

Investigating the effectiveness of Forest School sessions on children's physical activity levels

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Abstract

Purpose: Investigating the effectiveness of the Forest School sessions on children's physical activity levels.

Method: A mixed methods study followed a sample of 59 child participants from 4 primary schools while taking part in 12 weekly Forest School sessions. Children were assessed using the Physical Activity Questionnaire for older Children (PAQ-C) at baseline and at follow-up to assess habitual physical activity. Children were also monitored mid-intervention (week 6) using accelerometers worn for 7 days to objectively measure physical activity levels. At follow-up focus groups and write and draw activities were used to gather rich in-depth data regarding the children's experience of Forest School sessions and its impact on their mental wellbeing.

Results: Children had significantly greater levels of physical activity on a Forest School day compared to a regular school day, exceeding daily recommendations of physical activity for this group. Children reported an increase in physical activity and use of the natural environment, which was also extended to family members. Children experienced improvements in mental wellbeing as a result of Forest School sessions. Interesting gender differences were also highlighted in terms of activity preferences during sessions.

Conclusion: Forest School sessions are a successful intervention in improving physical activity levels in primary school children.

Introduction

“Forest School is an inspirational process that offers all ages regular opportunities to achieve and develop confidence through hands-on learning in a woodland environment” (Murray and O’Brien, 2005). Originating in Scandinavia, and adopted in schools in the UK. Forest Schools aim to promote academic, creative and physical development, while teaching personal and communication skills and providing children with a greater understanding of the world. This study primarily focuses on the physical activity benefits of Forest Schools to investigate whether Forest School sessions increase physical activity levels in primary school children.

Forest School is defined as ‘an inspirational process which offers ALL learners regular opportunities to achieve, develop confidence and self-esteem, through hands-on learning experiences in a woodland or natural environment with trees. Forest School is a specialist learning approach that sits within, and compliments, the wider context of outdoor and woodland education’ (McCree and McCree, 2012). It aims to provide a unique combination of learning and development, promoting mindful stillness and discovery in nature through play and free choice, enhancing emotional wellbeing and resilience. The practical activities of Forest School, such as using tools and fires, creating many learning opportunities, regaining skills that have been lost to the technological culture and narrowed school curriculum. It is based upon 6 main principles, which are:

1. Forest School is a long term process with frequent and regular sessions in a woodland or natural wooded environment, rather than a one-off visit. Planning, adaption, observations and reviewing are integral elements of Forest School.
2. Forest School takes part in a woodland or natural wooded environment to support the development of a relationship between the learner and the natural world.

3. Forest School aims to promote the holistic development of all those involved, fostering resilient, confident, independent and creative learners.
4. Forest School offers learners the opportunity to take supported risks appropriate to the environment and to themselves.
5. Forest School is run by qualified Forest School Practitioners who continuously maintain and develop their professional practice.
6. Forest School uses a range of learner-centred processes to create a community for development and learning.

(Cree and McCree, 2012)

Associated Benefits

Literature investigating the benefits of Forest Schools is limited to date. Those available studies however, show beneficial findings in varying outcomes. Therefore demonstrating the positive outcomes associated with Forest Schools and showing scope for further research.

Earlier evaluations were undertaken by the Forest Research and the New Economics Foundation. This research investigated the impacts of Forest Schools in 24 children, who were tracked for changes across three case study areas over an eight-month period. The study consisted of 2 phases, the first phase was undertaken in Wales with 2 case studies, one in North Wales and one in South Wales, where stakeholders of Forest Schools were involved to shape the evaluation (O'Brian and Murray, 2005). The agreed methodology was then used in 3 Forest School case studies in Shropshire, Worcestershire and Oxfordshire, across 7 schools, where 24 children attending Forest Schools in 2004 and 2005 participated to be observed over an 8-month period (O'Brian and Murray, 2007). The children attended Forest School sessions weekly or fortnightly for either mornings or afternoons with a total of 15 Forest School sessions. In each session, the Forest School Leaders recorded progress on each child

participant and any changes in behaviour. On analysis, a series of themes emerged. The case studies in England and Wales were similar, in regards the following benefits experienced by child participants. They experienced increased self-esteem and confidence, had improved cooperation with others and increased awareness of others, increased motivation and concentration, developments in language and communication skills, improvement in physical motor skills and a greater knowledge and understanding of the environment. An advantage of this study is that the Forest School Leaders knew the children and so could observe and record subtle changes, however this could also be a disadvantage in terms of experimenter bias. Another criticism of this study is that the child's change in behaviour could be due to a wide range of factors, including any changes in home life and their natural maturity as they got older, this study did not compare children when they were not attending Forest School sessions and so could not account for this.

Comparisons between Forest School settings and conventional indoor school settings have been assessed however in a more recent study (Roe and Aspinall, 2011). This study looked specifically into the restorative effects of Forest School compared to a conventional indoor school setting on a sample of 18 adolescents, with an average age of 11, who differed across a behavioural spectrum from 'good' to 'poor' behaviour, based upon school reports. Two hypotheses were proposed, firstly that activity in Forest School would be specifically more advantageous in raising mood and improving reflection upon personal projects than an indoor school setting and secondly, that the poor behaviour group would show a greater positive shift in mood and reflection of life tasks than the good behaviour group. The adolescents were measured according to mood using the using the shortened 14-item version of the University of Wales Institute of Science and Technology Mood Adjective Checklist (Mathews et al, 1990; Schultheiss and Brunstein, 1999) and reflection on personal development was measured using a 6-item personal project scale. Questionnaires were

completed immediately pre and post a typical day of Forest School with the same time intervals for the group in the conventional school setting. The results showed that in terms of mood, the forest school setting was consistently advantageous on all four emotional variables measured on the scale including energy, hedonic tone, stress and anger and effectively reversed these outcomes in the poor behaviour group. In regards to personal goals, the results were not reported as significant, however a positive trend was evident suggesting that the young people felt more effective about implementing their goals and more supported in realising them after the Forest School experience. Interestingly, whilst both groups benefitted from the Forest School setting, the change was greater in the poor behaviour group, where negative outcomes in the school setting were positively reversed in the forest settings. These findings suggest that these settings could play a role in helping to manage difficult behaviour in young people with behaviour problems which, in turn can positively influence health and wellbeing. Limitations of this study however include a small sample size, therefore a larger sample size would be needed for findings to be replicated further in young people.

Additionally, with the inability to control for social context between settings, it is also hard to separate out the effects of the programme activities and staff involved from the effects of the setting to be able to conclude whether the impact of the programme or the physical settings were responsible for the changes in the outcomes.

Most recent findings are reported by Ridgers et al (2012) study investigating children's perceptions, knowledge and experience of play in the natural environment. Furthermore, it was also investigated as to whether this provides appropriate mechanisms for connecting children with the natural environment. This was assessed through exploring changes in their leisure time activities and behaviours. This study included of 17 children aged 6-7 years-old from a North West England primary school. The children attended 12 sessions, each lasting 2 hours in length. Focus groups were conducted with the children in small groups both at

baseline, before the Forest School sessions began, and at follow-up, after the Forest School sessions had finished. At baseline the children were asked about their experiences of play and natural play and explored whether they faced any barriers to participate these activities. The follow-up focus groups asked the children what they had learnt and enjoyed about their Forest School sessions and whether they had continued to engage in the activities they had learned. Results showed that Forest School facilitated interactions with the natural environment and that activities undertaken in the sessions provided opportunities to develop participants knowledge and interest in nature and the world around them, with a sensitivity towards nature also been revealed. A limitation of this study is that the knowledge and interest gained in Forest School sessions could not be investigated in terms of whether this was transferred throughout the home and family environment and influenced family behaviours towards nature and the outdoors.

Anecdotal Evidence

Associated benefits of Forest School sessions have also been reported in anecdotal evidence (Slade et al, 2013). This research was carried out by the University of Northampton, who developed part of its campus as a Forest School site for use by schools and to enhance its students learning. The impact of visits made by reception age and Year 4 classes of the pilot primary school were evaluated by a researcher from the university. This was done using semi-structured interviews for the school staff, parents/carers of the children, and the children themselves. The findings showed, that in terms of the Forest Schools impact on the children, higher levels of social interaction were reported, self-esteem and concentration were improved. Staff also reported that these impacts were particularly significant on children with special educational needs and those children who were normally shy. The anecdotal nature of

this study poses limitations, which emphasises the need for further evaluation on the effects of Forest Schools.

Anecdotal evidence also comes from Swarbrick et al (2004) who explore the relationship between self-esteem and successful learning through a Forest School project run in Oxfordshire. The results of a questionnaire sent to Oxfordshire schools revealed that the project was viewed very favourably by the adult participants. Of the 29 questionnaires correctly completed and returned, when responding to the question, 'Has the Forest School changed your expectations of particular children?', adults working within the foundation stage mentioned an increased ability for quiet children to express themselves, an increase in confidence, positive participation from disruptive children, and speaking and listening skills. Similarly to Slade et al (2013) these changes were particularly evident in children who would otherwise struggle in a classroom setting, who are reported to be inventive and organised in directing their own learning whilst at Forest School. Anecdotal evidence from the present study also mentions elective mute children, where English is not their first language, speaking clearly and confidently in Forest School, while previously withdrawn teenagers develop confidence to conduct presentations on the project. This evidence, although anecdotal, suggests great potential for improving children's learning within Forest Schools. Similarly to Slade (2013) it also highlights the importance for empirical evidence to evaluate the impact of Forest Schools.

In a Forest School Pilot, as part of a learning for sustainability programme known as Broad Futures, which worked in partnership with Norfolk County Council's Literacy Team and Norfolk Environmental Education Service, Burtwright et al (2007) aimed to provide children with a stimulating experience on which to base later speaking, listening and writing. The learning objectives were to work well with other people in pairs and small groups, to look at images and describe what happened in Forest School and to use ICT to write about what

happened in Forest School. This involved 20 child participants from a mixed ability year 3 class taking part in a Forest School day, with the morning session taking place outdoors in a small nature area and the afternoon sessions taking place in a classroom. The morning session included activities, such as transporting logs and sticks using ropes, making shelters, minibeasting, willow weaving, stripping willow with a potato peeler, halving and hollowing apples to make cups and using digital equipment to record still and moving images. The afternoon session involved looking at photos and films taken during Forest School were projected onto a screen so that they could see themselves and others participating in Forest School activities and discuss them. Children had discussions about the extent to which the children had enjoyed their Forest School experience and whether they would like to share their experience with others, and it was discussed as to how this would work. Children also worked in pairs and told their partner 4 things about Forest School, they then created mind maps about what Forest School involved. These were used by the class teacher to write reports about Forest School. Feedback from participating children included statements such as, "I have learnt how fun it can be outside.", "We were using team work." and "It was like what the Indians would have done in the wild.". Feedback from the teacher described Forest School as "high quality experiences outside the classroom." The benefits of Forest School was described as, "Child-led approach builds confidence, encourages creativity and promotes independence which are essential skills for learning and for life.". The facilitators feedback was "I was amazed at the outcomes, the children loved the space that we gave them, were responsible and excited about the context. This led to intense activity that gave the children opportunities to explore their environment, enjoy each other's company and undertake tasks that they chose themselves and that actually utilised newly developed skills. The communication between children was colourful, creative, and at times magical." Sue Falch-Lovesey- Head of Environmental Education. While feedback from Nell Seal- Broad Futures

Project Coordinator was, “There was a noticeable difference in the engagement of children with the task they were involved with and also a much improved willingness to write. I noticed several children behave differently to how I had previously seen them. For example, several more quiet girls becoming more confident and independent, and a few of the previously unengaged boys improving their skills of concentration. The one individual I noticed a remarkable change in was a visually impaired boy who in the classroom had not been centrally involved in tasks but in Forest School was interested, engaged, enthusiastic and confident.”.

