STUDY PROTOCOL

Forest school INterventions for Children's Health: a feasibility cluster randomised controlled trial to compare Forest School versus usual indoor classroom-based curriculum activity with KS2 children: the FINCH protocol

[version 1; peer review: 1 approved]

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Abstract

Background

Child and adolescent mental health is a public health priority, and prevention, early intervention, and treatment are identified as national strategic priorities. Children and young people (CYP) in the United Kingdom are experiencing poorer mental health outcomes than ever, and the demand for services is the highest on record. Understanding the effectiveness of school-based interventions for promoting and developing emotional well-being is a core research

Open Peer Review

Approval Status ✓

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1. **Dave Cudworth**, Independent researcher, UK, UK

Any reports and responses or comments on the article can be found at the end of the article.

priority. A school-based intervention that is inclusive and has the potential for widespread delivery is 'Forest School'. Forest schools provide children with immersive experiences in nature that are non-classroom-based and have a core focus on child-led activities and exploration. Despite widespread implementation, evidence about optimal delivery methods for Forest Schools and their impact on mental health and emotional well-being is scarce. This study will generate new knowledge about the feasibility of running a definitive Forest School trial with Key Stage 2 (KS2) children aged between 7–11 inclusive of children with special educational needs and disabilities.

Research Questions

Is Forest School an acceptable and feasible intervention to improve the mental health of KS2 children?

Is it feasible to run a cluster Randomised Controlled Trial (RCT) of Forest School for children in key stage 2 (aged 7–11)?

Objectives

1.
Test feasibility of trial procedures for recruitment, randomisation, and data collection

2.
Conduct a mixed methods process evaluation to evaluate implementation and fidelity

3.
Collect feasibility data to support an economic evaluation in a full trial

4.
Refine the current logic model and optimise the intervention

Methods

In Work Package (WP) 1, we will conduct a feasibility cluster RCT of a Forest School intervention with 200 children in five schools across Hull, East Yorkshire, and North Yorkshire. We will test the acceptability and feasibility of intervention delivery, assess the feasibility of the trial processes, and establish key parameters for effectiveness. In WP2, we will evaluate the quality and fidelity of intervention delivery through process evaluation, including observations and qualitative interviews. WP3 focused on the preliminary collection of health economic data. WP4 uses focus groups to refine the logic model and optimize the content of the intervention. We seek to produce a manualised toolkit

informed by interconnected work packages to inform further research and implementation. The trial was registered in ISRCTN (The United Kingdom's Trial Registry). Clinical Trials Registration Number ISRCTN87263624.

Patient and Public Involvement

This proposal was developed with the active involvement of parents/guardians, children, and schools alongside key stakeholders from the local authority, education, and the community sector.

Dissemination

We will develop accessible presentations, online workshops with interactive elements, and newsletters. Producing a set of easily read infographics and creative outputs (video/social media) alongside our children's Patient and Public Involvement (PPI) groups will be a key output. We anticipate that two publications in open-access peer-reviewed journals will share the quantitative and qualitative findings of the study.

Plain Language Summary

More children and young people than ever are experiencing problems with their mental health. It can be hard for them to get the help they need because waiting times for mental health services are often long.

Schools are an important place where children can get support for their wellbeing. One approach that may help is spending more time outdoors and connecting with nature, which has been shown to benefit mental health.

Forest School is a type of outdoor learning that involves play, exploration, and hands-on activities in nature. These sessions are becoming more common in schools and community settings. Some people believe Forest School can improve children's mental health, but we don't yet have strong evidence to show this.

We want to find out if it's possible to run a larger study in the future to test whether Forest School can help children's mental health. To do this, we're running a smaller study first, called a "feasibility trial". This helps us understand what works and what doesn't before moving on to a bigger project.

We will work with primary schools in England that can run Forest School sessions. The schools will be asked to offer similar types of activities.

We will include year groups from Key Stage 2. Some children will be randomly chosen to take part in Forest School for 12 weeks. The other children will continue with their usual school activities during that time. After two terms, the second group will also get the chance to

take part in Forest School.

We will check:

If schools can run the programme as planned.

If we can collect the right information about children's mental health and wellbeing.

Whether families and school staff are happy with how the study is run.

How much it costs to deliver Forest School.

We will also interview children, parents, and staff to understand their experiences.

Our research team includes people with lived experience. One is a parent of children with additional needs, and another is a Forest School teacher who works with children with special educational needs. We've also worked closely with young people from a group called Re-Wilding Youth Hull to help design the study in a way that makes sense to them.

We will create easy-to-understand summaries of our findings and share them with parents, schools, and mental health professionals. We will also publish the results in academic journals and speak about them at health and education conferences.

Throughout the study, we'll use blogs and social media (like Instagram and Twitter) to keep people updated on our progress.

Keywords
Forest School, Schools, Children and young people, Public Health

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Introduction

Child and adolescent mental health is a public health priority, and prevention, early intervention, and the treatment of mental health problems in this group are national strategic priorities. The data consistently suggest that children and young people (CYP) in the UK continue to experience poorer mental health outcomes, and the demand for services to treat these is the highest on record. In children aged 7 to 16 years, the rates of a probable mental disorder rose from 1 in 9 in 2017 to 1 in 6 in 2020, where it remained at this high rate between the years of the survey 2020–2022[1]. Evidence indicates that we are experiencing a global public health crisis in youth mental health exacerbated by the COVID-19 pandemic[2]. There is a need to advocate evidence-based practices that are scalable, expand access to care for all children and young people, and provide fair and equitable mental health care for children worldwide[2]. The National Institute for Health and Care Excellence (NICE)[3] highlights the importance of all schools having a comprehensive social and emotional skills program. Understanding the effectiveness of school-based interventions in promoting children's emotional well-being is, therefore, an important research priority to ensure that these interventions are robust and evidence-based.

