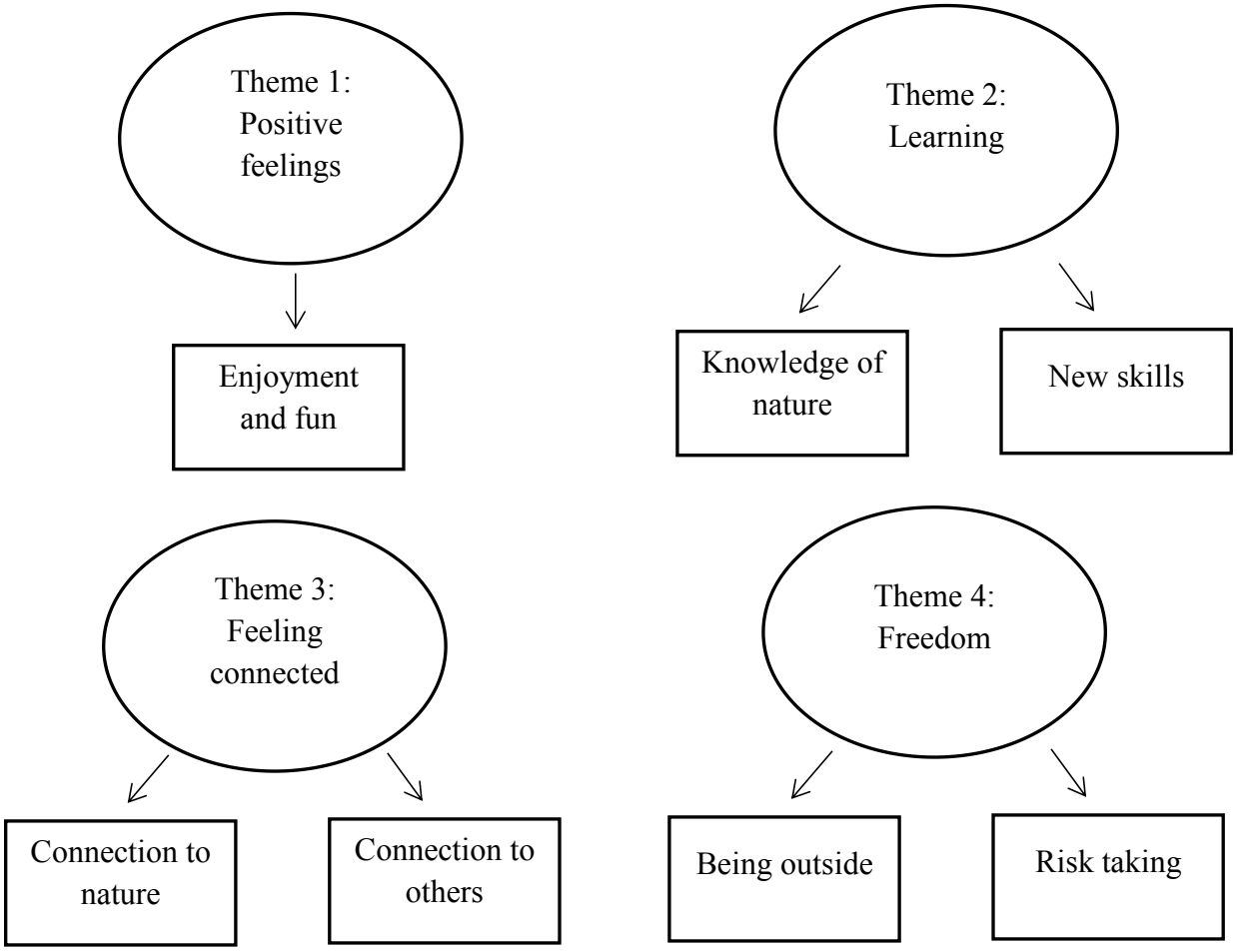

Figure 1. *Thematic map*

Theme 1: Positive feelings. A majority of the young people emphasised the positive feelings they had experienced in relation to the forest school programme. In particular, they conveyed a sense of enjoyment and fun involved in the activities they had participated in. The word "fun" was one of the most frequently used in the responses of young people.

P7: "It was great fun, with a wide variety of activities and there was never anyone left out."

P17: “In forest school I had a lot of enjoyment out of everything. I enjoyed exploring and cutting new shapes out of wood.”

P51: “My experience of forest school was amazing. All the teachers and my class mates were all funny and made me laugh. The nature was good. We went on trekking and walks. It was so fun!”

P82: “I really enjoyed taking part in activities. I felt safe but at the same time I was really enjoying myself.”

P103: “It has been fun, exciting, daring, and creative. Me and my friends had a great time!”

Theme 2: Learning. It appeared that the young people felt they had learned more about the environment and nature through the experience of forest school. The learning of new skills was also expressed by a number of participants, with some commenting on the acquisition of practical skills that they had formerly felt unable to do. The challenges involved in doing new tasks were also emphasised by some participants, and an apparent sense of achievement in being able to complete these.

P18: “I liked being there because we got to learn new stuff and look and feel lots of animals. I think that it’s helped me to know nature better.”

P33: “I learnt a lot about nature that I didn’t know before. It is a learning opportunity as well as being fun.”

P40: “I learnt a lot, especially craft and shelter building. I have learnt so many new skills. I really enjoyed learning about natural life and doing new things”.

P56: “I enjoyed learning about survival skills and learning about the forest. Some of the time it got a bit challenging and some tasks took a long time but I got to do things that I usually wouldn’t.”

P91: “I learnt new skills from all five days of it and did things I never knew I could do. I found out more about nature and how to take care of it. I felt useful and being at forest school was fun and educating.”

Theme 3: Feeling connected. Feeling connected emerged as a theme in relation to feeling connected to nature and to others (specifically friends and teachers). Young people commented on the respect for nature they experienced following their experience at forest school and an enhanced feeling of being part of nature.

P3: “I feel a part of nature and being at forest school has made me realise how important nature is and now I fully understand why we need to take care of our planet.”

P8: “Seeing how beautiful nature is made me want to go out in nature more. Working together in the forest with my friends was good and made me want to look after the forest”.

P45: “I liked being at forest school because it changed my perspective about nature and our natural environment and made me feel closer to nature. It made me feel like I could help the environment.”

P74: “I’ve worked with people I don’t usually, and got on better with the teachers than I do when I’m at school.”

P120: “I made some new friends and strengthened bonds with my best friends. I laughed a lot with people and enjoyed being with them and playing team games.”

Theme 4: Freedom. This theme encapsulated the feelings of freedom that the young people expressed in being outside of the school environment. The opportunity to take more risks was commented on, yet participants also emphasised how they felt safe during forest school.