Kenny (2010) used interpretive ethnographic case studies to explore if and how the Forest School approach could contribute to wellbeing, learning and development of children. It was also investigated as to whether this could meet the requirements of key statutory frameworks. Participants were 10 reception children from Bath and North East Somerset, who were assessed over 5 weeks. The Leuven Involvement and Wellbeing Scales (Laevers, 1989) were used to assess involvement and in 2 timed observations of each child to assess involvement and wellbeing scales. The Strengths and Difficulties Questionnaire (Goodman, 2006) were also used to assess wellbeing and mental health 1 week prior to the project and 1 week following. Reviews were also carried out where children could share their experiences. Following this, staff would reflect on their observations. Scale point data was also obtained from children in the 2 school classes from where the sample were selected which was collected in September 2007, Easter and July 2008 to assess potential impacts of the Forest School been delivered in the Summer term. Significant differences for wellbeing and involvement data presents the Forest School context to be an optimal learning environment, which supports learning and the wider developmental needs of participating children. Specifically in those children who had low school academic achievement levels. Indicating

that if carried out over a longer period, could assist in optimising levels of academic achievement for these children.

In a study funded by the Forestry Commission and the Central Scotland Forest Trust, Lovell (2009) investigated 26 children aged 9-11 from a primary school in Scotland. Children's rates of physical activity during Forest School sessions, the total amount of physical activity, the time spent at different intensities of activity and the number of continuous bouts of activity were assessed using accelerometers. This data was compared to measurements of activity during typical school days and those with PE lessons scheduled. 24 of these children were then interviewed in pairs to explore their perceptions and experiences of the physical activity in Forest School and in other contexts. Results showed that children were significantly more active during Forest School than on a typical school day and the levels of activity were 2.2 times greater than those days with PE lessons and 2.7 times greater than regular school days. On average, the children exceeded the recommended one hour of moderate and vigorous physical activity on the Forest School days with 89.4 minutes of physical activity. These recommendations were not met on regular school days and school days with PE scheduled. The children also participated in a higher frequency of bouts of physical activity on Forest School days than typical school days with two thirds of children achieving one bout of 20 minutes or more of continuous MVPA at Forest School. Boys were found to be more active than the girls. The interviews revealed that children appreciated the opportunity to take part in the physical activity in their Forest School sessions, they enjoyed the active games and the den-building in their local woodland where they felt safe and happy, the children also appreciated the lack of barriers to engaging with nature, such as bad weather and getting dirty, were embraced during Forest School sessions rather than been viewed as a barrier. This research indicates the important contributions that Forest School could have to the public health agenda and be used as a novel way to introduce greater amounts of physical

activity into the school day. Also due to the positive experiences of Forest Schools, this could also encourage the use of local green spaces in the long term, which may have been otherwise feared.

Evaluation of Literature to Date

Findings reveal a wide range of benefits associated with Forest School sessions. These range from improvements in mental wellbeing, with increased self-esteem, confidence and mood, social skills, with increased cooperation and awareness of others and behavioural benefits were also evident, with greater improvements seen in more poorly behaved children. Greater motivation, concentration, physical motor skills and language and communication skills were also demonstrated, possibly contributing to children's attainment of developmental milestones and academic progress. More specifically, increased knowledge, interest and understanding of the environment, and sensitivity towards nature were found, facilitating interactions with the natural environment in the future.

Limitations of the literature to date include a small sample size, meaning that a larger sample size would be needed for findings to be generalised in. The qualitative nature of studies, although providing rich in-depth data, which is extremely important, is not backed up by more robust statistics, which would add scientific rigour to the data. Observations made by the Forest School Leaders and Teachers as a means of data collection is advantageous, as the children will be more familiar to them allowing subtle changes in the children's wellbeing to be detected. However this method of data collection could be criticised for been prone to bias. The majority of studies to date also fail to examine the wider health and wellbeing benefits associated with Forest School sessions such as increased physical activity levels and decreased time spent sedentary.

Rationale

The present study aimed to address the current gaps in the literature described by using a mixed-methods approach to investigate the benefits of Forest School sessions on a large sample size, which focuses primarily on its impact on associated physical activity levels and sedentary behaviour.

Aims and Objectives

This study aimed to examine the impact of Forest School sessions on primary school children's physical activity levels. It specifically investigated whether:

- Children would be more physically active on a Forest School day compared to a normal school day?
- Children would be more physically active on a Forest School day than a school day with PE lessons?
- Forest School influenced children's general level of physical activity in their free time?

Method

Design

The present study was a repeated-measures mixed methods design. It followed a sample of 59 children aged 7-9 from 4 primary schools across Merseyside.

All participants from these schools were taking part in 12 weekly Forest School sessions, each lasting 2 hours.

Participants received the PAQ-C validated questionnaire (Kowalski et al, 1997) before starting their first Forest School session and after the last session to measure habitual physical activity before and after the intervention.

At the mid-point of the intervention, at approximately week 6 of Forest School sessions, uniaxial accelerometers were distributed for each child to wear for a total of 8 days, 7 of these days were analysed with the first day's data been discounted. This was done to account for children been more active due to the novel experience.

Upon completion of all Forest School sessions, in addition to the PAQ-C questionnaire (Kowalski et al, 1997), participants also completed a Write and Draw activity to assess what the children liked and disliked about the Forest School experience and took part in focus groups to investigate whether the Forest School sessions have made the children more active in general, how these sessions compare to regular lessons and PE lessons and how the sessions have affected their mental wellbeing. The focus groups also contained questions influenced from the Write and Draw activity's findings, to investigate these themes further.

Participants

The sample was made up of 59 participants in total. These were both male and female children aged 7-9 from 4 primary schools in Runcorn and Widnes participating in the Forest School sessions, who had consented to be involved in the present research. The schools were:

1. Windmill Hill Primary School- Runcorn (n=17) (School A)
2. Farnworth C of E Primary School- Widnes (n=17) (School B)
3. St Gerard's RC Primary School- Widnes (n=13) (School C)
4. Westfield Primary School- Runcorn (n= 12) (School D)

Apparatus and materials

The following materials were used:

A gatekeeper information sheet (Appendix A) to inform the Head Teachers of each of the 4 schools about the nature of the research. This asked for assistance in recruiting the children about to start the Forest School sessions onto the research and gave instructions on how to do this. Contact details of the Research Assistant, the Project Manager and the Principal Investigator were also given if they required any further information. A gatekeeper consent form (Appendix B) was signed by each Head Teacher to approve for their students to be involved in the research.

To assist Head Teachers in the recruitment of the children, a letter to parent's (Appendix C) was given to the parents of each child who were about to start the Forest School sessions. Enclosed with each letter was a Parent Information Sheet (Appendix D) informing parents about the research and what it would involve, a Parental Consent Form (Appendix E) to indicate their consent for their child to participate in the research, a Children's Participant

Information Sheet (Appendix F), similarly to the Parent Information Sheet, informing children of the nature of the study and what taking part will involve, in a child-friendly format, a Forest School Information Sheet (Appendix G) about Forest School sessions themselves, was also included, which was illustrated with pictures. A Child Assent Form (Appendix H) was also included, for the child to consent to take part in the research, which was countersigned by their parent/guardian.

To participate in the study, participants were required to return the Parental Consent Form and the Child Assent Form.

The Children's Baseline Questionnaire (Appendix I) asked for children's names, dates of birth, the date the questionnaire was completed, their sex, their class, their school and the name of their teacher. This was used at the beginning of the study, before the first Forest School session. The Children's Follow-up Questionnaire (Appendix J) asked for the children's name, school and the date to match this questionnaire to the one completed at baseline, this was used at the end of the study, after the last Forest School session. Both questionnaires used the Physical Activity Questionnaire for Older Children (PAQ-C) (Kowalski et al, 1997). This is a children's self-report questionnaire measuring habitual physical activity. It measures general moderate to vigorous physical activity levels and provides a summary physical activity score derived from 9 items, each on a 5-point scale. It is suitable for children aged 8-14 who attend school. It is a reliable and valid measure (Crocker et al, 1997). Previously used to measure physical activity in children in similar studies with similar settings and sample populations.

Uniaxial accelerometers were used to objectively measure the children's physical activity, These were distributed at the mid-point of the Forest School sessions, at approximately week 6. The monitors were distributed to the child participants and were worn on the right hip for 8

consecutive days. The uniaxial accelerometers provide an objective measure of physical activity and have been used successfully in similar settings settings (Ramirez-Rico et al, 2014; O'Dwyer, 2014; Boddy et al, 2014).

The first day of data collected on the accelerometers was discounted, to allow for any initial excitement of receiving the monitor to wear, the following 7 consecutive days were then analysed to include data from a Forest School session day, a regular school day, a school day including a PE lesson and weekend days. This assessed whether the children were more active on a Forest School day compared to a normal school day and whether the children were more active on a Forest School day compared to a day when the children had PE lessons. For the data to be recorded successfully, children were asked to wear the monitor all the times throughout the day from waking until going to bed and were advised to remove the monitor at times where it may get wet or damaged, such as when bathing, showering, or in certain contact sports.

To allow for the confounding effect of body size and somatic maturation, calculated from anthropometrics and age, and account for this, anthropometric measures of height, sitting height and weight were taken for each child participant, as standard within physical activity studies with children.

The Leicester Height Measure was used to measure children's height and sitting height and weighing scales were used to assess children's weight.

Children were given an Accelerometer Information Sheet and Diary (Appendix K), which had information about the accelerometer and how it should be worn with photographs to illustrate. On the back of the page, a diary was provided with instructions for the children to fill in each time they took their monitor off and for what reason, e.g. bathing, and how long for, e.g. 30 minutes. The children were asked to return this diary when they returned their

accelerometer 8 days later. A Parent and Teacher Information Sheet (Appendix L) was also given to each child's parent and the class teachers, to give further information about the accelerometers.

An incentive of a £10 National Book Token was used for each child who wore their accelerometer for the 8 days and returned it.

In addition to the Physical Activity Questionnaire for Older Children (Kowalski et al, 1997), qualitative measures were also used at follow-up.

A Write and Draw Activity to examine what the children liked and disliked about their Forest School experience was conducted. The children were given a Write and Draw Sheet (Appendix M) with 2 sides, with a title on one side saying, "What I liked about Forest School..." and on the opposite side "What I disliked about Forest School" with a section to indicate their sex by circling 'M' or 'F' and state their age. The same Write and Draw Activity Instructions (Appendix N) were read out to all participants as a class activity. Children were asked to fill in their age and sex on the Write and Draw Sheet and to write and draw as much as they wanted regarding what they liked about Forest School sessions under the title "What I liked about Forest School..." and the same for what they disliked about Forest Schools under the heading "What I disliked about Forest Schools...". The task lasted 20 minutes, with approximately 10 minutes given for each side.

The focus groups were conducted with groups of 2-5 children per group, dependent on children present. Teachers selected groups depending on which children worked the most cooperatively together. The same Focus Group Questions and Script (Appendix O) were used for each group. These contained questions to investigate whether Forest School sessions made children more active, how they compared to a normal school day, how they compared

to PE lessons, how the sessions affected their mental wellbeing, and additional questions derived from the Write and Draw findings to investigate themes revealed further.

Procedure

The study's procedure was the same for each school involved in the research. To recruit the schools onto the research, gatekeeper consent was gained. This involved visiting schools that were about to start the Forest School sessions to meet the Head Teachers to explain the purpose and the nature of the study, distributing the Gatekeeper Information Sheet (Appendix A) and asking them to sign the Gatekeeper Consent Form (Appendix B) to give consent for their school to be part of the research. The Head Teachers were then instructed on how to recruit the students onto the study and were given a Letter to Parents (Appendix C) to distribute to parents of the children. Each letter enclosed a Parent Information Sheet (Appendix D) a Parent Consent Form (Appendix E), a Children's Participant Information Sheet (Appendix F), a Forest School Information Sheet (Appendix G) and a Child Assent Form (Appendix H). The Head Teachers were informed that the children had to return the Parent Consent Form (Appendix E) and the Child Assent Form (Appendix H) to participate in the research.