Forest Schools are a nature based intervention with potential, educational, health and social benefits which are consistently evidenced in systematic reviews of CYP[4,5]. However, to date, there have been no published randomised controlled trials using a Forest School intervention, and its efficacy is limited to small cohorts or case study populations. Additionally, although its popularity is rising within the educational setting and beyond, its evidence base remains limited with respect to mental health benefits, particularly for older primary school-age children.

This protocol describes a feasibility cluster randomised controlled trial with embedded process evaluation to investigate whether Forest School is an *acceptable* and *feasible* intervention to improve the mental health and well-being outcomes of Key Stage 2 (KS2) children.

Background

Forest School is an English name developed from the rich tradition of Scandinavian 'Friluftsliv,' literally meaning free air life[6]. Within Scandinavia there are a variety of interventions developed from this ethos including 'skovegrupper' (forest or wood groups), 'naturbørnehaver' (nature kindergartens) and ordinary early years settings that use the outdoor area they have available. These approaches can be distinguished from outdoor education, which often starts with an issue, agenda, or problem for children to investigate. Forest School approaches are led by the child's interests, within a loose skills framework with an ethos summed up by one Forest School practitioner as "..we follow what the children point out first, and set challenges"[7].

While Forest School interventions has been the subject of several recent systematic reviews[4,5], there have been no randomised controlled trials conducted, and evidence is limited with respect to its contribution to mental health and wellbeing benefits[8]. However, a large body of research suggests that nature-based interventions can be an effective means of supporting CYP's mental health[9–12]. Nature connectedness, which refers to an individual's subjective sense of their relationship with the natural world, has been identified as a key concept in regulating emotional and mental health. Individuals who are more connected with nature are usually happier in life and more likely to report feeling that their lives are worthwhile[13]. Sella *et al.*[14] reviewed the literature on the influence of Forest Schools on the mental well-being of preschool children and found positive impacts in a wide range of variables that promote child health and development. However, they concluded that more evidence is needed because of methodological weaknesses across the reviewed studies. Evidence suggests that COVID-19 has widened the inequality gap in this respect, and children from ethnic minority backgrounds and low-income households are less likely than children in more affluent areas to experience the full benefits of access to nature and green space[15].

Forest School is a complex intervention, and there is no agreed model of transformational processes or theory of change. Previous studies have highlighted some potential pathways to improving mental health and well-being, including providing nurture, time, and space away from school as well as connection to the rest of nature[16]. Our proposed program allows for iterative cycles of testing, development, and refinement of Forest School as a mental health and well-being intervention in the school environment. In partnership with our Patient and Public Involvement (PPI) group/members/co-applicants and using the current literature, we have developed an initial logic model and underpinning program theory to aid us in better understanding the likely mechanisms of action and pathways to impact mental health and wellbeing. We will seek to refine this model at the end of this study.

There are several training centres and packages offered through national bodies (e.g., the Forest School Association, FSA). Regionally, training has been provided by various providers for teachers/professionals about the skills required to organise and deliver outdoor activities in line with the nature-based pedagogy of Forest School (e.g., Nature Friendly Schools and Creative Outdoor Learning Award). Our Patient and Public Involvement (PPI) work indicates that schools are delivering Forest Schools in line with nature-based pedagogy principles and often use a set structure regarding frequency, timings, and activities. However, the delivery of Forest Schools is often not as prescriptive as some of the training providers outline, that is, the FSA. Therefore, despite widespread implementation, evidence about optimal delivery methods for Forest Schools and their impact on mental health and emotional well-being is scarce.

This study aims to explore the acceptability and feasibility of the delivery of Forest Schools, assess the feasibility of trial processes, establish key parameters to inform a definite trial, and produce a manualized toolkit. If the outcomes of this study meet our feasibility progression criteria, we will seek to progress this research into a definitive trial.

Materials and methods

Study design

We report this protocol in line with the SPIRIT 2025 schedule of items to be addressed in a randomized trial protocol (a copy of the completed checklist can be found at: https://doi.org/10.1186/ISRCTN87263624). In accordance with this checklist, we have included a structured summary of the planned trial in our online repository (https://doi.org/10.1186/ISRCTN87263624).

We will conduct a feasibility cluster randomised control trial (RCT) of a Forest School intervention with 200 children in Key Stage 2 across eight schools across Hull, East Yorkshire, and North Yorkshire (England) with an embedded process evaluation to evaluate the quality and fidelity of intervention delivery. At the end of the study, focus groups will be used to refine the logic model and optimise the intervention. A patient and public involvement (PPI) group of children and parents/caregivers will meet periodically throughout the study to ensure input from those with lived experiences.

The trial was registered in ISRCTN (The United Kingdom's Trial Registry). Clinical Trials Registration Number ISRCTN87263624. ISRCTN - ISRCTN87263624: Forest school research. This study was registered on the 11th of September 2024.

The full protocol is available on the NIHR website (https://fundingawards.nihr.ac.uk/award/NIHR157698. A detailed statistical analysis plan will be stored according to the York Trials Unit (YTU) standard operating procedures and guidance documents within the trial master file and are available upon request.

Ethical approvals

The study received ethical approval from the University of York Department of Environment and Geography. Reference DEGERC/Res/12072024/1. Any amendments to the protocol will be submitted first to NIHR by email for their approval and then to the Department of Environment and Geography. If an amendment is substantial, then we will also update the Clinical Trials Registry with new information.

Research questions

There are two research questions for the study:

- Is Forest School an acceptable and feasible intervention to improve the mental health of children aged 7–11 years old?
- Is it feasible to run a cluster RCT of Forest Schools for children aged 7–11 years old?