P11: "We had the freedom to do things we aren't normally allowed to do. For example, using a knife to skin a pheasant or carving wood into animal shapes."

P58: "I enjoy being in nature because it makes me feel fresh and free. I liked being able to explore the forest and I felt safe there."

P72: "In forest school it teaches us to live in the wild by making shelters, food and weapons like arrows for fun. The teachers let us do more risky things than at school, like building fires and making knives."

P100: "I think it was really good because we were free to explore different places. Also I think there is a lot of freedom for the children in the forest and the teachers allow that and keep us safe."

P112: "It was great being allowed to do things we wouldn't normally get to do, like making fires, spotting poisonous berries, knife skills, sawing and wood chopping. I did way more things than when we're normally at school and I liked being able to run around the forest."

On completion of the study, a summary of the findings (which was accessible to participants) was sent to the school (Appendix Q). An end of study report was also sent to the university ethics panel (Appendix R).

Discussion

Summary of Findings

As hypothesised, findings indicated that there was a significant increase in participants' resilience levels following the forest school intervention, indicating the potential of forest school to provide beneficial outcomes for resiliency in young people. The prediction that participants attending forest school would report higher levels of mental wellbeing and connectedness to nature after their experience was not supported. Furthermore, analyses comparing the intervention group with the wait-list comparison group did not find significant differences between the groups for any of the variables. Therefore, hypothesis 1 was only partially supported. It is also important to note that effect sizes were small for all variables, and thus findings should be interpreted with caution. Hypothesis 2 predicted that male participants would report higher levels of mental wellbeing, resilience and connectedness to nature after their experience compared with female participants, which was fully supported by the findings. A regression analysis revealed that greater connection to nature, early environmental experiences, and sense of mastery were associated with higher levels of wellbeing, thus fully supporting hypothesis 3. Longitudinal analyses revealed significant differences in wellbeing and resilience levels three months after completion of forest school, suggesting a possible delayed effect of forest school on levels of wellbeing. No significant longitudinal differences over time were found for connection to nature.

The association found between connectedness to nature and wellbeing in this study is in line with previous literature which has suggested a link between connectedness to nature and wellbeing (e.g. Cervinka et al., 2012; Mayer & Frantz, 2004). Qualitative data highlighted how individuals felt part of nature and had a greater respect for nature following forest school. The lack of significant differences in participants' levels of connection to nature following

the forest school programme could be related to the age range of participants. It has been found that younger children experience stronger shifts in nature connectedness following a direct nature experience (Braun & Dierkes, 2016) and some research has argued that strengthening connectedness to nature is more sustainable for children under the age of 11 (Liefländer, Fröhlich, Bogner & Schultz, 2013).

The qualitative data provided support for the quantitative results. Many participants emphasised the enjoyment and achievement that they experienced as a result of the challenging activities they engaged in at forest school. Participants also emphasised the acquisition of new, practical skills, and the opportunity for risk taking, which could arguably have impacted on their sense of mastery scores. The high prevalence of positive comments emphasised the connection with others that the young people felt they had made at forest school, however it is unclear whether this is simply related to the experience of being in a group, rather than it being specific to the forest school programme.

Gender

Interestingly a significant differential effect was found for gender, with male participants experiencing a significant improvement in mental wellbeing, resilience, and connectedness to nature (as measured by the MENE). Although females had higher mean scores for all the variables, they did not experience any significant differences pre- and post-forest school. This is in line with previous research which has pointed to the impact of gender on outdoor education programmes (e.g. Gustafsson et al., 2011). One study focusing on the perspectives of boys and girls following a forest school programme found that girls focused on aspects of forest school such as learning about nature and feeling free, whereas boys tended to focus on the physical aspects of the programme (Garbutt, 2013). Fiskum and Jacobsen (2012) have suggested that boys may gain greater benefit from outdoor interventions due to the physical

activity involved, which could explain the gender differences observed in the present study, as the forest school programme encompassed a variety of physical activities, such as nature trails and shelter building.

It is of note that girls had higher scores overall than boys, which echoes existing literature that has found that females tend to report higher levels of life satisfaction than men (Hicks, 2011). Research has also indicated a greater incidence of concern for the natural environment amongst females compared to males (Mohai, 1992; Zelezny, Chua, & Aldrick, 2000). The reason for these differences is inconclusive, however it has been posited that empathy may play a role in this, with empathy induction being linked to an improvement in environmental behaviours and attitudes (Berenguer, 2007; Schultz, 2000). It has been argued that empathy is expressed more frequently by females and thus this could account for gender differences observed in relation to the natural environment (Arnocky & Stroink, 2011).

However, it is important to note that a variety of other research has found no connection between gender and connection to nature (e.g. Bragg et al., 2013; Mayer & Frantz, 2004) and other research has found contradictory findings to the current study, with girls showing an increase in self-esteem following a wilderness experience (Barton, Bragg, Pretty, Roberts & Wood, 2016). It is necessary to consider how broader social factors might contribute to the differing experiences that boys and girls have of the forest school environment, as previous research into playground interactions has found that boys show a preference for active games whereas girls tend to participate more in social interactions (Knowles, Parnell, Stratton & Ridgers, 2013). Furthermore, the construct of sense of mastery may be a gender sensitive dimension and other measures of resilience may be needed to further investigate the differences observed between boys and girls, as sense of mastery is only a small aspect of overall resilience. Further research is warranted to further investigate these potential gender differences in how young people experience forest school.

Limitations

Sample. The sample of participants in this study consisted only of students aged 11-12 years, which is a limited age range, meaning the findings may not be generalisable to other age groups. It would be important to look at a younger age range, and see if comparable results are found. The sample was also drawn from only one school which may further limit the generalisability of the findings, as the school was in an urban city in South East England and thus may not be applicable to schools in more rural settings.