All children about to attend the Forest School sessions completed the baseline questionnaires (Appendix I) in their class before their first Forest School session. This involved dividing the class up into 4 groups of 4-6 children on a table with 1 adult per group reading through the questionnaire with the children and giving verbal instructions on how to fill in each section. This method of data collection was chosen, to enable the children to ask questions as they completed each section of the questionnaire, and for any queries to be answered. The questionnaires asked for the children's name, date of birth, the date, their sex, class/year, school and teacher's name. This was done so that the baseline questionnaire could be

successfully matched up to the follow-up questionnaire and so that each school's data could be identified. Baseline questionnaires from those children who had returned consent forms were kept to be used in the data collection, those that did not have consent were destroyed to comply with data protection guidelines.

At the mid-point of the research, week 6 of the Forest School sessions, children who had returned consent forms, had their habitual physical activity measured using uniaxial accelerometers. This involved firstly recording anthropometric measures of height, sitting height and weight from each child, to allow for the confounding effect of body size and somatic maturation. This was done by the Research Assistant and Project Manager visiting the schools and taking 2 children out of their classroom at a time, into a quiet area, and measuring the child's height and sitting height using The Leicester Height Measure and weight on weighing scales. Measurements were recorded onto a table and were not read aloud to ensure confidentiality. Participants were then given their uniaxial accelerometer and instructed on how to wear it and when they needed to take it off. Participants were given an Accelerometer Information Sheet and Diary (Appendix K), which had further information about the accelerometer and how it should be worn with photographs to illustrate. On the back of the page, a diary was provided with instructions for the children to fill in each time they took their monitor off, and for what reason, e.g. bathing, and how long for. The children were instructed to fill in this diary, or ask their parents to do so for each time they removed the accelerometer. A Parent and Teacher Information Sheet (Appendix L) was also given to parents and class teachers, to give more information about the accelerometers. Children were asked to return the accelerometer 8 days from then with their diary completed.

A £10 National Book Token was used as an incentive. This incentive was verbally reinforced by the Researcher and the Class Teachers to encourage children to wear their accelerometer for the 8 days and bring it back with their diaries completed.

At the end of the Forest School sessions, after week 12, follow-up measures were taken, including the follow-up questionnaire and the qualitative elements of the study including the Write and Draw activity and the focus groups.

Firstly, the follow-up questionnaires (Appendix J) were completed as a class, as described for the baseline questionnaires. These asked for the participants name to match them up to the baseline questionnaires. As described previously for the baseline questionnaires, so that these could be done as a class activity, consistent with completing the baseline questionnaires and across all schools, all children took part in completing the questionnaire as a class, and only those that had corresponding consent forms were used in the research data.

Similarly, the Write and Draw Activity was carried out as a class activity. This examined what the children liked and disliked about their Forest School experience. The children were given a Write and Draw Sheet (Appendix M) with 2 sides, with a title on one side reading “What I liked about Forest School...” and on the opposite side “What I disliked about Forest School” with a section to fill out their sex by circling ‘M’ or ‘F’ and to state their age. The same Write and Draw Activity Instructions (Appendix N) were read out to all participants as a class activity, to enable consistency across all participants. Children were asked to fill in their age and sex on the Write and Draw Sheet and to write and draw as much as they wanted to say what they liked about Forest School sessions under the title “What I liked about Forest School...” and the same for what they disliked about Forest Schools under the heading “What I disliked about Forest Schools...”. The task lasted 20 minutes, with approximately 10 minutes given for each side. The children used pencils to write and draw and when they had finished this, they were offered coloured pencils to colour their pictures. Children were given the same verbal prompts to encourage them to think about their likes and dislikes about their Forest School experience, represent these ideas by drawing them, and labelling the people, objects and what is happening in their pictures. This activity was anonymous, and only the

sex and the age of each child was collected, therefore, to identify those that had given consent to take part in the research from those that had not and could not be used, a list of children's names were read out that had given consent and children were asked to put their hand up and were all given white pieces of paper, those remaining who had not given consent were given light blue pieces of paper. When the drawings were collected, they were later sorted through so that only the drawings on the white pieces of paper were analysed and the light blue drawings were not used.

Focus groups were conducted as a further qualitative follow-up measure (Appendix O). This involved the Research Assistant (CA) visiting each primary school involved in the study and taking children, who had consented to participate in the study, out of class in same-sex groups of 3-5 participants per group. These focus groups were carried out in a quiet room within the school building and a Dictaphone was used to record the results. The focus groups were carried out at specific times of the school day to avoid break times and lunch times and avoid possible contamination of results. The Class Teachers of the children were asked to select the groups, based on those children who worked the most cooperatively together. The groups were kept as same-sex groups, this was determined by the Write and Draw activity's findings, conducted previously which showed gender specific characteristics consistent with previous literature (Knowles et al, 2013, Woods et al, 2012, Coulter and Woods, 2011). The groups were therefore split up into male and female groups to explore these findings further with gender specific questions. Each focus group aimed to last 20-30 minutes. The Research Assistant read out a list of instructions, which were the same for each group. The questions asked were either aimed at the child participants individually, or as a group, the Research Assistant informed the child participant whether the question was been asked individually or as a group, before the question was asked. A consensus question was also asked where the children were asked to take a vote by raising their hand. The questions asked were designed

to assess the main aims of the study, which were, whether the Forest School sessions make children more active, whether children were more active on a Forest School day than a normal school day, and whether children were more active on a Forest School day than on a day when they have a PE lesson. Questions asked reflected these research questions, additional prompts were also associated with each question to be used if needed. The Pictorial Children's Effort Rating Table (PCERT) was used in the focus groups to enable the children to rate their physical exertion when completing activities in Forest School Sessions. This instrument uses pictures in addition to descriptive language to reflect changes in physiological demands of tasks on a 10-point scale from '1- very very easy' to '10- so hard I'm going to stop' (Yelling et al, 2002).

In addition to the main research questions, children were also asked how the Forest School sessions influenced their mental wellbeing. The gender specific questions were dependent on the Write and Draw findings per school involved. In one primary school, the majority of boys showed a like for the camp fire, playing hostage (a hide-and-seek game), and climbing the trees, and disliked the cold and wet weather they were exposed to. The male focus groups were therefore informed of these findings and asked why they thought this was so evident. The female focus groups followed the same procedure. In that particular example, the majority of the girls showed likes for participating in activities with their friends and the Forest School Leader, who was also female, they disliked the cold and expressed discomfort from sitting on logs and hurting themselves during particular activities. The girls were therefore asked about these findings, to explore them further. The children were thanked for their participation and returned to their classroom.

Ethical Considerations

The study complied with Liverpool John Moores University Ethics Committee where full ethical approval was obtained (Appendix P). To comply with ethical guidelines, all Head Teachers were provided with a gatekeeper information sheet (Appendix A) containing contact details and to inform them about the nature of the study. Parent information sheets (Appendix D) and Children's participant information sheets (Appendix F) detailing the study's purpose, what was required should they choose to take part, what taking would involve, reassuring them that, if they choose to take part, their results would remain confidential and gave contact details of the Principal Investigator, the Project Supervisor, and the Research Assistant if they required any additional information . Parental consent forms (Appendix E) and child assent forms (Appendix H) were signed by parents and child participants to confirm that they understood the nature of the study, which their participation is voluntary, meaning that they can withdraw from the study at any time without having to give a reason, that their results will remain confidential and anonymous, and thereby agreeing to take part in the study.

Data Analysis

The data for each measure was analysed as follows:

The Physical Activity Questionnaire for Older Children (PAQ-C)

The Physical Activity Questionnaire for Older Children (PAQ-C) scores were analysed using a repeated measures ANCOVA to compare differences in scores at baseline and follow-up.

Accelerometer data

Accelerometer data was analysed by Expert Researchers in Sport and Exercise Sciences at the Physical Activity Exchange at Liverpool John Moores University using protocols consistent with previous studies using uniaxial accelerometers. These analyses investigated differences in physical activity duration and intensity for Forest School days, regular school days, PE lesson days and weekend days.

Focus Groups

Audio files of focus groups were transcribed verbatim, transcriptions were then analysed using content analysis to examine key themes and subthemes. Pen profiles were then used to demonstrate a composite of key themes from the data deduced via an efficient process which offers examples of verbatim data to illustrate each theme. These extracted quotes, or a statement made by the children, were self-definable and self-delimiting in the expression of a single recognisable aspect their experience. A consultation process of triangulation took place with a presentation by the Principle Investigator, in which the pen profiles and verbatim quotations were demonstrated to and critically questioned the analysis in this session, and interrogated the data independently tracking the process in reverse from the pen profiles to the transcript.

Write and Draw

A form of content analysis was used to explore the 'likes' and 'dislikes' data and involved the production of pen profiles. This approach has been previously used in qualitative work involving young children as the participants (Knowles et al, 2013 and Ridgers et al, 2012). Pen profiles provide an efficient representation of key themes from data analysis demonstrating examples of verbatim data and frequency data as opposed to all raw data themes recorded using more traditional content analysis procedures (Knowles et al, 2009). Quotations and pictures were subsequently used to

expand the pen profiles and highlight emerging themes. Triangulation of the analysis occurred through presentation of the profiles together with associated verbatim/illustrative material by the Research Assistant to the Principle Investigator. These authors then critically questioned the analysis and interrogated the data independently tracking the process in reverse from the pen profiles (or outcome) to the write and draw data sheets (data source). This process continued until an acceptable consensus had been reached by the group. Methodological rigor, credibility and transferability was achieved via verbatim transcription of data and triangular consensus procedures. Dependability was demonstrated through the comparison of pen profiles with verbatim/illustration data and triangular consensus processes.

| Participating Schools: | Windmill Hill Primary School (n=17) | Farnworth C of E Primary School (n=17) | St Gerard's RC Primary School (n=13) | Westfield Primary School (n=12) |
|--|---|--|---|---|
| Baseline questionnaire completed before Forest School Sessions | | | | |
| | Forest School sessions weeks 1-6 running from 7/10/2013-11/11/2013 with Forest School Leader (CA) at 9am-11am in their school woodlands | Forest School sessions weeks 1-6 running from 7/10/2013-11/11/2013 with Forest School Leader (CA) at 1pm-3pm in their school woodlands | Forest School sessions weeks 1-6 running from 13/01/2014-17/02/2014 with Forest School Leader (NR) at 10am-12pm at Wigg Island Community Park | Forest School sessions weeks 1-6 running from 24/02/2014-31/03/2014 with Forest School Leader (JM) at 1pm-3pm in their school woodlands |
| Week 6 | | | | |
| Accelerometers distributed and worn for 8 days in total and recorded for 7 days | | | | |
| | Forest School sessions continued weeks 7-12 running from 18/11/2013-03/02/2014 | Forest School sessions continued weeks 7-12 running from 18/11/2013-03/02/2014 | Forest School sessions continued weeks 7-12 running from 24/02/2014-31/03/2014 | Forest School sessions continued weeks 7-12 running from 07/04/2014-12/05/2014 |
| Following Week 12 | | | | |
| Follow-up questionnaires Write and Draw activity Focus groups | | | | |

Figure 1. Procedure for Child Participants According to School

Results

Dropout Rate

There was a dropout rate of 6 participants (10%) from the baseline (n=59 to the follow-up (n= 53).

Demographics

In terms of demographic variables (Appendix Q) the mean age of children was 8 years old. (M= 8.17, SD=0.46) 33 were male (56%) and 26 were female (44%).

17 children were recruited from Windmill Hill Primary School in Runcorn (School A), 17 from Farnwoth C of E Primary School in Widnes (School B), 13 from St Gerard's RC Primary School in Widnes (School C) and 12 from Westfield Primary School in Runcorn (School D).

Descriptive Statistics

Physical Activity Questionnaire for Older Children (PAQ-C) (Kowalski et al, 1997)

The mean scores and standard deviations for the Physical Activity Questionnaire for Older Children (PAQ-C) (Kowalski et al, 1997) were M=3.26, SD=0.76 at baseline and M=3.18, SD=0.71 at follow-up.

Accelerometer Data

The mean and standard errors of the accelerometry data for Forest School days, regular school days, PE days and weekend days is shown in table 1.