Aims

1. Assess whether it is feasible to conduct a full-scale definitive cluster trial of a school-based Forest School intervention on mental health among 7–11 years old children
2. Conduct a mixed methods process evaluation
3. Collect feasibility data to support an economic evaluation in a full trial
4. Refine the current logic model and optimise the intervention

Objectives

1. Test feasibility and acceptability of recruitment, the randomisation strategy and trial procedures
2. Estimate recruitment and retention rates to inform a definitive trial
3. Explore the feasibility of collecting health outcomes, process, and health economic measures
4. Evaluate implementation and fidelity of delivery to determine feasibility of the intervention delivery
5. The acceptability of the intervention was evaluated from the perspectives of children, parents, Forest School facilitators, and other professional stakeholders.
6. Explore contextual factors affecting implementation and mechanisms of impact
7. Refine the logic model developed prior to study commencement and program theory to inform optimization of intervention for definitive cluster RCT.

Patient and Public Involvement (PPI)

We have two experienced PPI leaders in the research team. The PPI Lead role will include developing and shaping the PPI plans with public contributors, including our collaborators Rewilding Youth Hull, and setting and refining the overall PPI strategy as the project progresses. Collaborators include individuals with specific expertise in delivering the Forest School and supporting the CYP.

Our CYP panel includes approximately 10 children (aged 7–11) and their parents/guardians. Children will have attended creative sessions facilitated by staff from the Rewilding Youth Hull, separate to their parents with both groups, and then come together at the end. Sessions are to be held in the 'roundhouse' at Rewilding Youth Hull, which is a special round building with a firepit inside, to provide a green setting for activities. In line with NIHR guidance and as suggested by the CYP, we will appropriately remunerate children and parents for their time using vouchers. We will hold eight sessions throughout the grant term (September 2024–June 2026) with initial sessions focusing on providing training to young people on what research is and developing creative patient information sheets/initial communications. Six sessions will be undertaken when the research is up and running to share the results and ask for feedback. Two sessions will be held at the end of the study (June 2026) to examine the creative means of dissemination.

The opportunity to join the panel will be shared widely across a variety of platforms and services, including but not limited to Humber teaching NHS FT (Youth Forum and Recovery College), Rewilding Youth Hull, Child Orientated Mental Health Innovation Collaborative (COMIC) PPI group, local authority contacts (Mental Health Support Team manager) and local community groups that meet the needs of ethnically diverse communities.

In addition to the CYP and parent panel, we will ensure that we hold initial open sessions before beginning research at any school site, inviting all parents/guardians, teachers, staff, and governors. We will ensure that at each session delivered with schools/parents/caregivers, they are given brief training on the research protocols and involvement to ensure that they feel their input is valued.

Forest school intervention

Definition: The intervention can be described as a non-classroom-based timetabled session of child-led exploration and play in an outside space encouraging connection with and exploration within nature. We have used existing best practices and definitions, looking at current models of Forest School delivery within schools (FSA), Nature Friendly Schools, Creative Outdoor Learning Award, and PPI input (PPI Leads/workshops/schools) to define what Forest School means in the context of this feasibility study. We have defined the minimum standards that all schools must ensure are included as part of the Forest School sessions:

1. A non-classroom, child-led experience.
2. Outdoor spaces with natural features, room for forming a circle, and materials such as rope, various tools, and natural materials such as leaves and twigs.
3. Encouragement of connection with and exploration of nature through activities. It encompasses sensory contact with the natural world, fostering an emotional bond with and love for nature, appreciating the beauty of nature, contemplating the meaning and signs of nature, and demonstrating compassion and care for nature.

Physical materials to be used as part of the intervention will vary depending on the outdoor space available, but commonly used materials will be natural features in school grounds, including trees, bushes, grassy areas, sticks, and stones. Teachers also receive a list of resources that would be helpful in running sessions. This will be prepared by our experienced Forest School teachers and will include items such as tarpaulin, rope, potato peelers, pots, and pans. An activity manual and slides developed for delivery at the Forest School training session will be available to schools in the intervention group and, following the trial, the control schools. At the end of the trial, this manual was adapted and developed into a workbook following additional information being added as a result of the observations, workshops, and interviews. Both the control and intervention arms will receive a copy of the Forest School workbook as an additional benefit of taking part.

Rationale and goals of the FINCH intervention

The intervention will be underpinned by existing and established frameworks around Forest School that characterise seven core areas related to fire skills, using tools, navigation, cooking and growing food, den building and knots, nature appreciation, and personal and social skills. Within these core skill areas, participants will be given opportunities to explore specific activities with the Forest School lead teachers and assistants to adapt these to learners' interests, abilities, and needs. Examples may include supporting a child with fine motor skill difficulties in using tools or providing modifications to an activity, such as a quiet space for a child to work away from the group. Sessions are not prescriptive but need to include the core skill areas across the school term of delivery to ensure adherence to minimum standards. As the Forest School sessions are child-led, the teachers will adapt the lesson as much as possible around the needs of the children in their class (for instance, different activities for children who struggle to engage or for those who need more support). The teachers will tailor the Forest School experience around what the children engage most with.

Materials and mode of delivery

Our collaborators, PPI work, and existing Forest School delivery principles informed us of the materials and mode of delivery to be used in this study. Our collaborators had significant experience in applying these principles in practice. Sessions will take place at least two timetabled hours each week for one term (Spring or Summer), which equates to 12 sessions. A minimum of 10 out of the 12 sessions needed to be delivered, allowing for unforeseen circumstances such as staff illness and extreme weather. Splitting sessions into shorter time frames to account for unforeseen circumstances will also be considered appropriate, that is, 2 × 1-hour lessons instead of 1 × 2-hour sessions. Sessions will be delivered by existing staff within schools (headteachers, teachers, teaching assistants) who have previously received a specific core level of relevant training in Forest School delivery, including FSA Level 3, Nature Friendly Schools training, Creative Outdoor Learning Award, and/or at least five years' experience in delivering nature/outdoor-based play/learning to account for skilled individuals with backgrounds such as Brownies/Scouts. While we aim to make this an inclusive feasibility study, PPI input suggests that schools without any prior experience of outdoor or nature-based interventions may find it challenging to deliver the Forest School model effectively. Therefore, we must balance inclusivity with the practical demands of a small feasibility cluster RCT.