Measures. It is important to consider the sensitivity to change of the instruments utilised, as it may be that the length of time between the different measurement points was not sufficient to detect changes. The length of time of the forest school programme (five days spread over a five-week period) was quite a short time period to have had an influence on the wellbeing of the participants, and thus any effects identified may have been stronger if the programme had been longer. Tennant et al., (2007) noted that the capacity of the WEMWBS to detect changes in wellbeing following an intervention is not clear, and this may explain why a significant change in wellbeing was not detected for the group as a whole. Another potential drawback with the use of the WEMWBS was that it did not enable a distinction between eudemonia and hedonic wellbeing to be made. It could be the case that forest school has a greater impact on one of these more than the other (the link with hedonic wellbeing could arguably be seen in participants' comments about the fun and enjoyment they experienced through forest school). However, it is also important to note that these forms of wellbeing are contested and are not straightforward in their definitions. Research has suggested that rather than viewing wellbeing in terms of these two approaches it should instead be seen as a multi-dimensional construct (e.g. Diener et al., 2009; Stiglitz, Sen & Fitoussi, 2009). Dodge et al., (2012) have outlined the difficulties that have occurred in trying to define the concept of wellbeing, arguing that most attempts to define wellbeing have

described dimensions of wellbeing rather than a definition of what it actually is. They instead propose a definition of wellbeing as the balance point between an individual's resources and the challenges faced, positing that this includes three key concepts: "a set point for wellbeing; the inevitability of equilibrium or homeostasis; and the fluctuating state between challenges and resources" (p. 229-230). It is important to consider how these challenges in defining wellbeing may extend to the measurement of wellbeing, and thus caution should be applied in interpreting outcomes from wellbeing measures. This may be particularly true for the measurement of wellbeing in children and young people, as it has been argued that wellbeing measures are based on domains of wellbeing identified by adult researchers, rather than being based on children's personal values and views (Fattore, Mason & Watson, 2007).

The study relied on self-report measures, which means the results may have been distorted due to socially desirable responding, acquiescent responding, and extreme responding, (Paulhus & Vazire, 2010). Research has suggested this can be a particular issue for adolescents and lead to inaccurate and invalid responses (Fan et al., 2006). It may have been that verbally administrating the measures could have enhanced reliability, (Lezak, 2004) however this was not felt appropriate, due both to practicality and also concerns about it being a non-standardised method of delivery.

Furthermore, it may have been useful to collect parent or teacher ratings of the effect of the intervention. As parents were not involved in the intervention, they may have provided a more unbiased viewpoint. Inclusion of a behavioural measure could also have been useful to determine whether the changes reported in the self-report measures were observed in participant's actual behaviour. This may have been particularly relevant for the connection to nature measures as although it has been found that children's connection to nature influences their intention to take part in nature-based activity (Cheng & Monroe, 2012) it is unclear to what extent these measures actually predict environmental behaviour. Including a

behavioural measure of this, perhaps at the three-month time point, to investigate whether the forest school programme had translated into affecting actual behaviour may have been of use.

It is finally important to note that the measures are not able to disentangle the positive effects of being in a natural environment from the effects of engaging the young people in fun activities outside of the normal classroom setting. Inclusion of a comparison group who engaged in activities outdoors (but not in the forest setting) would enable the differential effects of these environments to be examined. There is a large evidence base into the link between increased physical activity and wellbeing (e.g. Mental Health Foundation, 2013) and it is also important to consider whether the beneficial impact of forest school could be linked to young people being more physically active at forest school rather than being solely due to being in the natural environment.

Strengths

This study had a relatively large sample size, especially when compared to the existing research into forest school, which has tended to take the form of case reports or small-scale studies (e.g. Bingley & Milligan, 2004; Cook et al., 2012; Garbutt, 2013). Another strength of this study was the longitudinal component, which allowed the longer-term effects of the forest school programme to be investigated and provided tentative evidence for beneficial implications beyond the immediate effects of the forest school programme. Although only 50 percent of participants completed the three-month follow-up, this provides a promising basis for future research to build on. Furthermore, the mixed methods design of the study allowed for a richer data set, with the qualitative data providing context for the quantitative data.

Implications

Results of this study suggest that enhancing connection to nature may have a beneficial impact, particularly for the wellbeing and resilience levels of male participants. This link to wellbeing arguably has important implications for work with individuals with mental health needs. Research has already started to advocate the use of the outdoors for therapeutic purposes (e.g. Clatworthy, Hinds & Camic, 2013; Priest, 2007). Several of the comments made by participants in the study referred to the ways in which being outdoors brought them enjoyment and helped lift their mood. Further research into this link between forest school and wellbeing (and related constructs such as resilience) could be of value in supporting projects to promote wellbeing and arguably be of use for people experiencing mental health difficulties.

The forest school programme was associated with improvements in levels of wellbeing and resilience, despite its relatively short duration, is encouraging as it suggests that even limited contact with nature can have a beneficial impact. The results also point to the fact that gender may be an important aspect to focus on in future research. Identifying the possible reasons for the gender difference could then be used to ensure that forest school meets the needs of both boys and girls.

Conclusions

This study investigated the impact of a forest school programme on participants' levels of wellbeing, resilience and connection to nature. It is necessary to interpret the results of the study cautiously, however they do provide evidence to support continued research into the impact of forest schools on children and young people, finding a significant improvement in participants' resilience levels following forest school. In line with previous research, forest school was found to have a greater beneficial impact on male participants, who experienced a

significant improvement in levels of mental wellbeing, resilience and connectedness to nature, both immediately after completion of forest school and three months later. In contrast, no improvement was observed for female participants in their levels of mental wellbeing, resilience and connectedness to nature immediately following forest school, and only resilience was found to have improved three months later. Qualitative data suggested beneficial effects of the forest school programme, with four main themes being identified: positive feelings, learning, feeling connected and freedom. Participants gave positive descriptions of mastering challenging activities, acquiring new skills, and building connections with others. Resilience, connectedness to nature, and early experiences of nature were found to be significant predictors of wellbeing. Despite some methodological limitations, this study provides tentative evidence of forest school's utility as a therapeutic intervention and further research to investigate this is suggested.

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Section C: Appendices of Supporting Material

Appendix A

Effective Public Health Practice Project Quality Assessment Tool for Quantitative Studies

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Appendix B

Critical Appraisal Skills Programme Qualitative Checklist

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Appendix C

Warwick Edinburgh Mental Wellbeing Scale (WEMWBS)

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Appendix D

Connection to Nature Index (CNI)

This has been removed from the electronic copy.

Appendix E

Monitor of Engagement with the Natural Environment (MENE)

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Appendix F

Early Environmental Experiences (EEE) Questionnaire

Please tell us how much you agree or disagree with each of the following statements by putting a tick in the relevant box.

		Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree
	Question	1	2	3	4	5	6	7
1	My parents / grandparents are interested in gardening							
2	I remember playing in woodlands while I was growing up							
3	I had access to a garden when I was younger							
4	My early schools had green play areas							

Appendix G

Qualitative Experience Question

In the box below, please write about your experience of forest school.

Appendix H

Letter Confirming Ethics Approval in Principle

This has been removed from the electronic copy.

Appendix I

Email Confirming Ethics Approval

This has been removed from the electronic copy.

Appendix J

Information Sheet For Parent or Person with Parental Responsibility

Investigating the effects of forest school on the mental wellbeing, resilience and environmental connectedness of young people.

Part 1

Hello. My name is [redacted] and I am a Trainee Clinical Psychologist at Canterbury Christ Church University. I would like to invite your child to take part in a research study.