Table 1. Means plus standard errors for the days of the week analysis (adjusted by wear time, gender and BMI Z-scores)

| Physical Activity Intensity | Day of the Week | Mean | Std. Error |
|-----------------------------|--------------------|----------------------|------------|
| Sedentary time | Forest School Day | 414.838 ^a | 7.920 |
| | Regular School Day | 430.303 ^a | 6.770 |
| | PE Day | 418.129 ^a | 7.232 |
| | Weekend Day | 418.826 ^a | 7.830 |
| Light intensity PA | Forest School Day | 197.230 ^a | 4.905 |
| | Regular School Day | 173.584 ^a | 4.193 |
| | PE Day | 198.215 ^a | 4.479 |
| | Weekend Day | 192.059 ^a | 4.849 |
| Moderate intensity PA | Forest School Day | 40.823 ^a | 2.234 |
| | Regular School Day | 34.698 ^a | 1.910 |
| | PE Day | 37.517 ^a | 2.040 |
| | Weekend Day | 40.208 ^a | 2.209 |
| Vigorous intensity PA | Forest School Day | 29.871 ^a | 2.367 |
| | Regular School Day | 27.177 ^a | 2.024 |
| | PE Day | 28.456 ^a | 2.161 |
| | Weekend Day | 29.539 ^a | 2.340 |
| Total PA (light+) | Forest School Day | 267.476 ^a | 7.431 |
| | Regular School Day | 248.902 ^a | 6.352 |
| | PE Day | 264.034 ^a | 6.785 |
| | Weekend Day | 262.618 ^a | 7.346 |
| Moderate to Vigorous PA | Forest School Day | 70.656 ^a | 4.122 |
| | Regular School Day | 62.222 ^a | 3.523 |
| | PE Day | 65.954 ^a | 3.763 |
| | Weekend Day | 69.816 ^a | 4.075 |

Data Analysis

Physical Activity Questionnaire for Older Children (PAQ-C) (Kowalski et al, 1997)

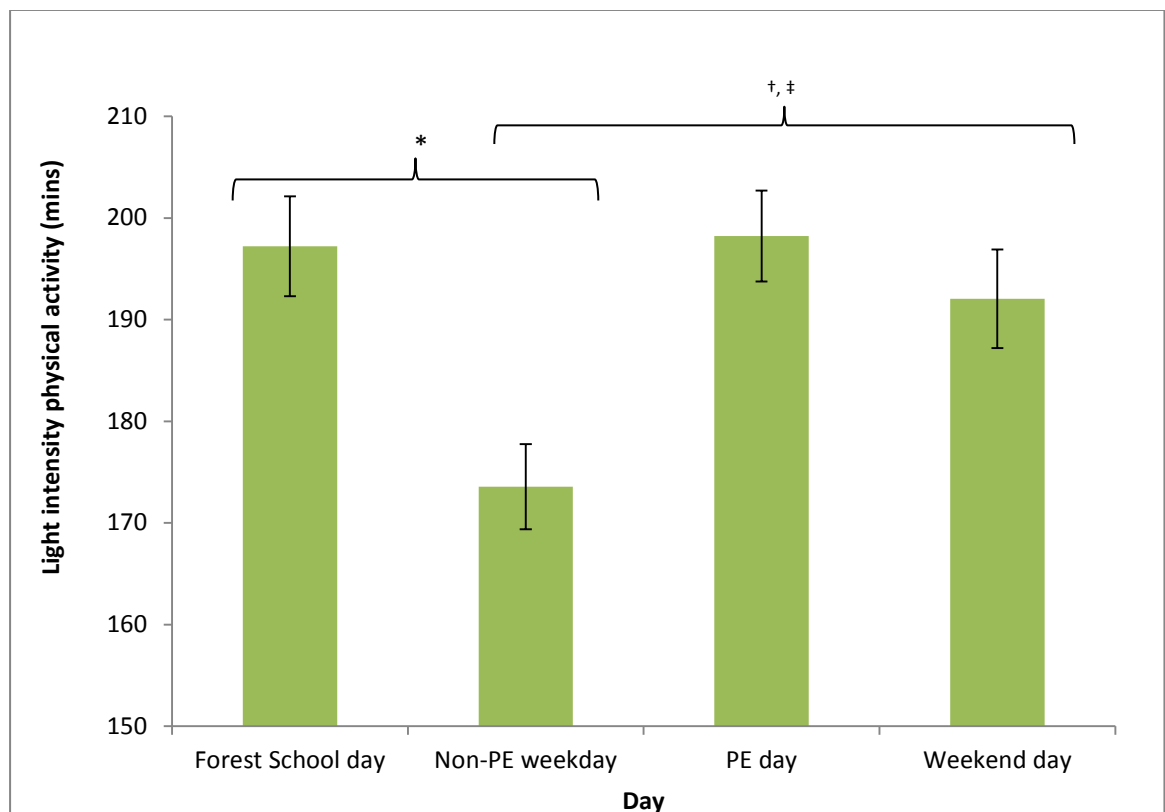
A repeated measures analysis of covariance (Appendix R) was conducted to analyse the differences in the baseline and follow-up Physical Activity Questionnaires for Older Children (Kowalski et al, 1997). The results showed there were no significant

differences in children's self-reported physical activity levels from baseline to follow-up ($F_{1,57} = 1.93, P = .17$).

Accelerometer Data

The accelerometer data revealed a significant difference ($p = 0.002$) in light intensity physical activity on a Forest School day ($M = 197.23, SE = 4.90$) compared to a regular school day ($M = 173.58, SE = 4.19$). This is shown in figure 1. It is also demonstrated that light intensity physical activity was also significantly higher ($p = 0.028$) on a PE day ($M = 198.21, SE = 4.48$) compared to a regular school day ($M = 173.58, SE = 4.19$) and significantly higher ($p = 0.001$) on a weekend day ($M = 192.06, SE = 4.85$) compared to a regular school day ($M = 173.58, SE = 4.19$) See figure 2.

Figure 2. Time spent in light intensity physical activity



There were no significant differences between time spent sedentary, in moderate to vigorous and total physical activity.

However it can be observed that less time was spent sedentary on a Forest School day than on a regular school day, a PE day, or a weekend day (see figure 3).

Additionally, more time is spent in moderate to vigorous physical activity on a Forest School day than on a regular school day, a PE day and a weekend day (see figure 4).

This is also the same for the total physical activity scores (see figure 5).