There will be a minimum adult to child ratio of 1:9 and those with Special Educational Needs and Disabilities (SEND) will be supported by teaching assistants and volunteers. At the initial open sessions at each school, we will invite volunteers, offering continuing professional development for existing staff, such as midday supervisors and parents. These volunteers can potentially support the delivery of the intervention sessions, helping to increase the adult-to-child ratio.

Although there is no formal monitoring plan for the FINCH trial, we will adopt a risk-based monitoring approach, and the core study team will hold weekly meetings where we will discuss the progress of the trial and any issues with trial conduct or data collection, which may affect the integrity of the data. The study will be monitored on an ad hoc basis, in line with the particular needs of the trial. We have completed and signed a Data Protection Impact Assessment where we identified various risk factors associated with the study and how to minimize these; we will continuously hold our conduct of the study to a high standard and monitor our activities against these criteria. We will use our observations and reflections to design a comprehensive monitoring plan and proceed with a full trial.

Control arm

Control schools will be undertaking the usual indoor classroom-based curriculum activity during the terms when intervention schools are delivering Forest School. These activities were documented during the process evaluation. This comparator was chosen as we wanted to see if the Forest School has benefits over and above what currently happens in the classroom. After the study period, the control arm schools are welcome to start implementing Forest School, and the research team will be on hand to provide any guidance or support to allow them to do so. The community of practice sessions, in which all schools are invited to attend at three time points during the term, allows the control schools to interact with the intervention schools that are currently trialling Forest School and receive guidance and advice. These meetings were also attended by a member of the core Research Team and a member of the study team, who is a qualified Forest School practitioner. These sessions should put them in good place to successfully implement the Forest School if they choose to do so. No specific harm is anticipated, but a risk and adverse event process are in place.

Participants

The study is a multi-site study that will take place in eight primary schools across the East and North Yorkshire. We will work with each school to select a KS2 class as a part of the study. This decision will be made by the teachers based on the practicality of delivery and their previous experience in delivering outdoor education and Forest School related activities. If possible, we will ensure that we have a range of KS2 classes (Years 3–6) to ensure variation in age groups. All children in the class will be invited to participate in ensuring equal access. We will involve children aged 7–11 (KS2) in participating schools, including those with special educational needs and/or physical disabilities. We will use a school study agreement and consent form with each school to clearly delineate the requirements for participation and hold an introductory meeting before starting. Due to the nature of the intervention, there will be no blinding of the participants, teachers, facilitators, outcome assessors, or data analysts.

Inclusion criteria

- Schools with existing capacity and training to deliver Forest Schools, as defined in the study intervention
- Outdoor space available within school grounds
- All children within the allocated class

Exclusion criteria

As this is a feasibility study, we will not exclude schools unless they have no access to outdoor spaces of any type and are not practically able to run Forest Schools (e.g., the school does not have capacity, or no teachers are trained to deliver Forest Schools). We are keen to test the feasibility of delivery across a variety of outdoor spaces in recognition of the fact that this improves accessibility and diversity.

Recruitment

We will gather expressions of interest (EOIs) from schools, including the schools we have already contacted in the development of the application, and will look to include schools with a range of geographic regions situated within communities with differing levels of socio-economic deprivation, ethnically diverse, and with varying access to outdoor space to undertake Forest Schools. A poster and participant information sheet (PIS) will be available to schools, and this will be shared through email, social media platforms, and physically within meetings and with schools. The start date for recruitment was September 2024 and the end date was April 2025.

Once a school has officially joined the study, it will sign a school study agreement that will set out the study timescales and protocol requirements.

Consent processes

Opt-out criteria were used in this feasibility study. Parents or caregivers will be provided with the PIS and contact details for the study, and will be given the option to opt out of data collection. Parents/caregivers will be asked to return a signed 'Parent/Carer Child Withdrawal' form if they do not wish to share their child/children's data with the research team, and/or they do not wish themselves or their child or children to take part in any assessments or surveys and subsequent focus groups and interviews. This will not affect their children's participation in Forest Schools.

The researchers obtaining consent for the qualitative interviews will have up-to-date Good Clinical Practice training, will be DBS-checked, and will have the appropriate skills and qualifications to obtain consent. Parents and children will be provided with a separate PIS for the interviews. A consent form will be used for qualitative research interviews to be completed by the parent/caregiver, and the researcher will check their understanding. Children will be asked to complete an assent form indicating that they are happy to be interviewed, and the researcher will clarify that they understand what is involved. Consent will not be obtained for the observations as permission for these is included in the school-study agreement. We do not have any formal procedures in place to obtain consent from adults or children who lack the decision-making capacity.

Data protection and participant confidentiality

Participants' data will be anonymized and kept confidential. Participants will be assigned a unique ID that will be linked

to their data. Parents will be allocated the same ID as their child so that their data can be linked. Paper questionnaires will be stored in a locked filing cabinet and any identifiable information will be removed before they are stored. Personal demographic information about the children (e.g., date of birth, Special Educational Needs and Disabilities SEND details, free school meals, pupil premium, etc.) will be collected using a pupil details spreadsheet. This will be a password-protected file stored on a secure university-approved server and will be anonymized before being sent for analysis. Only a limited number of people will be able to access participant data to ensure the smooth running of the trial, data entry, or analysis. After the trial, only anonymized data will be presented in any report or publication to protect the confidentiality of the participants. Information disclosed during the interviews will be treated with the strictest confidence. Participant data transferred to sponsors, co-investigators, and external parties will be anonymized and sent through university-approved file sharing systems wherever possible. Confidentiality of participant information is of the highest priority and will be maintained throughout the study.