It is up to you whether you decide if you want your child to take part or not. If you decide you do not want your child to take part in the research this will not affect their participation in the forest school programme.
Before you decide if you would like your child to take part in the research, it's important to understand why it is being carried out and what it involves. Please read this information sheet to find out more and discuss it with others if you wish.

What is the purpose of the study?
Research suggests that experiences of nature can have a positive impact on mental well-being in young people. We are interested in the effect of forest school on the mental well-being of young people and also how it might affect their resilience (their ability to cope with difficulties) and connection to nature.
We hope that the study will provide new information on the relationship between forest school and mental well-being. At the end of the study we will provide you with a letter summarising the main findings.

Why has my child been invited to take part?
Your child has been invited to take part in this study as they are being offered the opportunity to participate in forest school through their secondary school. Other young people in Year 7 who are taking part in forest school are also being contacted to see if they would like to take part.

Does my child have to take part?
No it is up to you whether you would like your child to take part. We will ask for your consent and need you to sign a consent form and then give you a copy of this information sheet. We will ask for your child's assent and they will be free to stop taking part at any time during the research without giving a reason. If they decide to stop, this will not affect their participation in forest school.

What will happen to my child if they take part?
Your child will be asked to complete five questionnaires on three occasions (before and after taking part in forest school). One is about their well-being, three are about their resilience, and one is about their connectedness to nature. They will also be asked about their experience of forest school and about their early experiences of nature. We expect that this process will take approximately 20-30 minutes each time and will happen in form time so your child will not be missing lessons to take part.

Who cannot take part?
If your child has previously taken part in forest school then they will not be able to take part in this study.

What are the possible disadvantages and risks of taking part?
The risks involved in participating are very low. If there are questions that your child doesn't want to answer then he or she does not have to answer them. We will make sure your child understands that they can stop taking part in the study at any time without it impacting on them taking part in forest school.

What are the possible benefits of taking part?
We cannot promise that the study will directly help you but the information we get from this study may help us to improve our understanding of the link between forest school and well-being in young people.

Will my child taking part in the study be kept confidential?

Yes. We will follow ethical and legal practice and all information about your child will be handled in confidence. Further details are included in Part 2.

This completes part 1.

If the information in Part 1 has interested you and you are considering participation, please read the additional information in Part 2 before making a decision.

Part 2

What will happen if I don't want to carry on with the study?
Your child is free to withdraw from the study without having to give a reason. If your child decides they want to withdraw from the study we will delete all records of their data. Once anonymised, your child's data won't be able to be identified so once this process has taken place the data won't be able to be deleted.

What if there is a problem?
We do not expect that completing the questionnaires will cause any problems, however the researcher ([redacted], Trainee Clinical Psychologist) will be available to help if any problems arise.

What if I have any complaints about the study?
If you have a concern about any aspect of the study, you should ask to speak to the researcher,[redacted], who will try to answer your questions (0333 011 7070). If you remain unhappy and wish to complain formally, you can do this by contacting [redacted], Christ Church Canterbury University, Salomon's Estate, Broomhill Road, Tunbridge Wells, TN3 0TG.

Will taking part be confidential?

All information collected about your child during the course of the research will be kept strictly confidential.
If any risk related information is disclosed to me during the process of data protection this will be shared with the school and their risk protocol followed.
Your child's answers on the questionnaires will be assigned a special identification number so it will be completely anonymous. This information will be stored on a secure computer in locked offices and in locked filing cabinets. Your child's responses to our questions will remain completely confidential unless they tell us something that indicates their safety is in danger. We will then discuss this with you.

After the study has finished, a CD containing the anonymous questionnaire data will be kept in a locked filing cabinet in a specified office in Christ Church Canterbury University. This will be kept for 10 years. It will not be possible to identify your child from this data.

What will happen to the results of the study?
It will not be possible to identify your child's answers in the results or in the report. The results will be used to form part of a doctoral thesis for a doctorate in Clinical Psychology at Christ Church Canterbury University. A report about the study will also be submitted to some journals that publish research. When the study has finished we will send you a letter describing the major findings.

Who is organising and funding the research?
The study is being organised and funded as part of a doctorate at Christ Church Canterbury University. It is being organised in collaboration with [redacted]

Who has reviewed the study?
Before any research goes ahead it has to be checked by a Research Ethics Committee to make sure that it is fair. This study has been checked by the Salomons Campus Ethics Panel, Canterbury Christ Church University Research Ethics Committee.

Any questions about the study?
If you would like to speak to me and find out more about the study or have questions about it answered, you can leave a message for me on a 24-hour voicemail phone line at 0333 011 7070. Please say that the message is for me ([redacted]) and leave a contact number so that I can get back to you.

Appendix K

Information Sheet for Young Person

Investigating the effects of forest school

Part 1

Hello. My name is [redacted] and I am a Trainee Clinical Psychologist at Canterbury Christ Church University. I would like to invite you to take part in a research study. Please read this information sheet to find out more and discuss it with others if you wish.

Why are we doing this research?
We are interested in what effect forest school has on wellbeing and how people cope with difficulties.

Why have I been invited to take part?
Everyone in Year 7 can take part.

Do I have to take part?
No it is up to you! You can stop being part of the research study at any time and still take part in forest school.

What will happen to me if I take part?
You will be asked to complete five questionnaires on three occasions (before and after taking part in forest school) and also be asked some short questions about your experience of forest school. We expect that this will take approximately 20-30 minutes each time.

Who cannot take part?
If you have previously taken part in forest school then you will not be able to take part in this study.

Is there anything to be worried about if I take part?
The risks involved in taking part are very low. If there are questions that you don't want to answer then you do not have to answer them.

Contact details:

If you have any questions you can contact me, ([redacted])
on 0333 011 7070 and leave a message so that I can get back to you as quickly as possible.

Thank you for reading so far - if you are still interested, please go to Part 2.

Part 2

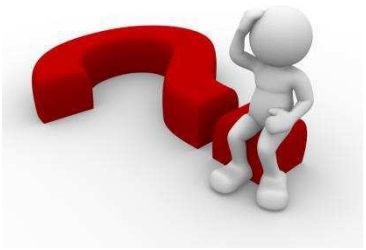
What if there is a problem?
We do not expect that completing the questionnaires will cause any problems, however the researcher ([redacted] Trainee Clinical Psychologist) will be available to help if any problems arise.

Will anyone else know I'm doing this?
We will only tell those who have a need or right to know.

What will happen to the results of the study?
The study will be written up as part of a doctorate in Clinical Psychology and may be published in a journal.

Who has reviewed the study?
Before any research goes ahead it has to be checked to make sure that the research is fair. This study has been checked by a group of people at Canterbury Christ Church University.