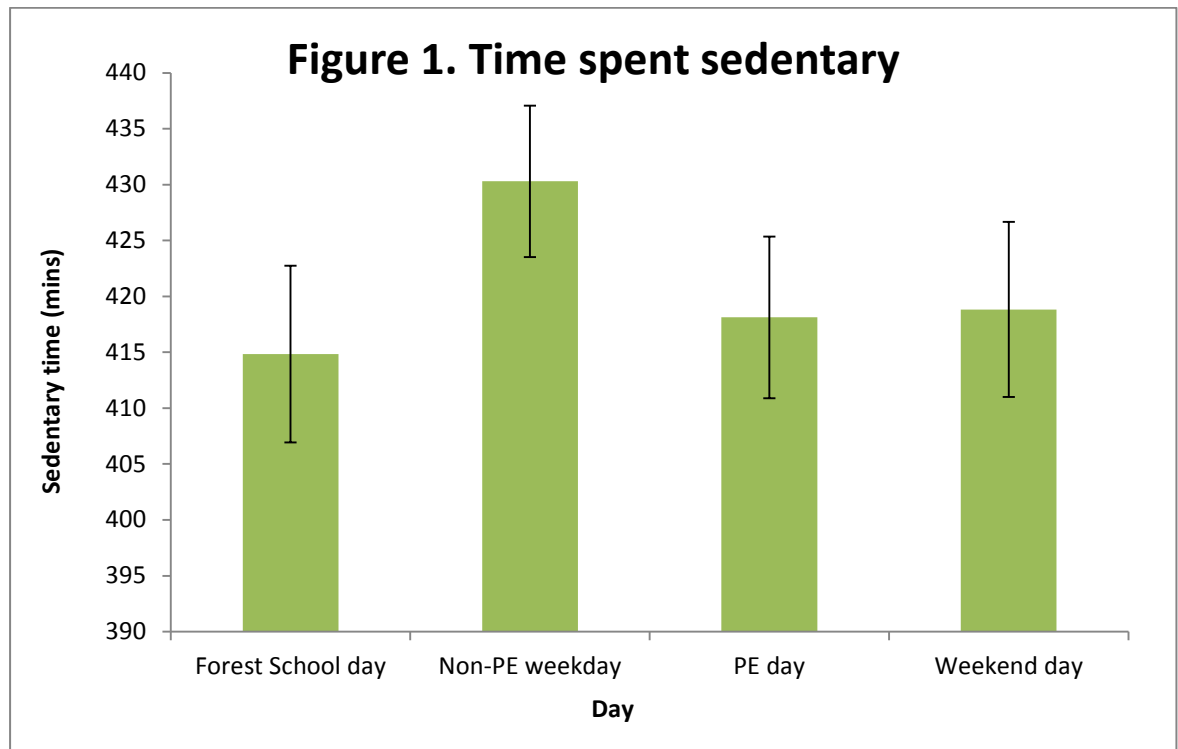


Figure 3. Time spent sedentary

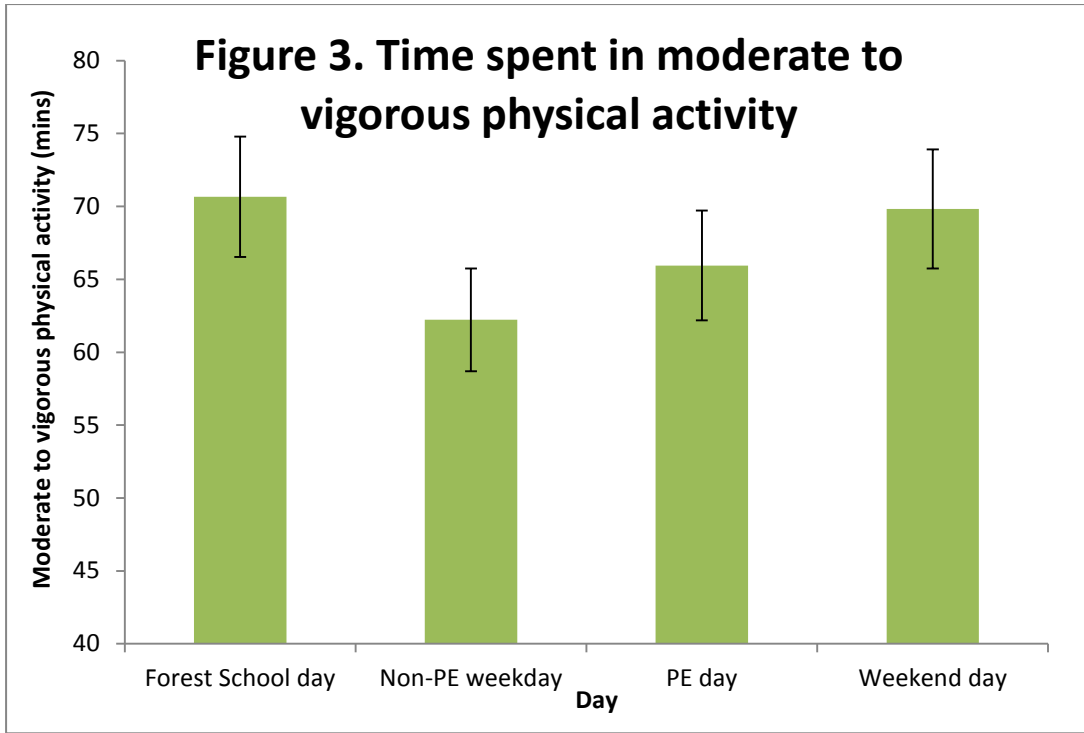


Figure 4. Time spent in moderate to vigorous physical activity

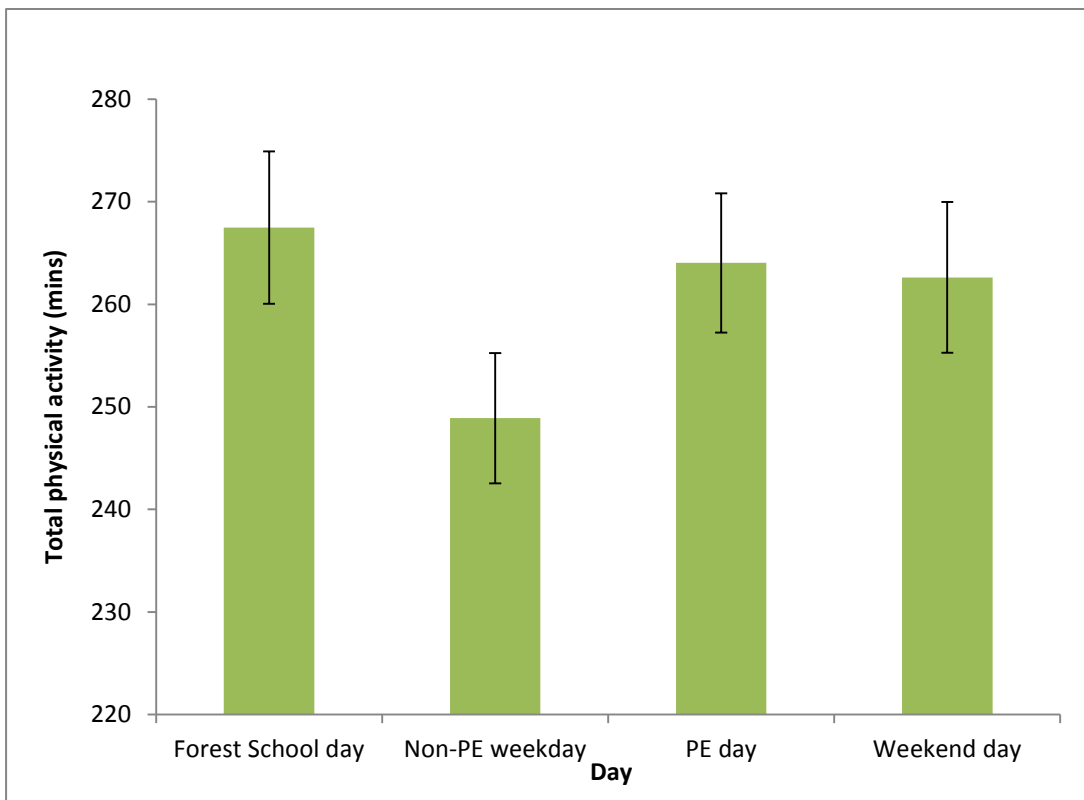


Figure 5. Total physical activity (light to vigorous intensity)

Focus Groups

Focus group data was analysed using content analysis, the results are shown in Appendix S-V. Themes were illustrated using pen profiles (Appendix W-Z).

Research questions explored during focus groups were as follows:

1. Do Forest School sessions make children more active?
2. Are children more active on a day when they have Forest School compared to a normal school day?
3. Are children more active on a Forest School day compared to a PE day?
4. How does Forest School influence mental wellbeing?

Themes will be discussed for each research question. For research question 1- 'do Forest School sessions make children more active?' When discussing physical activity generated from Forest School sessions, the majority of children talked about the chasing games played during the sessions (n=43). They discussed feelings associated while playing these games and said that they felt happy (n=9), tired (n=7) and physically active (n=4). The majority rated their physical exertion levels as 'hard' (n=33) and 'moderate' (n=13) when taking part in these games. When asked about the physical activity that they take part in at home, the majority reported that they played outdoors (n=43). When asked about how Forest School sessions had impacted on the amount of physical activity they do in their leisure time, the majority agreed that Forest School sessions had increased the amount of physical activity they participated in at home (n=46) and some went on to state that they had replicated the games they had learnt during their Forest School sessions (n=20). Of those children stating that they played indoors (n=16), the majority of those (n=12) played sedentary games, such as computer games and reported restrictions in terms of playing outdoors. Other

opportunities to be physically active included family days out (n=39), holidays (n=9) and out of school clubs (n=6). Research question 2 asked 'are children more active on a Forest School day compared to a normal school day?'. The majority of children said that they preferred outdoor lessons as opposed to indoor lessons (n=51). Some stated that they preferred the Forest School sessions compared to their regular classroom lessons (n=23) due to the increased opportunities to play (n=9). Children also reported that the behaviour of their peers was different in Forest School sessions compared to when they are in the classroom environment (n=18) and stated that their peers were more helpful (n=3), with improved behaviour (n=2) and the quieter children were less shy (n=2). Further opportunities to go outdoors included school trips (n=37) and occasional outdoor lesson opportunities (n=23) where children had the opportunity to learn away from their traditional classroom environment.

When exploring research question 3 'are children more active on a Forest School day compared to a PE day?' Children highlighted differences between Forest School and PE lessons (n=47), reporting that Forest School were different as they were more active (n=11), the environment was different to when participating in PE lessons (n=7), there was more freedom (n=5) and more creativity (n=5) in Forest School sessions. Children reported that PE was different to Forest School as they had the opportunity in PE lessons to play sport (n=4) and there was more equipment available (n=4) compared to Forest School sessions.

When examining research question 4, 'how Forest School sessions influence mental wellbeing?' the majority of children reported feeling bored (n=13) before Forest School sessions started. They stated that they enjoyed participating in Forest School sessions (n=39) with the majority of children highlighting opportunities for free play and creativity (n=7) as been a factor as well as the opportunity for increased social

interaction (n=3) and exercise (n=3). After completing Forest School sessions, the majority of children reported feeling sad that the sessions had finished (n=28). When asked if a Forest School session would influence mental wellbeing if they were experiencing negative emotions, the majority of children agreed that Forest School sessions would influence their mental wellbeing (n=34) with the majority reporting that it would positively influence their mental wellbeing by making them feel happier (n=11).

Write and Draw

One hundred and thirteen children completed the task (aged 7-9). Fifty three of those children (aged 7-9) were eligible. There were 6 absences. Of those eligible returns (n=53) 5 were not legible. The following quality measures were used in the analyses of the data. Drawings needed to be a legible representation of people, events, and/or places labelling (using words) identifying factors (names, place, activity, etc) and/or a denoted interaction or association. Table 3 summarizes the completion of this questionnaire task by picture and labelling. The following procedure and terminology were adopted to analyse the questions ‘what I like about Forest School is . . . ?’ and ‘what I dislike about Forest School is . . . ?’. Responses to these statements were classified as a written ‘report.’ When children reported more than 1 like or dislike, the reports were categorized to ‘marks’ in relation to a specific theme (i.e., play, games, environment). A ‘mark’ refers to where participant ‘reports’ were identifiable with a ‘theme.’ In most cases 1 report identified more than 1 theme and subsequently more than 1 mark. Pen profiles the following figures (figures 6-9) show data from schools A,B,C and D illustrating boys and girls likes and dislikes associated with Forest School sessions.

Table 3. Write and draw reports and themes extracted from schools A, B, C and D according to gender

| School | Return rate | Gender | Task | Reports Extracted | Themes |
|---------------|--------------------|-----------------|-------------|--------------------------|---|
| A | (n=16) | Male (n=9) | Likes | 7 | construction (n=8), fire (n=7) and playing active games (n=7) |
| | | | Dislikes | 3 | cold and the wet (n=6) and the end of Forest Schools (n=4) |
| | | Female (n=7) | Likes | 8 | social elements (n=13), creative tasks (n=12) and playing games (n=6) |
| | | | Dislikes | 1 | cold and the wet (n=9) |
| B | (n=16) | Male (n=7) | Likes | 3 | fire (n=5), trees (n=2) and creative tasks (n=2) |
| | | | Dislikes | 1 | end of the Forest School sessions (n=4) |
| | | Female (n=7) | Likes | 6 | fire (n=4), social elements (n=3), playing active games (n=5) and construction (n=2) |
| | | | Dislikes | 2 | end of the Forest School sessions (n=6) |
| C | (n=10) | Male (n=5) | Likes | 6 | socialising elements (n=5), wildlife (n=3) , active games (n=4) and campfire activities (n=4) |
| | | | Dislikes | 3 | getting hurt (n=3) and educational games (n=4) |
| | | Female (n=5) | Likes | 5 | social elements (n=7) , creative tasks (n=4), campfire activities (n=3) and nature (n=4) |
| | | | Dislikes | 1 | dogs present (n=2) |
| D | (n=11) | Male (n=6) | Likes | 4 | climbing trees (n=4), construction (n=5) and bird watching (n=2) |
| | | | Dislikes | 2 | construction (n=3) and people standing on the flowers (n=3) |
| | | Female (n=5) | Likes | 3 | construction (n=4) and mini beasts (n=2) |
| | | | Dislikes | 1 | people standing on the flowers (n=2) |

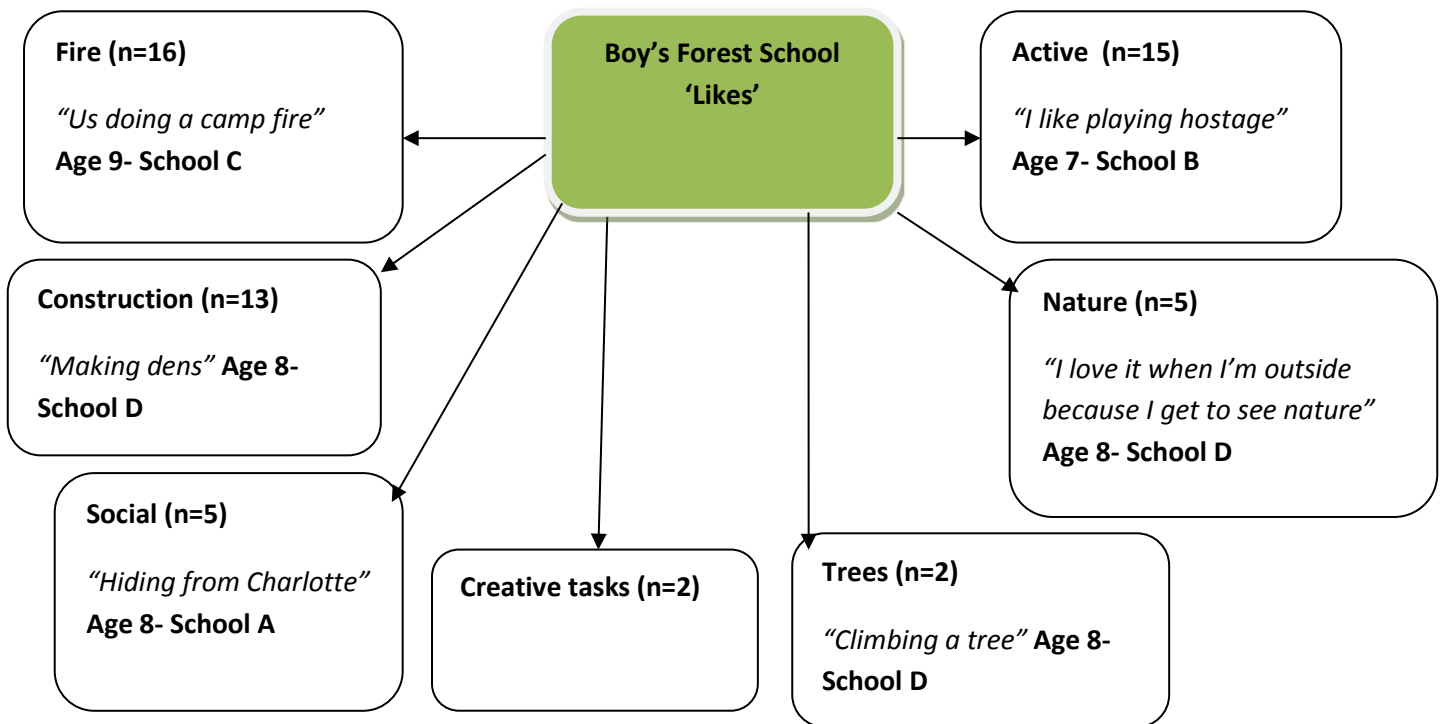


Figure 6. Pen Profiles for Boys "What I like about Forest School is...?"