In line with the 2018 General Data Protection Regulation and UK Policy Framework for Health and Social Care, 79 anonymized trial data will be securely archived by the University of York for a minimum of 10 years. Personal data of participants will be stored for up to three years after the study has ended for the purpose of disseminating study findings. It is unlikely that this will take longer than 12 months; however, to ensure that participants receive adequate and full information about the study after it has finished, additional time was allocated.

All information collected during the trial will be kept strictly confidential, as described above. Information will be held securely in paper and/or electronic format at the University of York. The University of York complied with all aspects of the 2018 General Data Protection Regulation and Data Protection Act 2018. Operationally, this will include obtaining explicit consent from study participants to record personal details including name, postal and email address, contact telephone numbers, and appropriate storage, restricted access, and disposal arrangements for their personal details. All participants will be informed of their rights regarding stored personal information, including erasure, rectification, and objection. All work will be conducted following the University of York's publicly available data protection guidance which is publicly available (University of York, 2018).

Sample size

Sample size calculations were based on estimating the retention rates and standard deviation (SD) of the candidate primary outcome (Strengths and Difficulties Questionnaire). At least four clusters per group are recommended for pilot cluster RCTs, and we intend to randomize eight schools. An average of 25 children per school are anticipated, and we will include eight schools (i.e., 200 children). This will be equivalent to 70 children in an individually randomized trial (assuming an ICC of 0.1), and would be sufficient to allow a completion rate of 80% to be estimated within a 95% confidence interval of ±9%, which is in line with the sample size for estimating a reliable SD. We will recruit additional schools to go on a reserve list in case schools drop out before randomization or before they start the delivery of the Forest School.

Data collection

The following data will be collected:

- **Demographic information for children** will be collected at baseline and will be provided by the school from their routinely collected data including age, gender (male/female/other), ethnicity, special educational needs, and disabilities (children with Education Health Care Plan; existing diagnoses), if they receive free school meals, pupil premium, and postcode of the child's registered address.

- **Demographics for parents** will be collected using a short demographic questionnaire based on questions from the Office of National Statistics (ONS). This will include: age, gender, ethnicity, marital status, relationship to the child involved in the study, highest level of academic qualification, occupation, and accommodation status. This questionnaire will be given to parents to complete and return to the school or to the research team directly through a self-addressed envelope.

- **The UK Habitat Classification (UKHab)**[17] is a free-to-use, unified, and comprehensive approach for classifying habitats that are flexible enough for use in a wide range of habitat survey types, including small urban sites. The UKHab will be used to record the school outdoor environment in which the delivery takes place. The feasibility study is interested in whether this information can be collected and whether the type of school habitat affects delivery. This measure was collected by the research team during the initial site visits.

- **School attendance** for the Forest School intervention will be collected from the school attendance registers. This will include specific data on Forest School session attendance and overall school attendance over the entire term. This data will be collected at the end of the school year.

- **Local Environmental Context** will be assessed to understand the local environmental context of a school using existing online data tools. We will use Natural England's Green Infrastructure map[18] to identify accessible blue and green infrastructure and woodlands around schools, as well as play and active recreation facilities and the public rights of way and access points that connect these spaces to their surroundings. For each school, we used spatial analysis to present the relevant datasets at high resolution within the buffer zones around school buildings. We will also consider these environmental data within each school catchment, as this represents an alternative

way of understanding the environment that many children attending each school will experience on a day-to-day basis. We also undertake a child-focused analysis based on the locations of the centers of each child's postcode (available from the Ordnance Survey). For this analysis, we used a subset of the environmental data used for the school-focused analysis (likely datasets include green spaces, woodland, woody linear features, green space access points, and recreational areas) and used a similar spatial approach based on buffers around each child's postcode.

- Brief self-report **Forest School Facilitator Checklists** will be completed by the lead Forest School Facilitator after each session. The checklists will capture the date and time of the session, number of pupils in attendance, number of staff in attendance, location, focus of session (linked to core principles), activities delivered, details of any tailoring or adaptation to activities, level of enjoyment and engagement from learners, facilitator satisfaction, the extent to which the session was child-led, amount of time spent outside, and a free text box to capture any other notes/comments.

The following outcome measures will be collected at Baseline, Week 12 (end of intervention), and week 24 (follow-up), and the mean change from baseline at each time point will be analyzed:

Primary outcome

- **Strengths and Difficulties Questionnaire**[19] (parent and teacher versions) was the primary outcome for the main trial. The SDQ is a brief emotional and behavioral questionnaire. The SDQ queries the positive and negative attributes displayed by the child across five subscales: Emotional Symptoms, Conduct Problems, Hyperactivity/Inattention, Peer Relationship Problems, and Prosocial behavior. The total score can also be generated by summing the first four subscales.

Secondary outcomes

- **The Child Health Utility 9D**[20] is a pediatric preference-based measure of health-related quality of life suitable for 7–17-year-olds. It consists of a short questionnaire and set of preference weights using general population values. The questionnaire has nine questions, with five response levels per question, and is self-completed by the child (or proxy completed for younger children).

- We will use a selection of questions from the People and Nature Surveys for England[21] to gather information on **Frequency of access and attitudes towards green and natural spaces**. This will be completed by the parents only.

- **The Nature Connection Index (NCI)**[22] can be used with adults and children to identify changes in natural connectedness for individuals and groups of people. Nature connection is a key underlying theory as to why Forest Schools may be effective and so could be important to measure in a future definitive trial. Children will complete this measure.

- **Inclusion of Nature in Self Scales (INS)**[23] asked respondents to select one of seven pictures that best described their relationship with the natural environment. This will be used alongside NCI for children only.