Thank you for reading this - please ask any questions if you need to.



Appendix L

Consent Form

Title of Study: Investigating the effect of forest school on the mental wellbeing, resilience and environmental connectedness of young people.
Name of Researcher: [redacted] Trainee Clinical Psychologist

Centre Number:

Study Number:

Participant Identification Number for this study:

Please tick box

1. I confirm that I have read and understand the information sheet dated.....(version.....) for the above study. I have had the opportunity to consider the information and ask questions.	☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time without having to give a reason.	☐
3. I agree that anonymous written quotes from my answers on the questionnaire may be used in published reports of the study findings.	☐
4. I agree to take part in the above study.	☐

Name of Young Person _____

Name of Parent or Person With Parental Responsibility _____
Date_____

Signature _____

Name of Person taking consent _____

Date_____

Signature _____

Please return one copy of this form to the school using the envelope provided. The other copy of this form is for you to keep, together with the information sheet.

Appendix M

Agreement Form

Title of Study: Investigating the effect of forest school on the mental wellbeing, resilience and environmental connectedness of young people.

Please circle all you agree with:

Has someone explained this study to you?	Yes / No
Do you understand what this study is about?	Yes / No
Have you asked all the questions you want?	Yes / No
Have you had your questions answered in a way you understand?	Yes / No
Do you understand it's okay to stop taking part at any time?	Yes / No

If any answers are no or you don't want to take part, don't sign your name.

If you do want to take part, please write your name below

Your name _____

Date _____

The researcher who explained this study needs to sign too

Print Name _____

Sign _____

Date _____

Thank you for your help. 

Appendix N

Shapiro-Wilk Statistics and Skewness and Kurtosis z-scores

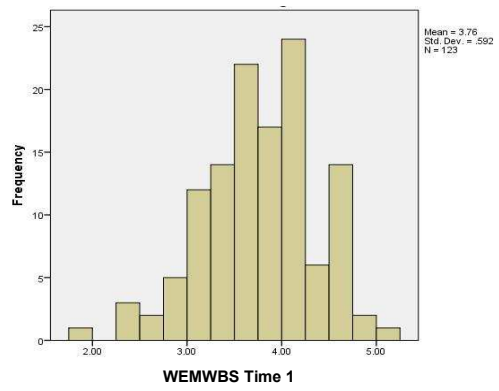
Measure	Time point	Shapiro-Wilk Statistic	df	*p*	Skewness (SE)	Kurtosis (SE)	z-score Skewness	z-score Kurtosis
WEMWBS	Time 1	.99	123	.190	-.41 (.22)	.11 (.43)	-1.86	0.26
	Time 2	.98	123	.105	-.34 (.22)	-.20 (.43)	-1.55	-.47
	Time 3	.98	123	.110	-.34 (.22)	-.17 (.43)	-1.55	-.40
MENE	Time 1	.95	123	.000*	-.20 (.22)	-.84 (.43)	-.91	-1.95
	Time 2	.92	122	.000*	-.88 (.22)	.86 (.44)	-4.00	1.95
	Time 3	.93	123	.000*	-.71 (.22)	.71 (.43)	-3.23	1.65
CNI	Time 1	.97	123	.008*	-.47 (.22)	-.25 (.43)	-2.14	-.58
	Time 2	.97	123	.003*	-.70 (.22)	.54 (.43)	-3.18	1.26
	Time 3	.96	123	.002*	-.67 (.22)	.39 (.43)	-3.05	.91
SoM	Time 1	.99	123	.668	-.01 (.22)	-.43 (.43)	-.05	-1.00
	Time 2	.98	123	.060	-.53 (.22)	.38 (.43)	-2.41	.88
	Time 3	.99	123	.210	.01 (.22)	-.15 (.43)	.05	-.35
EEE	Time 1	.88	123	.000*	-1.23 (.22)	1.42 (.43)	-5.59	3.30

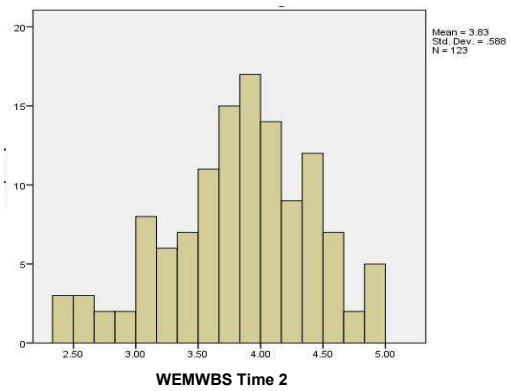
df = degrees of freedom; SE = standard error

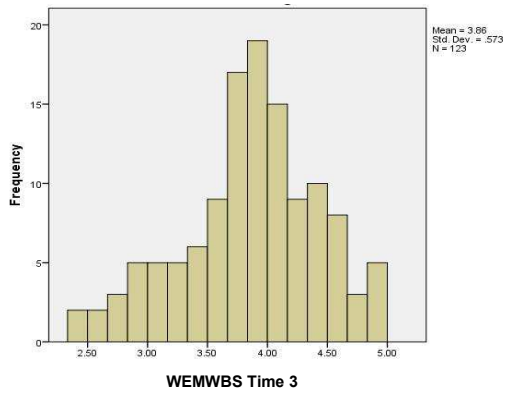
* = data that deviated significantly from a normal distribution