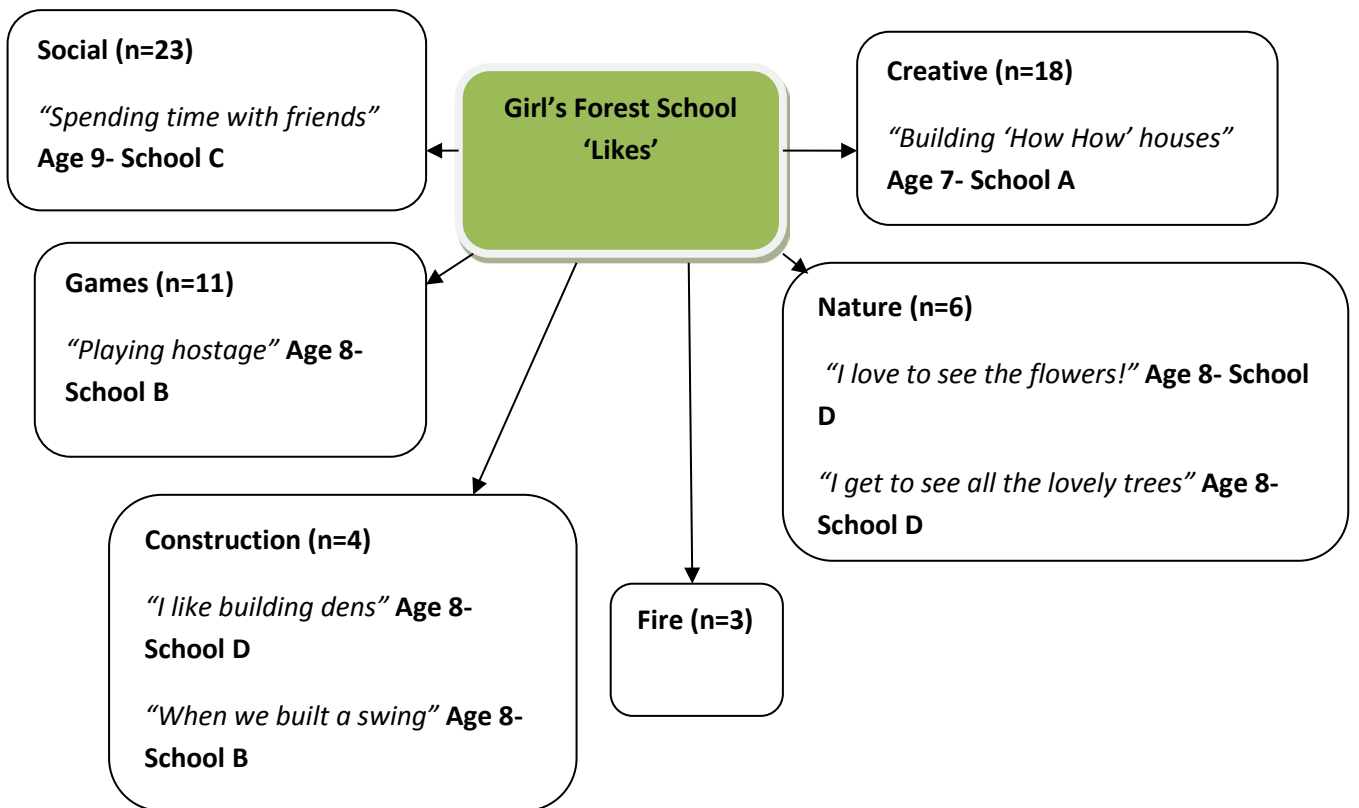


Figure 7. Pen Profiles for Girls "What I like about Forest School is...?"

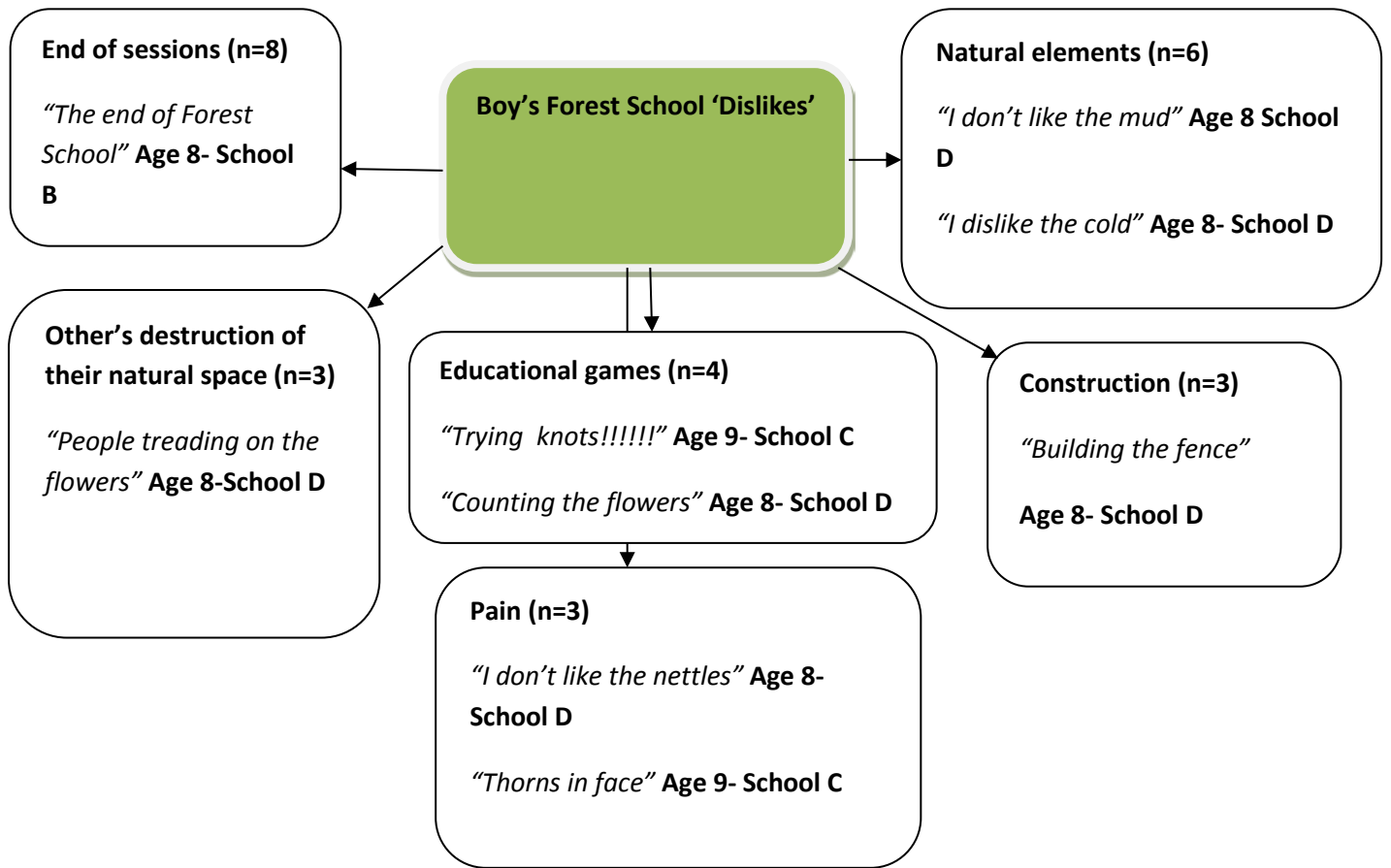


Figure 8. Pen Profiles for Boys "What I dislike about Forest School is...?"

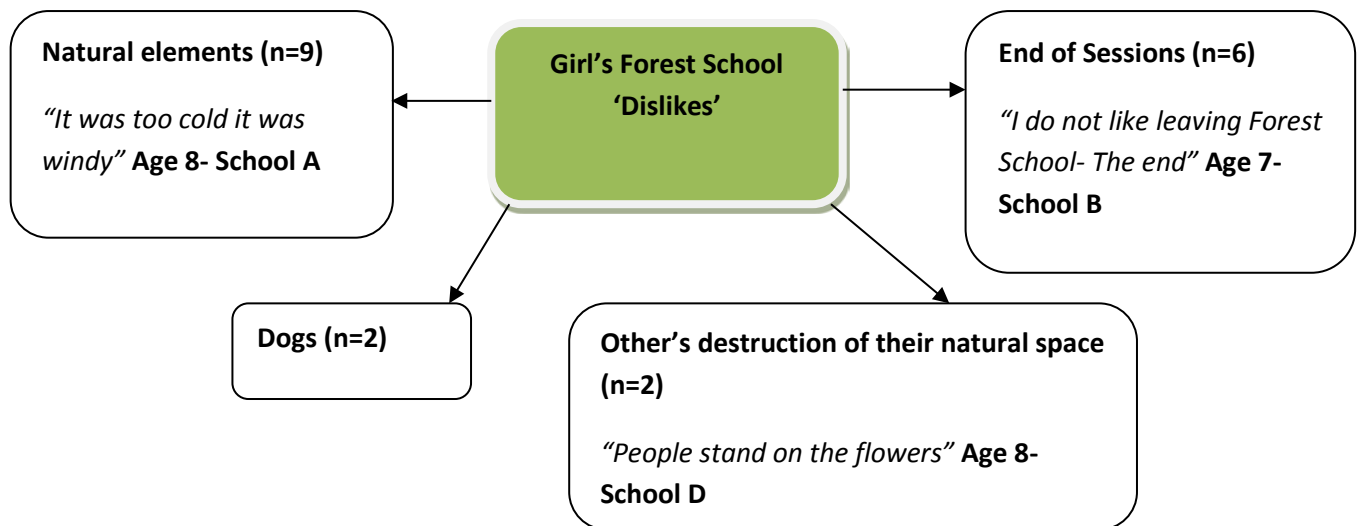


Figure 9. Pen Profiles for Girls "What I dislike about Forest School is...?"