These measures were chosen because they are validated for use with young children and/or are the most appropriate for analysing natural environments.

Randomisation

In this cluster, exploratory, parallel-group RCT, schools will be randomized with a 1:1 allocation ratio by a statistician based in the (YTU) who is not involved in the recruitment of the schools. The staff involved in trial delivery and liaising with the schools will not have access to the allocation schedule, which will be stored in the University of York Secure Drive. Minimization using free school status (at or above national average/below), class (year 3 or 4/ year 5 or 6), and location (urban/rural) will be undertaken using the MinimPY software.

Trial processes

We will collect feasibility data to inform a future randomized controlled trial at the Forest School. In addition, we will collect primary and secondary outcome measures at three time points (baseline), initial follow-up (week 12), and final follow-up (week 24) for both groups (Consort Flow Diagram available Figure 2: https://doi.org/10.1186/ISRCTN87263624). The research assistant will support the facilitation of these measures remotely, by telephone or face-to-face, depending on the preferences of parents and teaching staff. PPI work has informed the selection of measures, and key considerations, such as parental burden and accessibility, have been considered.

Recruitment: How can we successfully recruit to the study? What is the best way to engage with the population in which school sites are involved?

Retention: Do schools and participants withdraw from the study? If so, why and how can we reduce the number of withdrawals?

Representativeness of participants: Demographic information will be collected to determine if the intervention is accessible to a diverse population. Age, sex (male/female/third sex), ethnicity (based on ONS categories), special educational needs and disabilities (children with EHC; diagnosis), and Index of Multiple Deprivation based on participant home postcode.

Data completeness: Do schools and CYP complete the outcome measures included.

Acceptability of trial processes and intervention: This relates to both the intervention and the research process, and will be

assessed based on quantitative data of the school sessions carried out and qualitative interviews with participants.

The progression criteria for a definitive RCT will be based on a RAG-rating traffic light system: green (proceeding to RCT), amber (review RCT design and/or intervention components and delivery), and red (stop and reconsider the design and/or intervention components and delivery).

Analysis

Data on the number of schools and pupils approached, agreeing to participate, schools randomly assigned, schools receiving the intended intervention, completing the study protocol, and pupils providing outcome data will be summarised. The number of schools/pupils withdrawing from the trial, and where available, the reasons for withdrawal, will be summarized. For each data collection point, the number of non-responders was calculated, and participation rates were compared. We may also quantify the degree of clustering using ICCs (with 95% confidence intervals), but acknowledge that this may not be reliable owing to the small sample size[24]. All data will be summarized descriptively as counts and percentages for categorical data, and means, SDs, median, minimum, and maximum for continuous data. Data will be descriptively summarized overall, by group, and within subgroups (SEND status/type). We will gather these data on SEND status to consider whether it will be feasible and useful to examine the subcategories for future main trials. The number of sessions delivered and attended is summarized as a measure of acceptance.

Process evaluation

Our process evaluation is informed by existing frameworks[25–27] and draws on mixed methods, using observations and interviews, to examine the feasibility and acceptability of the intervention and mechanisms of impact.

Patterns of implementation and fidelity

The process evaluation gathers data to establish how the intervention is delivered and whether this varies across schools (Objective 4). The intervention is flexible, with scope for adaptation by the school staff to suit the needs of learners and the context of delivery. Nevertheless, as reported, there are several core principles and minimum standards that must be adhered to in order to meet our definition of a Forest School. We will explore *adherence* to these principles via Forest School facilitator brief self-report checklists to be completed by the lead Forest School Facilitator after each session.

Quality of delivery and participant responsiveness observations

Quality of delivery and participant responsiveness will be assessed through a structured observation conducted by two members of the research team in two randomly selected Forest School sessions. We will develop a coding framework for structured observation in line with specialist guidance on the implementation and process evaluation of school-based interventions in school settings[28]. Items will be developed to code indicators of delivery quality, such as facilitator interest and enthusiasm, preparedness, and participant responsiveness during the delivery of a session[29]. Items coded to assess participant responsiveness will assess the extent to which pupils appear to be engaged and interested in intervention materials and activities. We will consult our PPI and advisory groups regarding the development of the coding framework.

We will establish *reach* and *dose* by using attendance registers and session facilitator checklists to determine the number and proportion of children who engage in at least one activity in at least four of the seven core Forest School areas and monitor the overall number of sessions delivered per school.

Semi-structured qualitative interviews: to explore acceptability, context and mechanisms of action

Qualitative interviews with two members of the school staff (headteacher and class teacher) at the control schools will explore the extent to which the Forest School is different from the existing provision (*differentiation*). We also aimed to understand how the delivery of the trial impacted control schools, especially those who have experienced the study design, including the study setup and data collection. We will also interview the intervention group teachers, see below for more details, including interview methods.

Population sampling

Qualitative data will be generated through semi-structured interviews. We will purposively sample and recruit interviewees representing the following stakeholder groups: Forest School facilitators (n=8; two per intervention school), wider school staff (n=8; one to two per intervention school), children (n=16; four to six per intervention school), and their parents/caregivers (n=16). The selection sampling of Forest School Facilitators will include the leading staff member of the Forest School sessions (this is likely to be the class teacher) and one member of the staff supporting the Forest School sessions (this is likely to be the class teaching assistant). Implementation data will be used to ensure that we capture the views of high/low-fidelity facilitators. Wider school staff will be sampled to provide a range of seniority and roles, including head teachers and teaching assistants or SEND staff. Children and parents/caregivers will be approached based on consent status and then selected and purposively sampled to generate variation in age, gender, socio-demographic group, school, and SEND status.