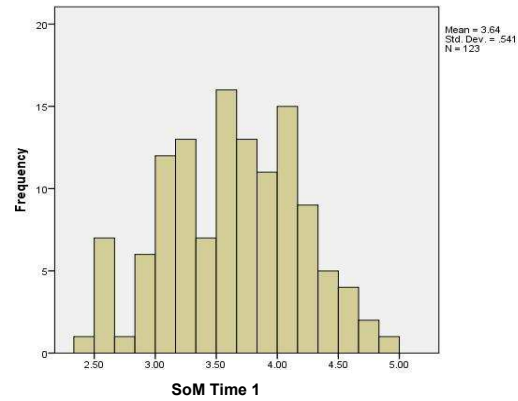
Appendix O

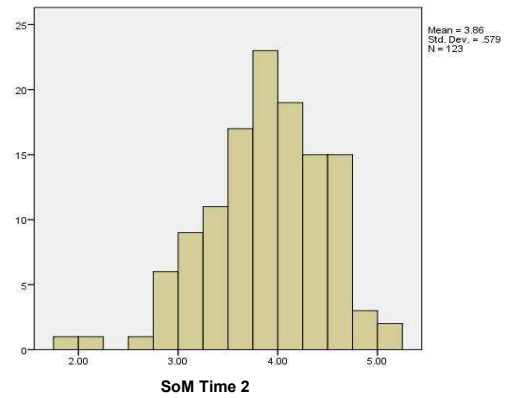
Histograms

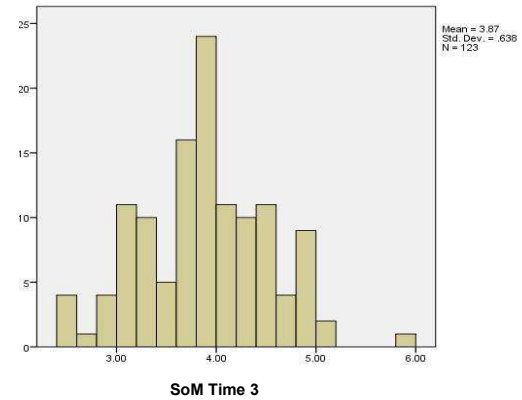


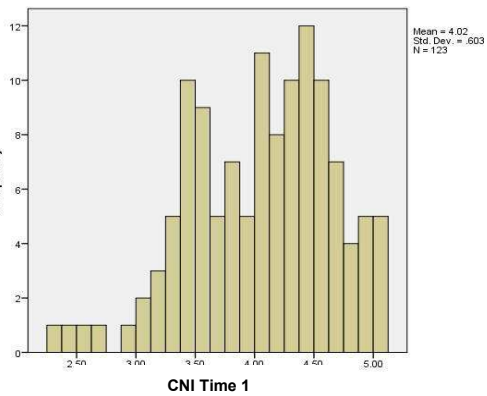


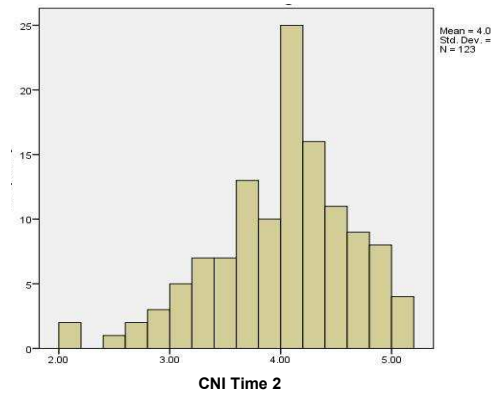


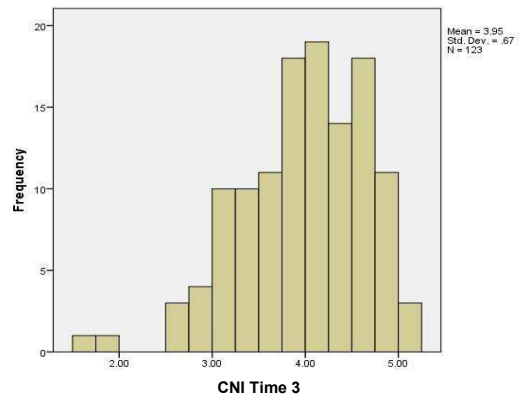


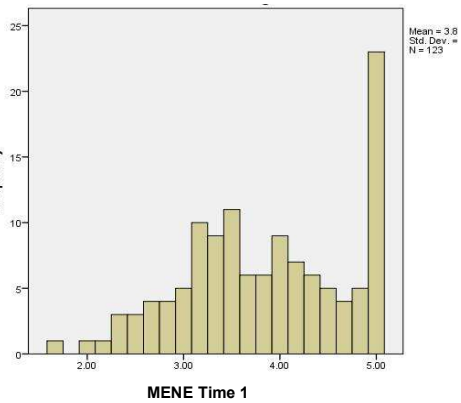


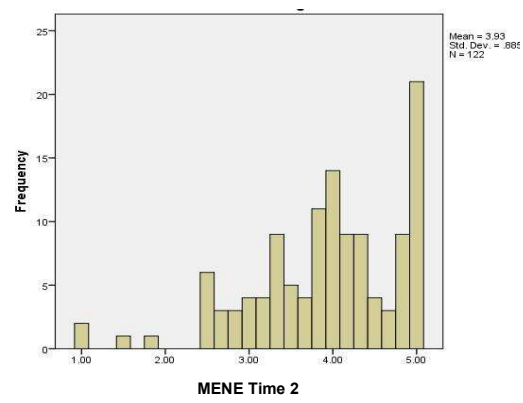


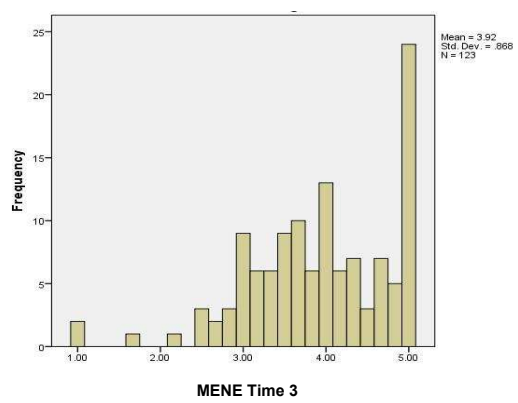












Appendix P

Gender Differences Over Time

Variable	Mean (SD)				N		*t*		df		Sig. level (1-tailed)	
	Time 1		Time 2									
	M	F	M	F	M	F	M	F	M	F	M	F
WEMWBS	3.67 (.64)	3.87 (.50)	3.80 (.61)	3.87 (.55)	70	53	-1.99	.09	69	52	.025	.463
MENE	3.65 (.91)	4.11 (.88)	3.81 (.91)	4.11 (.84)	69	53	-2.06	.04	68	52	.022	.486
CNI	3.87 (.62)	4.15 (.61)	3.89 (.65)	4.12 (.63)	70	53	-.32	.50	69	52	.377	.311
SoM	3.70 (.54)	3.75 (.59)	3.83 (.60)	3.84 (.62)	70	53	-1.93	-1.14	69	52	.029	.130

Note. SD = standard deviation; M = male; F = female

Appendix Q

End of Study Report for Participants

A study investigating forest school

What we were trying to find out

This study looked at the effect forest school had on wellbeing and resilience (how you are feeling and how you can cope with day-to-day life). The study also looked at how connected to nature people felt after going to forest school, and whether boys and girls felt differently about these things.

What we did

We asked students in Year 7 who were going to attend forest school to take part in the study. In total, 123 students aged 11 and 12 took part.

We asked the students questions before and after forest school. Half of them were asked the same questions again three months later. We asked students to write about what they thought of forest school.

What we found out

After going to forest school, students levels of resilience were higher. Boys also had improved wellbeing and felt more connected to nature..

Both boys and girls said they enjoyed forest school and wrote about how fun it was. They said they'd learned lots of new skills and facts about the forest. They said they felt they had more freedom at forest school compared to being in a classroom.