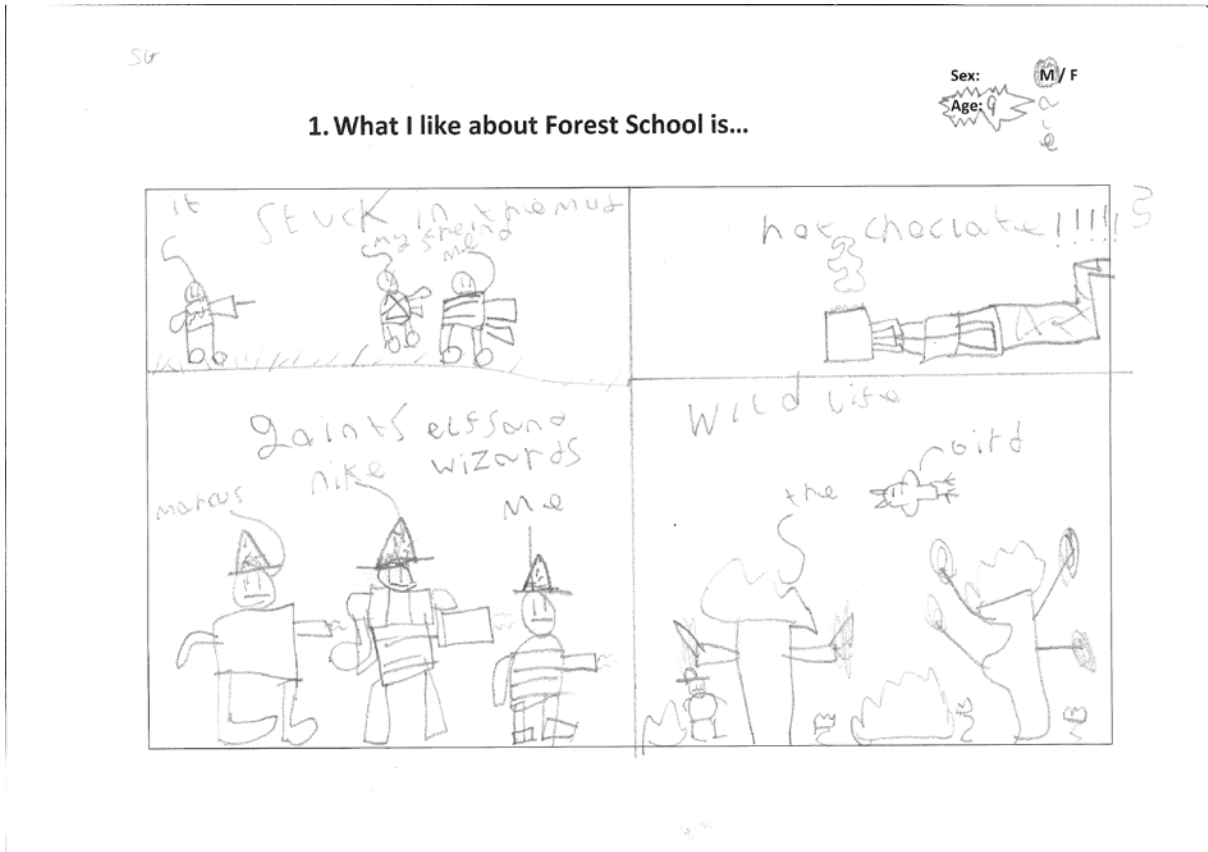


Figure 10. Drawing to illustrate boy's likes- Age 9- School C

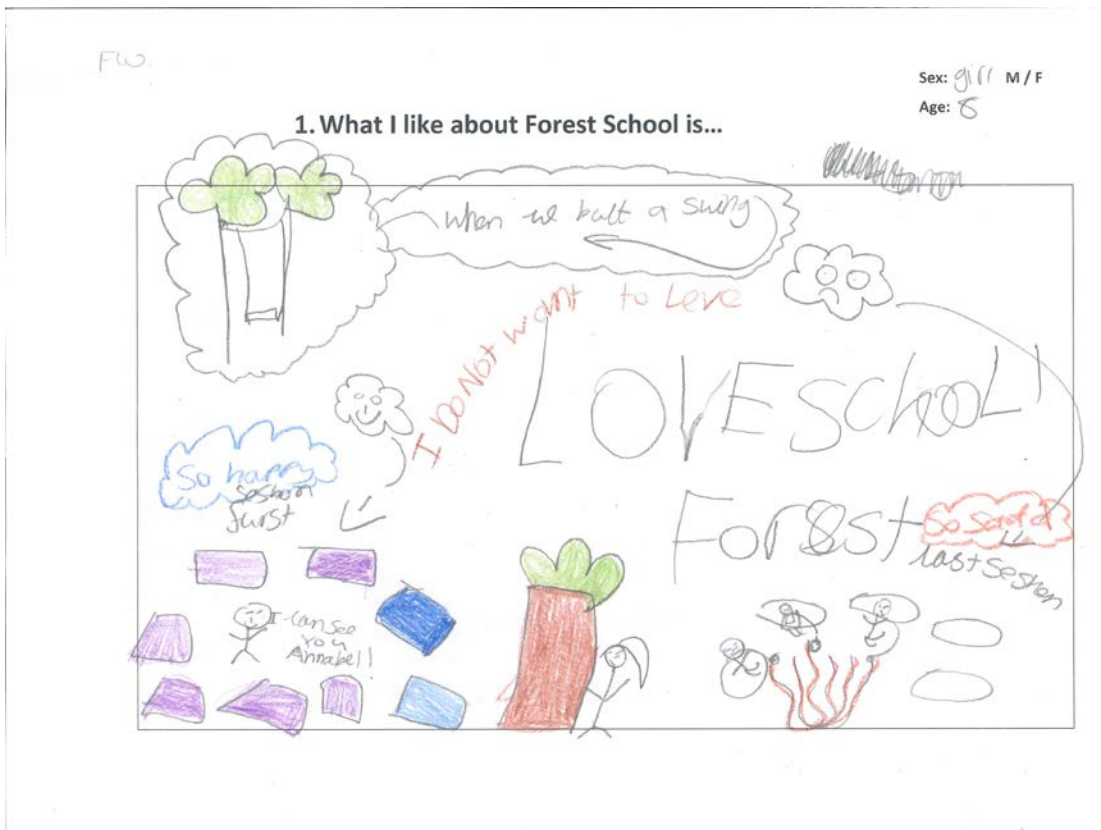


Figure 11. Drawing to illustrate girl's likes- Age 8- School B

2. What I dislike about Forest School is...

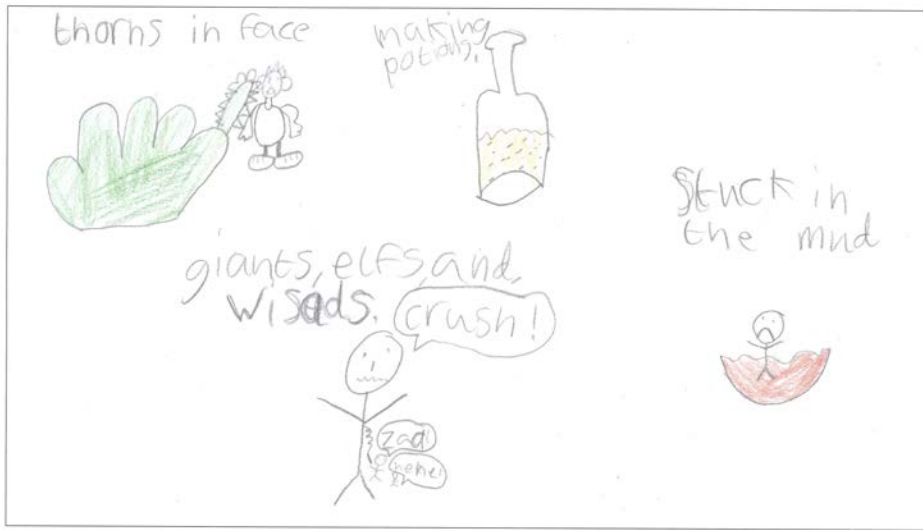


Figure 12. Drawing to illustrate boy's dislikes- Age 9- School C

2. What I dislike about Forest School is...

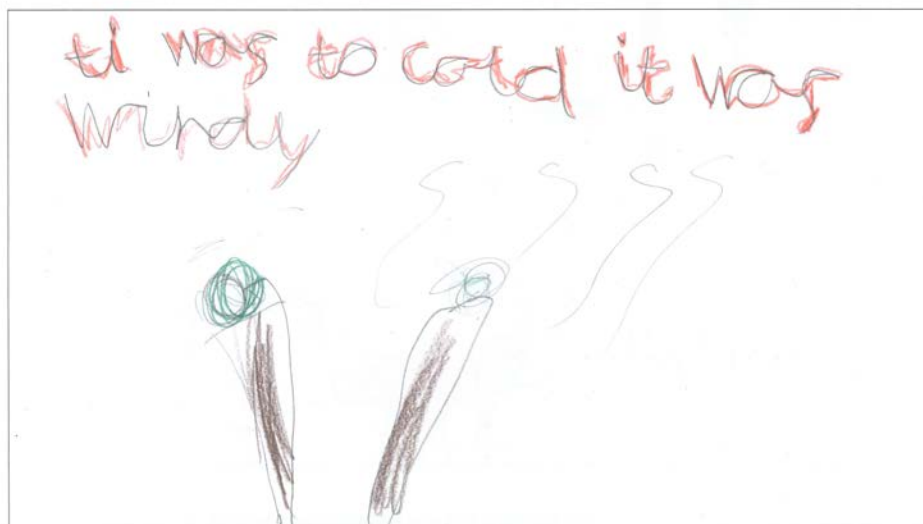


Figure 13. Drawing to illustrate girls dis likes- Age 8- School A

Discussion

This study used a mixed methods approach to investigate whether Forest School sessions were effective in increasing children's physical activity levels. It looked specifically at whether children would be more active on a Forest School day compared to a regular school day, whether children would be more active on a Forest School day compared to a school day with a PE lesson and whether Forest School sessions would make children more physically active in general.

According to the accelerometer data, children were significantly more active in terms of light intensity physical activity on a Forest School day than on a regular school day, this was not found for days with PE lessons or weekend days, however, trends showed that the amount of light intensity physical activity completed on a Forest School day was similar to that undertaken on a PE lesson day and was slightly more than the physical activity children were engaged in on a weekend day. When analysing the results regarding moderate physical activity, there were not significant differences for Forest School days, regular school days, PE lesson days or weekends. Trend did reveal however that children were slightly more active in moderate physical activity on Forest School days compared to regular school days, PE lesson days and weekend days, these findings were also evident for moderate to vigorous, vigorous and total physical activity assessed. When examining sedentary behaviour, children spent less time sedentary on a Forest School day than any other day of the week.

These objective findings demonstrate Forest School sessions to be extremely beneficial in terms of increasing children's physical activity levels and decreasing sedentary behaviour. Children spent significantly more time taking part in light intensity physical activity on Forest School days than regular school days. The NHS recommends 60 minutes of physical activity for children aged 5-18, benefits of taking part in this amount of physical activity include improvements in cardiovascular health, healthy weight maintenance, improved bone health, increased self-confidence as well as encouraging the development of new social skills (NHS Choices, 2014). When comparing light intensity physical activity to the NHS guidelines for this demographic, the time spent in light intensity physical activity on a Forest School day exceeded these guidelines with three times the recommendations.

Trends revealing that time spent in light intensity physical activity was similar to the physical activity on a day with a PE lesson are also extremely valuable in demonstrating the impact of Forest School sessions as a means of increasing physical activity levels in primary school children. These findings show particular relevance in the light of recent Ofsted (2013) recommendations, which state the following key recommendations regarding physical education:

“Teachers should improve pupils’ fitness by keeping them physically active throughout all lessons and engaging them in regular, high intensity vigorous activity or sustained periods of time

Teachers should raise their expectations of where more able pupils are capable of achieving and provide them with challenging, competitive activities that lead to high standards of performance”

Forest School sessions can therefore provide a potential solution in fulfilling these recommendations, by keeping children engaged in physical activity while continuing to follow the relevant core curriculum and providing children with unique physical challenges, possibly neglected during PE lessons. Therefore supporting Forest School as an additional opportunity for physical activity engagement to PE, this also may be favoured by children who do not enjoy the elements of traditional PE lessons, such as competitive sports.

In March 2013 the government announced that it was to provide additional funding of £150 million per year to improve provision of physical education (PE) and sport in primary schools in England under The Primary PE and Sport Premium with the following vision:

“All pupils leaving primary school physically literate and with the knowledge, skills and motivation necessary to equip them for a healthy lifestyle and lifelong participation in physical activity and sport.”

In order to obtain this funding, key requirements include

“The engagement of all pupils in regular physical activity – kick-starting healthy active lifestyles”

Of which Forest School sessions have been shown to exhibit in this particular study. Findings could therefore be of particular benefit to schools in enabling them to unlock this funding and similar opportunities.

Trends showing that children were slightly more active on Forest School days compared to regular school days, PE lesson days and weekend days for moderate to vigorous, vigorous and total physical activity assessed are also promising. This is particularly significant for this study’s demographic within Halton where 25.1% of children in reception class and 36.5% of year 6 children are classed as overweight (NCMP, 2012/13). Childhood obesity is also considered to be one of the most serious global public health challenges for the 21st century (WHO, 2014) and obese children are at an increased risk of developing various health problems, and more likely to become obese adults. Statistics from 2012 show that around 28% of children aged 2 to 15 were classed as obese or overweight (HSE, 2012). This implicates the importance of current findings in having a national as well as a local impact.

The lack of sedentary behaviour on Forest School days compared to the other days of the week are compliant with the NHS recommends for minimising sedentary behaviour (NHS Choices, 2014) which include reducing time spent watching television, using the computer or playing video games and breaking up sedentary time such as swapping a long bus or car journey for walking part of the way. Forest School sessions have been effective in this study at minimising sedentary behaviour typically experienced during traditional lessons, by encouraging children to be physically active in the natural environment as opposed to sitting for long periods in a classroom environment.