Interview process

Topic guides will be used to focus on discussions, and emergent/unforeseen issues will be explored as appropriate. The topics covered in the guide will include perspectives on the acceptability of Forest Schools, how and why the intervention might impact child outcomes, and whether the impact achieved is influenced by student characteristics, wider school contexts or other factors, any unintended, potentially harmful consequences, and the acceptability of collecting measures and trial processes. Separate topic guides will be created for each

stakeholder group and informed by the Theoretical Framework of Acceptability[30], developed in consultation with our PPI and advisory groups.

Recruitment and consent: qualitative interviews

Parents/caregivers will be approached by schoolteachers using a Patient Information Sheet (PIS) to explain the purpose and process of the qualitative interviews. Children will automatically opt in unless their parent/carer completes an opt-out form to withdraw their child from selection. Parents or caregivers interested in participating in an interview must complete and return a permission-to-contact form, either to the school or directly to the research team via email. This will enable the research team to make contact and be selected for an interview. Both forms are attached to the PIS.

Interviews will be conducted in person (in school) or online depending on the interviewees' preferences. Full parent/caregiver consent will be obtained from the children selected for an interview. Children will be asked to complete an assent form to indicate that they are happy to be interviewed once the research team has briefed them about the interview process and answered any questions that they may have. Children will be interviewed (for a maximum of 30 minutes) by two members of the research team during the school day in groups of four to six in a focus/discussion group supported by a member of the teaching staff. This will take place in an area in the setting of their Forest School sessions, such as around the fire circle, to encourage discussion and engagement. For parents/caregivers, full informed consent will be obtained before the interview, which will last between 30–45 minutes and be scheduled for a time and mode most convenient to them (e.g., face-to-face, Zoom). In line with the recommended guidelines for payment of study activities, parents/carers will be reimbursed with a £25 Love2shop voucher to give us their time and views.

Recording process

All the interviews will be audio-recorded and transcribed verbatim. Topic guides and interview procedures will be piloted prior to use and refined, as needed. Quantitative data on the context for delivery will be gathered via UKHab, while factors that are anticipated to affect engagement with and benefits of forest schools will be captured using the NCI and the outdoor learning skills progression tool. Collecting these data will allow us to pilot mediator analyses representing theorized mechanisms of action.

Qualitative analysis

Qualitative data will be uploaded into specialist software for analysis via qualitative content analysis (free text from checklists) and thematic analysis (interview data), following the steps outlined by Bager-Charleson and McBeath[31]. The findings will be sensitized to the Theoretical Framework of Acceptability, and context-mechanism-outcome configurations will be developed.

Health economic analysis

This will focus on the feasibility of collecting data to support an economic evaluation that reflects costs and relevant outcomes from a health and education perspective. For health outcomes, we will assess the completeness and response rates to the Child Health Utility 9D (CHU 9D) across subgroups (no SEND, SEND type), and compared this to the potential of using SDQ data mapped to CHU 9D in terms of completeness and any additional uncertainty introduced by the use of a mapping algorithm[32]. This will inform the trade-off in a definitive trial between questionnaire burden (both CHU 9D and SDQ vs. SDQ alone) and the quality of data on child mental health impacts. CHU 9D or SDQ mapped to CHU 9D is anticipated to capture any immediate impact of forest schools on child mental health.

Improvements in the SDQ may be used to predict improvements in child mental health, which in a full economic evaluation could be used to predict ongoing health-related quality of life and health resource use[33]. The feasibility of collecting SDQ and attendance data will inform the choice of educational outcomes in a full economic analysis that would accompany a full trial.

From the education sector cost perspective, we will develop resource use questionnaires (school questionnaire and staff questionnaire) and use them in participating schools to determine whether it is feasible to identify any change in resource use from delivering Forest Schools in different school settings compared to usual activities (no Forest School). Within this, we will assess the impact on the total school resources used to make activities accessible and inclusive to children with SEND (school questionnaire). The school questionnaire aims to identify expenditures on infrastructure and equipment. A staff questionnaire for individuals running forest school sessions will assess staff time in planning and delivery of the intervention. The school questionnaire will include staff time spent in training and the community of practice, and we will also examine the costs that would be charged to the school for training workshops and any attendant materials.

Logic model refinement and intervention optimisation

Data from the process evaluation will be used to deepen the understanding of the mechanisms of action, reach consensus about the core intervention components, and establish ways to optimize delivery in schools in a large trial. We will run three workshops to support rapid cycles of analysis and feedback regarding the acceptability and feasibility of the intervention. Workshop participants will be the research team, including PPI co-applicants and our Forest School consultants.

In workshop 1, data from observations and interviews will be organized, filtered, and interpreted using affinity sorting and diagramming to cluster key findings and prioritize the next steps[34]. In workshop 2, participants will refine the intervention program theory and logic model developed prior to the start of the study (to include consideration of any potential harm or dark logic) to inform the evaluation framework to be used in a definitive trial. In workshop 3, participants will use the TIDier checklist[35] to identify and characterize the core intervention components and features to be carried forward into the main trial. Co-applicants MP, AK, and Forest School Consultant CS will ensure that the intervention is refined within the agreed limits and capabilities of primary schools.

Assessment and management of risk

An adverse event is any unexpected effect or untoward clinical event affecting the participant (i.e., any unfavourable and unintended sign, symptom, or disease). The severity of these events is outlined below. Possible harm as a result of the study is expected to be minimal but will be monitored and recorded. Adverse events (AE) in this study may include the following:

- Significant emotional distress.
- Verbal abuse
- Physical violence
- Physical injuries that did not require hospitalization.
- Allergic reactions not requiring hospitalization

All AEs will be assessed for seriousness and will be recorded as Serious Adverse Events (SAEs) if they

- Result in death
- Are life-threatening
- Requires hospitalization or prolongation of existing hospitalization
- Persistent or significant disability or incapacity

The adverse event reporting period for FINCH begins once the school is randomized and ends 24 weeks after the baseline data collection, that is, after the school is sent their final follow-up questionnaire. In this study, AEs and SAEs will only be recorded and reported if the event is

1. Suspected to be related to the research procedures (e.g., taking part in the forest school intervention, completion of follow-up questionnaires, participation in an observation or qualitative study)

The following events will not be recorded or reported:

- Normal childhood illnesses which are unrelated to an aspect of taking part in the study
- Hospitalization planned prior to study entry
- Pre-existing conditions.
- Death, for example, from an illness such as cancer or an accident, which is unrelated to participating in the study.