Our conclusions

Our results suggest forest school may help people feel they can cope with their difficulties. Our results suggest that boys may have got more benefit from forest school than girls, and further research could look into this in more detail.

Appendix R

End of Study Report for Ethics Panel

Salomons Centre for Applied Psychology Ethics Panel

Canterbury Christ Church University

Broomhill Road

Tunbridge Wells

Kent, TN3 0TG

Dear [redacted]

Study Title: Investigating the effect of forest school on the mental wellbeing, resilience and environmental connectedness of young people

Please find enclosed the end of study report for the above mentioned project.

This study was reviewed by the Salomons Centre for Applied Psychology ethics panel in July 2015. After receiving confirmation that approval conditions, as suggested by the committee, had been satisfactorily adhered to, the study formally commenced on 22nd September 2015. Data collection progressed smoothly with no ethical issues or concerns raised. The study concluded on 13th May 2016. I hope that the committee will find the enclosed report to be of interest. Should you have any other queries, please do not hesitate to contact me on [redacted].

Yours sincerely,

[redacted]

Trainee Clinical Psychologist

Canterbury Christ Church University

Investigating the effect of forest school on the mental wellbeing, resilience and environmental connectedness of young people

Aims

This study aimed to investigate the effect of forest school on the mental wellbeing, resilience and environmental connectedness in a group of 123 students aged 11 and 12 years. The study also aimed to explore the association between these variables and determine the influence of gender.

Methodology

Recruitment took place at a school in the South-East of England over an 8 month period, and the final sample of 123 students consisted of students aged 11 and 12 years old, who had taken part in a five day forest school programme.

A mixed methods crossover design was employed, with data obtained via self report questionnaires. The following quantitative measures were administered pre- and post-forest school, (for all participants) and again three months after the completion of forest school (for approximately half of the sample):

The Warwick Edinburgh Mental Wellbeing Scale (Tennant et al., 2007)

The Sense of Mastery scale (Prince-Embury, 2006)

The Connection to Nature Index (Cheng & Monroe, 2012)

The Monitor of Engagement with the Natural Environment survey (Natural England, 2015)

A measure of early environmental experiences was also included before participants took part in the forest school programme. Additionally, an open-ended qualitative question was administered on completion of forest school. This asked participants to write whatever they chose to about their experience.

Findings

For all participants, their overall level of resilience increased significantly following the forest school experience. No significant differences over time were found for wellbeing or connectedness to nature scores. No significant differences were found between those participants who had finished forest school and those in the wait-list comparison group who were yet to start forest school. Significant differences over time for wellbeing and resilience scores were found for the longitudinal data.

Furthermore, gender effects were found, with male participants showing significant improvements in their levels of wellbeing, resilience and connectedness to nature, compared to female participants who showed no significant improvement over time.
A regression analysis found that greater early environmental experiences, connectedness to nature, and resilience were associated with higher levels of wellbeing.
The qualitative data available led to the identification of four broad themes: positive feelings, learning, feeling connected, and freedom.

Conclusions

These results suggest the potential of forest school in providing beneficial outcomes for resiliency in young people. The differential impact of gender found in this study is in line with previous research which has pointed to males gaining greater benefit from outdoor education programmes than females.
Qualitative data further suggested beneficial effects of forest school, through positive descriptions of mastering challenging activities, acquiring new skills and building connections with others.
This study provides tentative evidence of forest school's utility as a therapeutic intervention and further research is warranted to investigate this further.

Appendix S

Submission Guidelines for Journal of Public Mental Health

General and style guidelines taken from

http://www.emeraldgrouppublishing.com/products/journals/author_guidelines.htm?id=JPMH

Manuscript Requirements
Please prepare your manuscript before submission, using the following guidelines:

Format	Article files should be provided in Microsoft Word format. LaTex files can be used if an accompanying PDF document is provided. PDF as a sole file type is not accepted, a PDF must be accompanied by the source file. Acceptable figure file types are listed further below.
Article Length	Articles should be between 2000 and 4000 words in length. This includes all text including references and appendices. Please allow 350 words for each figure or table.
Article Title	A title of not more than eight words should be provided.
Author details	All contributing authors' names should be added to the ScholarOne submission, and their names arranged in the correct order for publication. • Correct email addresses should be supplied for each author in their separate author accounts • The full name of each author must be present in their author account in the exact format they should appear for publication, including or excluding any middle names or initials as required • The affiliation of each contributing author should be correct in their individual author account. The affiliation listed should be where they were based at the time that the research for the paper was conducted
Biographies and acknowledgements	Authors who wish to include these items should save them together in an MS Word file to be uploaded with the submission. If they are to be included, a brief professional biography of not more than 100 words should be supplied for each named author.
Research funding	Authors must declare all sources of external research funding in their article and a statement to this effect should appear in the Acknowledgements section. Authors should describe the role of the funder or financial sponsor in the entire research

	process, from study design to submission.
Structured Abstract	Authors must supply a structured abstract in their submission, set out under 4-7 sub-headings (see our "How to... write an abstract" guide for practical help and guidance): • Purpose (mandatory) • Design/methodology/approach (mandatory) • Findings (mandatory) • Research limitations/implications (if applicable) • Practical implications (if applicable) • Social implications (if applicable) • Originality/value (mandatory) Maximum is 250 words in total (including keywords and article classification, see below). Authors should avoid the use of personal pronouns within the structured abstract and body of the paper (e.g. "this paper investigates..." is correct, "I investigate..." is incorrect).
Keywords	Authors should provide appropriate and short keywords in the ScholarOne submission that encapsulate the principal topics of the paper (see the How to... ensure your article is highly downloaded guide for practical help and guidance on choosing search-engine friendly keywords). The maximum number of keywords is 12. Whilst Emerald will endeavour to use submitted keywords in the published version, all keywords are subject to approval by Emerald's in house editorial team and may be replaced by a matching term to ensure consistency.
Article Classification	Authors must categorize their paper as part of the ScholarOne submission process. The category which most closely describes their paper should be selected from the list below. **Research paper.** This category covers papers which report on any type of research undertaken by the author(s). The research may involve the construction or testing of a model or framework, action research, testing of data, market research or surveys, empirical, scientific or clinical research. **Viewpoint.** Any paper, where content is dependent on the author's opinion and interpretation, should be included in this category; this also includes journalistic pieces. **Technical paper.** Describes and evaluates technical products, processes or services. **Conceptual paper.** These papers will not be based on research