These findings are consistent with findings from Lovell (2009) where children were significantly more active during Forest Schools compared to regular school days and exceeded the daily recommended 60 minutes of physical activity. Yet this study also showed Forest School sessions to involve more physical activity than a PE lesson. Gender was also examined in this study however, revealing no significant differences between physical activity levels in boys and girls. Further analysis on the present study would be beneficial to investigate this on the current sample.

Interestingly, the self-reported physical activity did not reflect the accelerometer data with data from the Physical Activity Questionnaire for Older Children (Kowalski, 1997) revealing no significant differences between self-reported physical activity at baseline and follow-up. These findings could be explained by the limitations associated with using questionnaires on this demographic and those associated with this questionnaire in particular. General limitations include bias due to possible exaggeration of activity reported or recall difficulties. Whereas specific limitations of using the Physical Activity Questionnaire for Older Children (Kowalski, 1997) are that this instrument was developed to assess general levels of physical activity and do not therefore provide an estimate of caloric expenditure or specific frequency, time, and intensity information. It also fails to discriminate between specific activity intensities, such as moderate and vigorous activities, they simply provide a summary activity score. These limitations could explain the lack of significance in these findings.

Data collected during the write and draw activity revealed interesting gender differences in terms of activity preferences while participating in Forest School sessions. Data from all schools (Schools A, B, C and D) showed that boys liked tasks involving construction, such as den-building and path-making, been involved with making the campfire and playing active games involving chasing, hiding and climbing. Whereas the girls enjoyed the social elements of Forest School, such as playing with friends and interacting while been sat around the campfire, they also preferred the creative tasks that were available which were arts and crafts using natural materials such as leaves and branches. Interestingly, gender differences were not as evident in terms of the children's dislikes of Forest School sessions with both boys and girls showing a dislike for the end of the Forest School sessions, where they expressed a sadness to leave and the negative elements associated with been in the outdoors, such as been cold and wet at times. The dislike for the cold and the wet weather could partially be explained by the fact that the Forest School sessions were delivered in the autumn and winter months, where cold and wet weather was usually apparent.

These gender differences reflect write and draw data from previous playground studies with primary school children (Knowles et al, 2013). This study similarly showed boys citing playing active games with peers such as football and girls participating in more social interactions.

Gender difference highlighted during this study could potentially inform the delivery of Forest School sessions, by advising on activities to keep both boys and girls engaged throughout.

Focus group data showed that Forest School sessions had a wider impact on children extending to their leisure time, family activities and mental wellbeing.

Children agreed that Forest School sessions made them physically active, this was particularly evident when taking part in chasing games, which they enjoyed and experienced physical exertion, with the majority rating their exertion levels as 'moderate' to 'hard'. The majority reported playing outdoors in their leisure time and agreed that Forest School sessions had positively impacted on the amount of physical activity they participated in during their leisure time with some reporting that they had replicated the games they had learned during their Forest School sessions. These findings reflect those by Ridgers et al (2012) where children experienced a greater engagement with the natural environment as a result of Forest School sessions. Of those who reported playing indoors, the majority of those activities were sedentary games, such as playing computer games and discussed restrictions to outdoor play. When comparing Forest School days to regular school days, the majority of children preferred doing lessons outdoors, stating more specifically that they enjoyed Forest School sessions as opposed to their regular classroom lessons, due to the wider opportunities to play. Interestingly the children also reported that their peers behaved differently in Forest School compared to their regular classroom lessons with improved behaviour and those quieter children been less shy. These findings are similar to previous Forest School studies (Slade et al, 2013; Roe and Aspinall, 2011; O'Brian and Murray, 2007). When exploring comparisons between Forest School sessions and PE lessons, children agreed that Forest School sessions were more active, the environment was very different, they had more freedom and had the opportunity to express their creativity in Forest School sessions when compared to their PE lessons. Whereas, in PE lessons children agreed that this gave them the opportunity to play sport and more equipment was available, as compared to their Forest School sessions. In terms of mental wellbeing, the majority of children reported feeling bored before they started their Forest School sessions and that they enjoyed participating in Forest School sessions, highly valued the opportunities for free play and creativity, increased social interaction and exercise. At the end of the Forest School sessions, children reported feeling sad that the sessions had come to an end. Children also agreed that Forest School sessions would positively influence their mental wellbeing by making them feel happier supporting previous literature (Kenny, 2010).

Advantages of the current study include a mixed methods approach to data collection which utilising quantitative, qualitative and objective data techniques. This makes this study scientifically robust while enabling rich in-depth data to be gathered from the child's perspective, whereas previous studies have tended to be qualitative with accounts from teachers or Forest School Leaders. This study also uses the largest sample size to date, unlike previous studies using smaller sample sizes where findings cannot be generalised to wider populations. The current study is also unique in terms of investigates physical activity as a primary outcome of Forest School as well as general wellbeing and its impact on children and their families.

Limitations of the present study are the lack of long-term follow-up measures, as it would have been interesting to follow the present sample over 12 months to see if the benefits

experienced as a result of Forest School sessions could be sustained. This would make an interesting follow-up study. In addition to the factors assessed during the present study. It would also be interesting to assess academic attainment and assess whether Forest School has an impact on this. This study assessed gender differences and found interesting results in terms of the write and draw data, it would therefore be interesting to manipulate the current study's accelerometer data to examine whether there were an objective gender differences in boys and girls physical activity levels.

It can therefore be concluded that the current study demonstrates Forest School sessions as a successful intervention in increasing children's physical activity levels. Increased physical activity levels and utilisation of the natural environment is also extended to wider family members, meaning less engagement in sedentary behaviour. Forest School sessions also promoted greater mental wellbeing in children, who expressed that they felt happier as a result of the sessions. Interesting gender differences were also demonstrated in write and draw data, consistent with previous studies possibly having implications for delivery of Forest School sessions to keep both boys and girls engaged throughout.

References

- Burtwright, C., Falch-Lovesey, S., & Lord, C. (2007). Forest School: Using a Forest School experience as a stimulus for speaking and listening, with a focus on raising achievement in boys writing using ICT. <http://www.schools.norfolk.gov.uk/view/NCC104254> . Accessed 27th July 2014.
- Cree, J., & McCree, M. (2012). A brief history of the roots of Forest School, part 1. *Horizons, Institute of Outdoor Learning*, **60**, 32-36.
- Cree, J. & McCree, M. (2013). A brief history of Forest School, part 2. *Horizons, Institute of Outdoor Learning*, **62**, 32-35.
- Crocker, P.R., Bailey, D.A., Faulkner, R.A., Kowalski, K.C. & Mcgrath, R. (1997). Measuring general levels of physical activity for the Physical Activity Questionnaire for Older Children. *Medicine and Science*, **29** (10), 1344-1349.
- HSE. (2012). Health Survey for England. Report available online: http://www.noo.org.uk/data_sources/child/health_survey_england. Accessed 27th July 2014.
- Kenny, R. (2010). Forest School and the Early Years Foundation Stage - an exploratory case study. https://www.academia.edu/666361/Forest_School_and_the_Early_Years_Foundation_Stage_-_An_Exploratory_Case_Study. Accessed 27th July 2014.
- Knowles, Z.R., Parnell, D., Stratton, G. & Ridgers, N.D. (2013). Learning from the experts: Exploring playground experience and activities using a write and draw technique. *Journal of Physical Activity and Health*, **10**, 408-415.
- Kowalski, K., Crocker, P., & Faulkner, R. (1997). *Validation of the physical activity questionnaire for older children. Pediatric Exercise Science*, **9**, 174-186.
- Lovell, R. (2009). Physical activity at Forest School. Forestry Commission Scotland. (report). Available at: http://www.educationscotland.gov.uk/Images/Physical%20Activity%20at%20Forest%20school_tcm4-597067.pdf . <http://www.forestresearch.gov.uk/website/forestresearch.nsf/ByUnique/INFD-6HKEMHS>. Accessed 27th July 2014.
- Mathews, G., Jones, D.M., Chamberlain, A.G., 1990. Refining the measurement of mood: the UWIST Mood Adjective Checklist. *The British Journal of Psychology*, **81**, 17-42.
- Murray, R. & O'Brien, E. (2005). Such enthusiasm – a joy to see: an evaluation of Forest School in England. (online) <http://www.forestresearch.gov.uk/website/forestresearch.nsf/ByUnique/INFD-6HKEMHS>. Accessed 27th July 2014.

NCMP. (2012/ 13). Childhood Obesity in Halton: National Child Measurement Programme (NCMP) Official Report 2012-2013. Available at: <http://www3.halton.gov.uk/Pages/councildemocracy/pdfs/CensusandStatistics/NCMP201213.pdf> . 27th July 2014.

NHS Choices. (2014). Physical Activity Guidelines for Children and Young People. NHS Choices. Available at: <http://www.nhs.uk/Livewell/fitness/Documents/children-and-young-people-5-18-years.pdf>. Accessed 27th July 2014.

O'Brien, L., & Murray, R. (2007). Forest School and its impacts on young children: case studies in Britain. *Urban Forestry and Urban Greening*, *6* (4), 249–265.

O'Dwyer, 2014

Ofstead. (2013). Press release: Not enough physical in physical education, Ofstead. Report available at: <https://www.gov.uk/government/news/not-enough-physical-in-physical-education> . Accessed 27th July 2014.

Ramirez-Rico et al, 2014

Ridgers, N.D., Knowles, Z.R., & Jo Sayers. (2012). Encouraging play in the natural environment: a child-focused case study of Forest School. *Children's Geographies*, *10*(1), 49-65.

Roe, J., & Aspinall, P. (2011). The restorative outcomes of forest school and conventional school in young people with good and poor behaviour. *Urban Forestry and Greening*, *10*, 205-212.

Schultheiss, O.C., Brunstein, J.C., 1999. Goal imagery: bridging the gap between implicit motives and explicit goals. *Journal of Personality*, *67*, 1–38.

Slade, M., Lowery, C., & Bland, K. (2013). Evaluating the impact of Forest School: collaboration between a university and a primary school. *British Journal of Learning Support*, *28*(2), 66-72.

Swarbrick, N., Eastwood, G., & Tutton, K. (2004). Forest School: Self-esteem and successful interaction as part of the forest school project. *Support for Learning*, *19*(3), 143-146.

WHO. (2014). Population-based approaches to Childhood Obesity Prevention. Report available at: http://www.who.int/dietphysicalactivity/childhood/WHO_new_childhoodobesity_PREVENTION_27nov_HR_PRINT_OK.pdf. Accessed 27th July 2014.

Yelling, Y., Lamb, K.L. & Swaine, I.L. (2002). Validity of a pictorial perceived exertion scale for effort estimation and effort production during stepping exercise in adolescent children. *European Physical Education Review*, *8*, 157–175.

Appendices

Appendix A- Gatekeeper Information Sheet

Appendix B- Gatekeeper Consent Form

Appendix C- Letters to Parents

Appendix D- Parent Information Sheet

Appendix E-Parent Consent Form

Appendix F- Children's Participant Information Sheet

Appendix G- Forest School Information Sheet

Appendix H- Child Assent Form

Appendix I- Children's Baseline Questionnaire

Appendix J- Children's Follow-up Questionnaire

Appendix K- Accelerometer Information Sheet and Diary

Appendix L- Parent/ Teacher Information Sheet

Appendix M- Write and Draw Sheet

Appendix N- Write and Draw Activity Instructions

Appendix O- Focus Group Questions and Script

Appendix P- Research Ethics Committee Application

Appendix Q- Demographics

Appendix R- PAQ-C- ANOVA

Appendix S- Content Analysis Table- Research Question 1

Appendix T- Content Analysis Table- Research Question 2

Appendix U- Content Analysis Table- Research Question 3

Appendix V- Content Analysis Table- Research Question 4

Appendix W- Pen Profile- Research Question 1

Appendix X- Pen Profile- Research Question 2

Appendix Y- Pen Profile- Research Question 3

Appendix Z- Pen Profile- Research Question 4