Teaching staff will monitor children using internal school procedures for safeguarding and risk, and any concerns arising because the study will be communicated to the PI and research team as soon as reasonably practicable. If participants have any issues, they will have contact details with the research team. We will put adaptations in place to ensure accessibility for those attending with disabilities, such as sensory impairment or mobility restrictions. We will develop a resource pack for mental health support for schools that they signpost if needed, such as appropriate charities and local CAMHS.

Discussion

The aim across all work packages is to test the acceptability and feasibility of delivery of the Forest School within KS2 classes, assess the feasibility of trial processes, and establish key parameters for effectiveness and cost-effectiveness. Forest School is a complex intervention, and this study will generate new knowledge on how to conduct a trial in this area, with KS2 children, and how to engage teachers, children, and parents. We hope that the results of this study will inform future clinical trials.

Dissemination

To share the methods and findings of this study, we will develop various dissemination materials in accessible formats, including presentations, an online workshop with interactive elements and newsletters, a set of easily read infographics and creative outputs (videos and social media infographics) created in partnership with our children's PPI group, and a newsletter. National dissemination will occur through our associated networks, including the Royal College of Psychiatrists, Clinical Research Networks (CRN), and NIHR Applied Research Collaborations (ARCs). We will publish findings from the study in open-access peer-reviewed scientific journals and present them at relevant symposia and conferences. In addition to the main trial findings, we will publish health, economic, and qualitative findings.

The results will be posted on websites, blogs, and forums. We will also share the methods and findings on social media such as LinkedIn, Facebook, Instagram, and Science Fairs. We will produce a short laypersons summary of the results and distribute this to all parents/carers, teachers, and children in the study in an age-appropriate language. We will also attend the schools and our partner organization, Rewilding Youth, to conduct informal interactive presentations that families and school staff can attend to determine the results and ask questions.

We aim to share these results as soon as possible after they become available. In the preparation of publications, we followed the criteria for authorship by the International Committee of Medical Journal Editors (ICMJE).

Roles and responsibilities

The coordinating site

The Humber Teaching NHS Foundation Trust will act as the main sponsor for this study and oversee the delivery of the study with the York Trials Unit. The York Trials Unit will be responsible for processing, analysing, and archiving data. The Humber Teaching NHS Foundation Trust and the York Trials Unit will be jointly responsible for the writing of publications and disseminating results.

Trial steering group

A Trial steering group will be held every 6 months. The trial steering group will be attended by the study leads, in addition to independent academics with specialist knowledge of trial delivery and data management. The trial steering group ensured that the study ran to the study protocol.

Study management group
A study management group will be held every month during the 20 months of the study. The study management group is made up of public contributors, academic co-applicants, and co-applicants from education and local authorities. The study management group will be responsible for ensuring that the study runs the protocol.

Patient & public involvement group
Our Children and Young Person (CYP) panel will include approximately 10 children (aged 7–12) and their parents/caregivers. Children will facilitate creative sessions separate from their parents, with both groups coming together at the end. Sessions are to be held in the 'roundhouse' at the Rewilding Youth Hull to provide a green setting for activities. In line with NIHR guidance and as suggested by the CYP, we will appropriately remunerate children and parents for their time using vouchers. We will hold eight sessions throughout the grant term, with initial sessions focusing on providing training to young people on what research is and developing creative patient information sheets/initial communications. Six sessions will be undertaken when the research is up and running to share the results and ask for feedback. Two sessions were held at the end of the study to examine the creative means of dissemination.

The opportunity to join the panel will be shared widely across a variety of platforms and services, including but not limited to Humber teaching NHS FT (Youth Forum and Recovery College), Rewilding Youth Hull, Child Orientated Mental Health Innovation Collaborative (COMIC) PPI group, local authority contacts (Mental Health Support Team manager), and local community groups that meet the needs of ethnically diverse communities.

In addition to the CYP and parent panel, we will ensure that we hold initial open sessions before beginning research at any school site, inviting all parents/guardians, teachers, staff, and governors. We will ensure that at each session delivered with schools/parents, they are given brief training on the research protocols and involvement to ensure that they feel their input is valued.

Data availability
As this paper reports the protocol for this study no data is currently available however study documentation and supplementary materials can be accessed at:

ISRCTN repository, Forest School Research, https://doi.org/10.1186/ISRCTN87263624

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Reviewer Report 23 September 2025

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✔ **Dave Cudworth**
Independent researcher, UK, UK

This research proposal is very timely and contemporarily important. It is well written, structured and very clear. I recommend that this randomised control trial should go ahead and fully support it. I feel that the findings could potentially provide solid evidence for a full roll-out of FS provision across all primary provision. However, it would be interesting if this study also noted its possibility of being a pilot for a further study on KS3 provision, where I feel provision of outdoor learning is even more important.

Is the rationale for, and objectives of, the study clearly described?
Yes

Is the study design appropriate for the research question?
Yes

Are sufficient details of the methods provided to allow replication by others?
Yes

Are the datasets clearly presented in a useable and accessible format?
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: I am an independent education researcher and Forest School leader with over two decades of experience in both school and university settings. My work is situated within the fields of outdoor and experiential education, with a particular focus on the pedagogical, relational, and ecological dimensions of learning in natural environments. My current research explores how engagement with outdoor learning spaces can cultivate learners' well-being and ecological consciousness.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.