	but will develop hypotheses. The papers are likely to be discursive and will cover philosophical discussions and comparative studies of others' work and thinking. **Case study.** Case studies describe actual interventions or experiences within organizations. They may well be subjective and will not generally report on research. A description of a legal case or a hypothetical case study used as a teaching exercise would also fit into this category. **Literature review.** It is expected that all types of paper cite any relevant literature so this category should only be used if the main purpose of the paper is to annotate and/or critique the literature in a particular subject area. It may be a selective bibliography providing advice on information sources or it may be comprehensive in that the paper's aim is to cover the main contributors to the development of a topic and explore their different views. **General review.** This category covers those papers which provide an overview or historical examination of some concept, technique or phenomenon. The papers are likely to be more descriptive or instructional ("how to" papers) than discursive.
Headings	Headings must be concise, with a clear indication of the distinction between the hierarchy of headings. The preferred format is for first level headings to be presented in bold format and subsequent sub-headings to be presented in medium italics.
Notes/Endnotes	Notes or Endnotes should be used only if absolutely necessary and must be identified in the text by consecutive numbers, enclosed in square brackets and listed at the end of the article.
Figures	All Figures (charts, diagrams, line drawings, web pages/screenshots, and photographic images) should be submitted in electronic form. All Figures should be of high quality, legible and numbered consecutively with Arabic numerals. Graphics may be supplied in colour to facilitate their appearance on the online database. • Figures created in MS Word, MS PowerPoint, MS Excel, Illustrator should be supplied in their native formats. Electronic figures created in other applications should be copied from the origination software and pasted into a blank MS Word document or saved and imported into an MS Word document or alternatively

	create a .pdf file from the origination software. • Figures which cannot be supplied as above are acceptable in the standard image formats which are: .pdf, .ai, and .eps. If you are unable to supply graphics in these formats then please ensure they are .tif, .jpeg, or .bmp at a resolution of at least 300dpi and at least 10cm wide. • To prepare web pages/screenshots simultaneously press the "Alt" and "Print screen" keys on the keyboard, open a blank Microsoft Word document and simultaneously press "Ctrl" and "V" to paste the image. (Capture all the contents/windows on the computer screen to paste into MS Word, by simultaneously pressing "Ctrl" and "Print screen".) • Photographic images should be submitted electronically and of high quality. They should be saved as .tif or .jpeg files at a resolution of at least 300dpi and at least 10cm wide. Digital camera settings should be set at the highest resolution/quality possible.
Tables	Tables should be typed and included in a separate file to the main body of the article. The position of each table should be clearly labelled in the body text of article with corresponding labels being clearly shown in the separate file. Ensure that any superscripts or asterisks are shown next to the relevant items and have corresponding explanations displayed as footnotes to the table, figure or plate.
References	References to other publications must be in **Harvard** style and carefully checked for completeness, accuracy and consistency. This is very important in an electronic environment because it enables your readers to exploit the Reference Linking facility on the database and link back to the works you have cited through CrossRef. You should cite publications in the text: (Adams, 2006) using the first named author's name or (Adams and Brown, 2006) citing both names of two, or (Adams et al., 2006), when there are three or more authors. At the end of the paper a reference list in alphabetical order should be supplied:
For books	Surname, Initials (year), Title of Book, Publisher, Place of publication. e.g. Harrow, R. (2005), No Place to Hide, Simon & Schuster, New York, NY.
For book chapters	Surname, Initials (year), "Chapter title", Editor's Surname,

	Initials, Title of Book, Publisher, Place of publication, pages. e.g. Calabrese, F.A. (2005), "The early pathways: theory to practice – a continuum", in Stankosky, M. (Ed.), Creating the Discipline of Knowledge Management, Elsevier, New York, NY, pp. 15-20.
For journals	Surname, Initials (year), "Title of article", Journal Name, volume issue, pages. e.g. Capizzi, M.T. and Ferguson, R. (2005), "Loyalty trends for the twenty-first century", Journal of Consumer Marketing, Vol. 22 No. 2, pp. 72-80.
For published conference proceedings	Surname, Initials (year of publication), "Title of paper", in Surname, Initials (Ed.), Title of published proceeding which may include place and date(s) held, Publisher, Place of publication, Page numbers. e.g. Jakkilinki, R., Georgievski, M. and Sharda, N. (2007), "Connecting destinations with an ontology-based e-tourism planner", in Information and communication technologies in tourism 2007 proceedings of the international conference in Ljubljana, Slovenia, 2007, Springer-Verlag, Vienna, pp. 12-32.
For unpublished conference proceedings	Surname, Initials (year), "Title of paper", paper presented at Name of Conference, date of conference, place of conference, available at: URL if freely available on the internet (accessed date). e.g. Aumueller, D. (2005), "Semantic authoring and retrieval within a wiki", paper presented at the European Semantic Web Conference (ESWC), 29 May-1 June, Heraklion, Crete, available at: http://dbs.uni-leipzig.de/file/aumueller05wiksar.pdf (accessed 20 February 2007).
For working papers	Surname, Initials (year), "Title of article", working paper [number if available], Institution or organization, Place of organization, date. e.g. Moizer, P. (2003), "How published academic research can inform policy decisions: the case of mandatory rotation of audit appointments", working paper, Leeds University Business School, University of Leeds, Leeds, 28 March.
For encyclopedia entries (with no author or editor)	Title of Encyclopedia (year) "Title of entry", volume, edition, Title of Encyclopedia, Publisher, Place of publication, pages. e.g. Encyclopaedia Britannica (1926) "Psychology of culture

	contact", Vol. 1, 13th ed., Encyclopaedia Britannica, London and New York, NY, pp. 765-71. (For authored entries please refer to book chapter guidelines above)
For newspaper articles (authored)	Surname, Initials (year), "Article title", Newspaper, date, pages. e.g. Smith, A. (2008), "Money for old rope", Daily News, 21 January, pp. 1, 3-4.
For newspaper articles (non-authored)	Newspaper (year), "Article title", date, pages. e.g. Daily News (2008), "Small change", 2 February, p. 7.
For archival or other unpublished sources	Surname, Initials, (year), "Title of document", Unpublished Manuscript, collection name, inventory record, name of archive, location of archive. e.g. Litman, S. (1902), "Mechanism & Technique of Commerce", Unpublished Manuscript, Simon Litman Papers, Record series 9/5/29 Box 3, University of Illinois Archives, Urbana-Champaign, IL.
For electronic sources	If available online, the full URL should be supplied at the end of the reference, as well as a date that the resource was accessed. e.g. Castle, B. (2005), "Introduction to web services for remote portlets", available at: http://www-128.ibm.com/developerworks/library/ws-wsrp/ (accessed 12 November 2007). Standalone URLs, i.e. without an author or date, should be included either within parentheses within the main text, or preferably set as a note (roman numeral within square brackets within text followed by the full URL address at the end of the paper).